Honeywell | CIU 888

Configuration Manual

Release R210

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PREFACE

General

Commissioning is the first step after the installation of the CIU 888. During commissioning, the CIU 888 site configuration is created and site elements such as CIU, field ports, tanks, GPU data inputs, Modbus data inputs, TRL/2 data input, and host ports are configured.

When the site is in operation and there are changes, for example a gauge is added or an additional host system is connected, these changes need to be implemented, and the CIU 888 needs to be updated with the new site configuration.

Purpose of this manual

The purpose of this manual is to provide information about the commissioning and configuration of the CIU 888.For the migration of an existing CIU 880 Prime/Plus site configuration to the CIU 888, See chapter 3.2.4 "Ensite pro database import option".

Target audience of this manual

This manual is primarily intended for service technicians who are responsible for commissioning and configuration of the CIU 888.

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The CIU 888 Service Tool is used for commissioning and configuration of the CIU 888. The CIU 888 Service Tool is typically installed on a PC/ laptop running Windows 10, which in turn is connected to the CIU 888 via the Service port located at the front of the CIU 888 or VPN port located at the back of the CIU 888.

CIU 888 Service Tool replaces Ensite Pro as the configuration tool for CIU 888. The CIU 888 Service Tool provides the Ensite Pro configuration options with the following improvements:

- Support for a maximum of 80 tanks.
- Support for a maximum of 6 field ports.
- Support for a maximum of 6 host ports.
- Support for gauge engineering units.
- Support for configuring a maximum of 4 host ports for GPU emulation and Modbus Emulation
- Support for Modbus field scan.
- Support for TRL/2 field scan.
- Support for servicing of Rex gauges.
- Support for Modbus TCP/IP on host ethernet ports.
- Support for OPC UA TCP on host ethernet ports.
- Support for Wireless field device scan on field ethernet port.

NOTE: *CIU 888 Service Tool can be released independent of CIU 888 firmware, hence the CIU 888 Service Tool has its own release number independent of CIU 888 firmware release number.*

1.1 When to use CIU 888 Service Tool

From CIU 888 R103 release, **CIU 888 Service Tool** is being introduced to configure CIU 888.

Until R103 release, **Ensite Pro, Ensite Pro to CIU 888 Migration Tool, and Web interface** are used during commissioning/configuration of the CIU 888.

The Migration tool is used for uploading the site configuration to the CIU 888 and for updating the INI files generated from Entis Pro. INI files are configuration files for Entis Pro. Migration tool needs to update the INI files before the files can be loaded to the Entis Pro tank inventory system.

The applicable configuration tools and scenarios to configure CIU 888 are mentioned in the following table.

Use Ensite Pro + Migration tool + Web interface	Use CIU 888 Service Tool
Supported scenarios: 1. CIU 880 being replaced by CIU 888, except 4 plus host ports in redundant non cross hot standby configuration. 2. Earlier units of CIU 888 being replaced with new units of CIU 888.	Supported scenarios: 1. CIU 880 being replaced by CIU 888 with 4 plus host ports in redundant non cross hot standby configuration (new configuration). 2. New sites being commissioned for CIU 888. 3 CIU880 Migrations through Ensite Pro database import

NOTE: For Ensite pro database See chapter 3.2.4 "Ensite pro database import option".

1.1.1 CIU 888 and Service Tool Compatibility Matrix

CIU 888 Version	Service Tool Version
R103.1/R103.2	Service Tool R101.1
R120.1	Service Tool R120.1
R120.2	Service Tool R120.2
R130.1	Service Tool R130.1
R140	Service Tool R140
R150	Service Tool R150
R160	Service Tool R160
R161	Service Tool R161
R162	Service Tool R162
R210	Service Tool R210

1.2 Recommended workflows to commission CIU 888

This section gives details on how to commission a CIU 888 (both redundant and non-redundant), and how to update the site configuration details of an existing CIU 888.

1.2.1 Commissioning a CIU 888 Standalone system
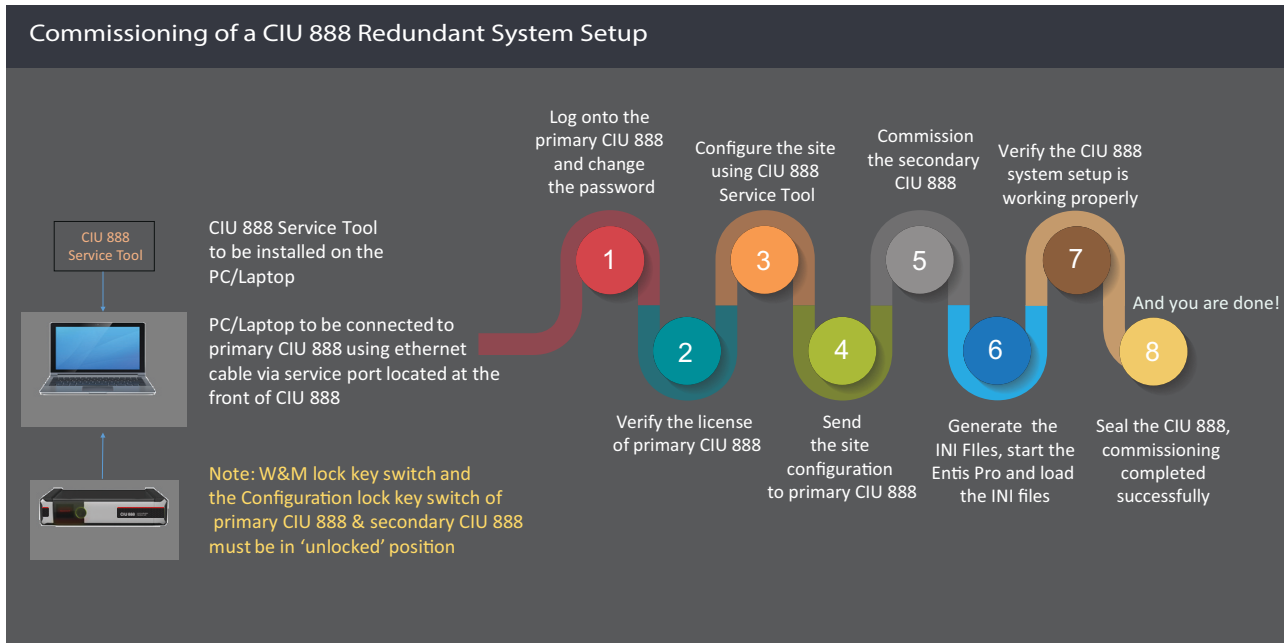
FIGURE 1-1   Commissioning a Standalone System Setup

Notes: 1. *Step 3 can be done offline without connection to CIU 888 and is independent of step 1 and 2.*

          2. *Steps 5 and 6 are required only when Entis Pro is a host connecting to CIU 888.*

1.2.2 Commissioning a CIU 888 Redundant system
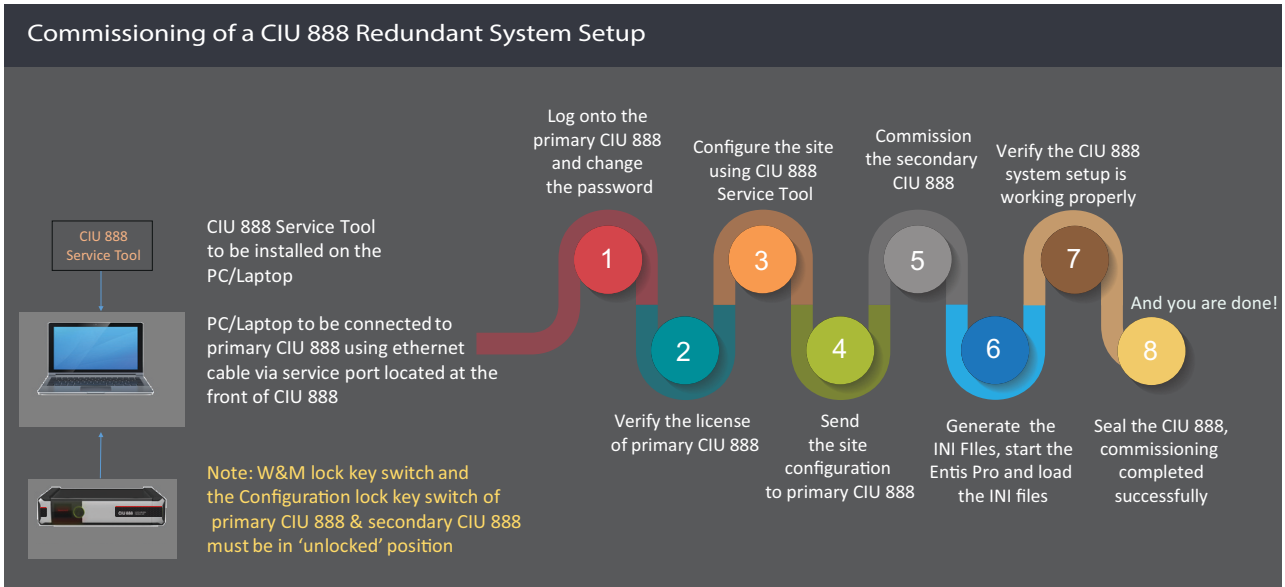
FIGURE 1-2   Commissioning of a Redundant System Setup

Notes: 1. Step 3 can be done offline without connection to CIU 888 and is independent of step 1 and 2.

2. Step 6 is required only when Entis Pro is a host connecting to CIU 888.

1.2.3 Updating Non Redundant CIU 888 Configuration
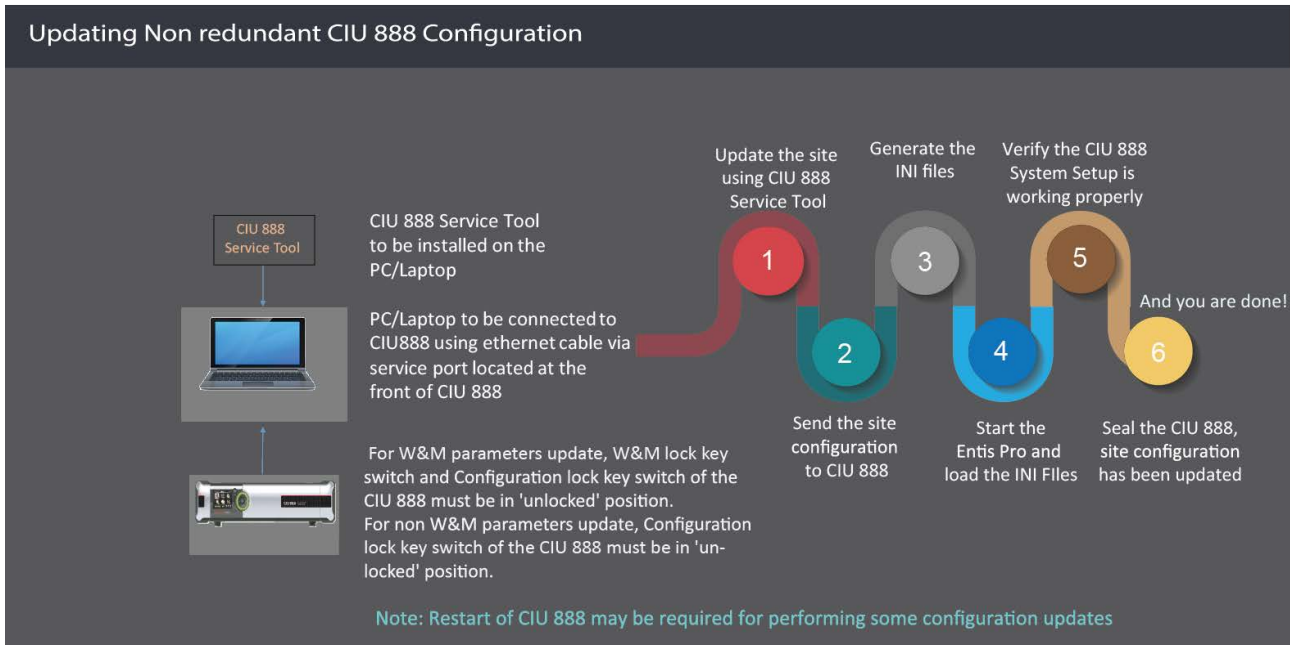
FIGURE 1-3   Updating Non redundant CIU 888 Configuration

NOTE: *Steps 3 and 4 are required only when Entis Pro is a host connecting to CIU 888.*

1.2.4 Updating Redundant CIU 888s Configuration
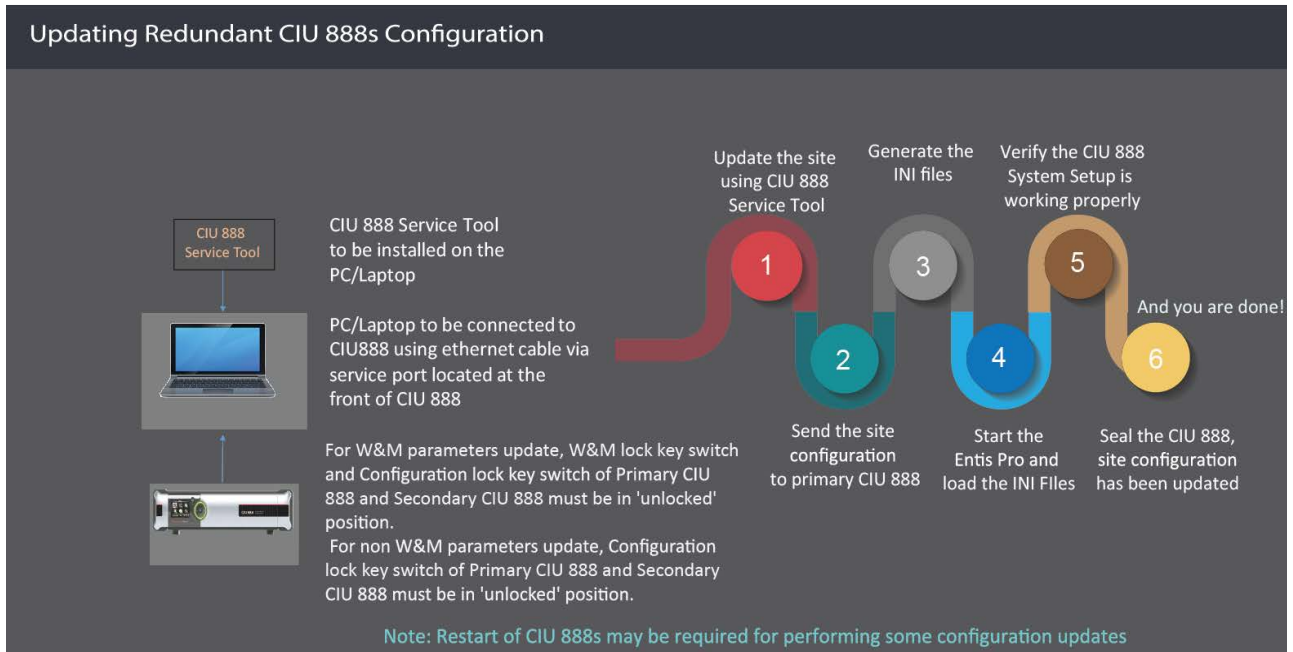
FIGURE 1-4 Updating Redundant CIU 888s Configuration

Notes: 1. *Steps 3 and 4 are required only when Entis Pro is a host connecting to CIU 888.*

2. *Primary CIU 888 & Secondary CIU 888 must be in sync.*

3. *Entis pro should be shut down before sending the site configuration to CIU 888.*

4. *Updates can be sent only to primary CIU 888 and not to secondary CIU 888.*

CHAPTER 2 INSTALLING CIU 888 SERVICE TOOL

2.1 Prerequisites

The PC/laptop must meet the following requirements to install the CIU 888 Service Tool:

- Windows 10 Enterprise 64 bit or Windows 10 LTSB 64 bit
- Microsoft .NET Framework 4.0 or higher

NOTE: *Microsoft .NET Framework 4.0 is installed automatically during the installation of Windows 7 or Windows 10.*

- Minimum 4 GB RAM
- Microsoft Internet Explorer 10.x or 11.x or Google Chrome (version 66 or above).

2.2 Installing CIU 888 Service Tool

2.2.1 Installing CIU 888 Service Tool on the new machine

1. Right-click on **Setup** file and then click **Run as administrator**.

   The **welcome to installShield Wizard** appears:.
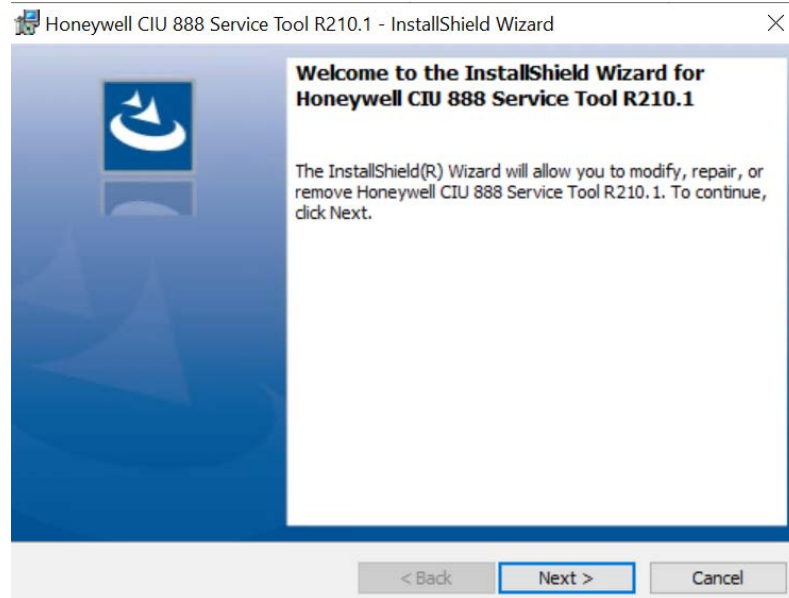
2. Click **Next**.

   The **License Agreement** window appears:
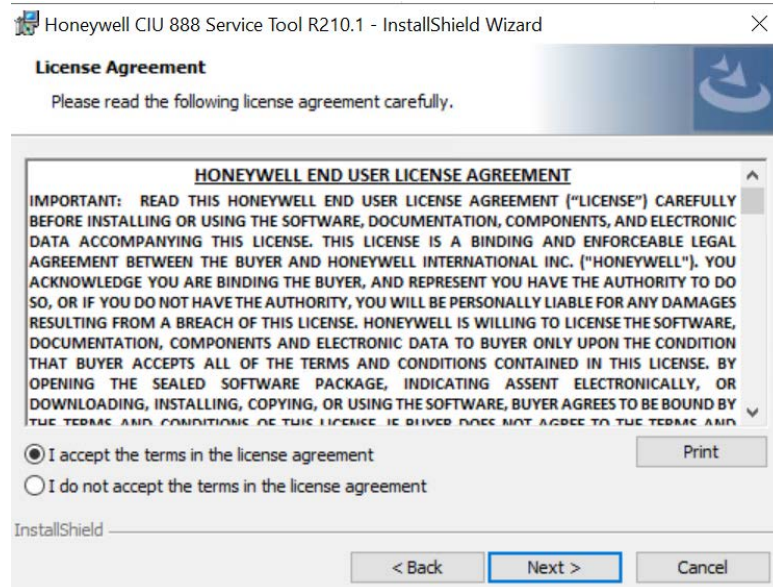
3. Read all license agreement and select "**I accept the terms in the license agreement**" .
4. Click **Next**.

The **Ready to Install the Program** window appears:
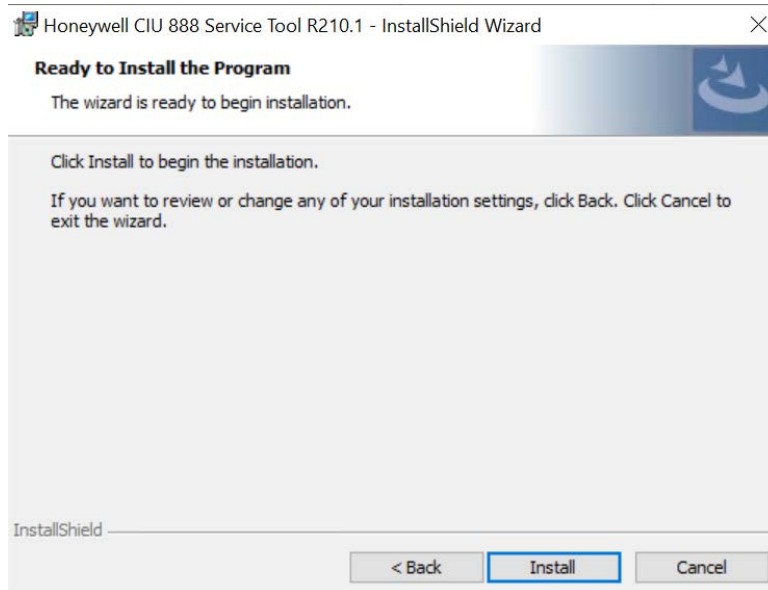
5. Click **Install**.

6. The **Installing Honeywell CIU 888 Service Tool R210** installation progress status window appears:
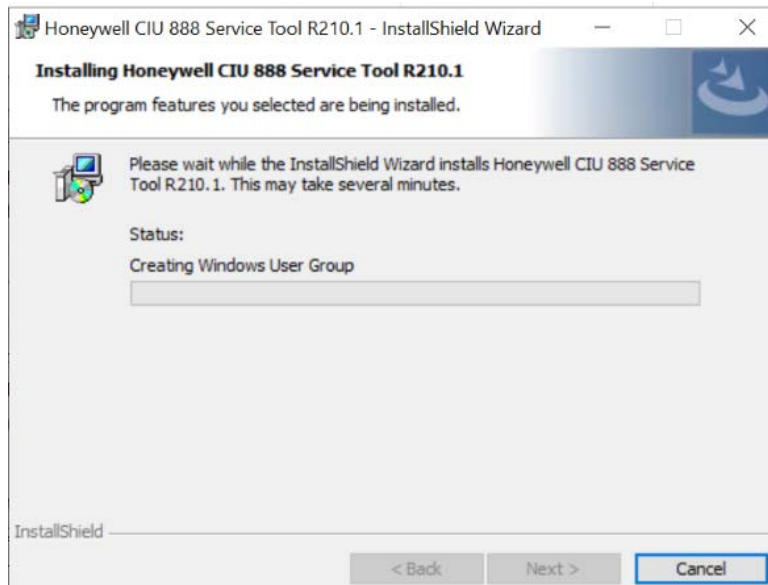
7. The **InstallShield Wizard Completed** window appears after successfull installation:
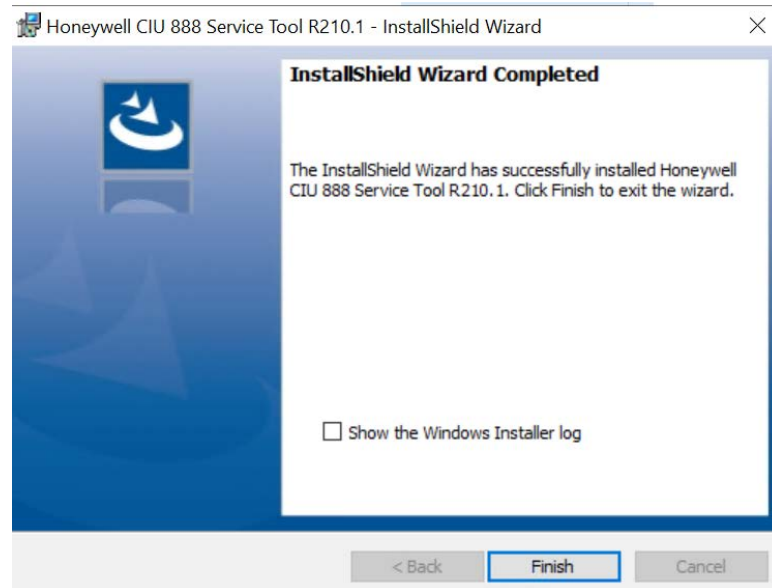
NOTE: The "Local Engineers" group will be created by default and the current user will be added to the "Local Engineers" group.

8. Click **Finish** to close the wizard.

9. The message box appears to logoff and login the machine.
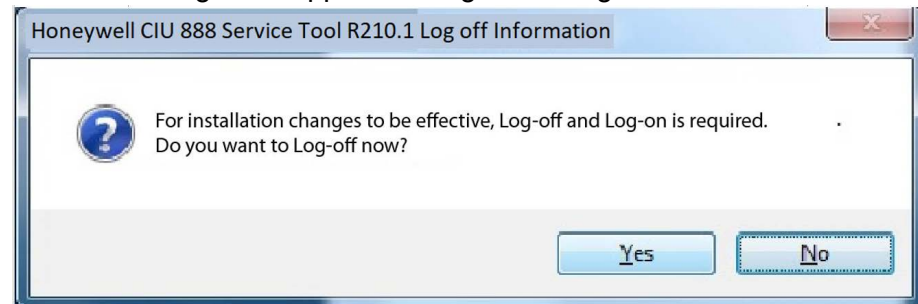
NOTE: If the local engineers group is already existing in the machine and if the current user is already associated with the local engineers group, the message box may not appear to logoff and login the machine.

10. Click **Yes** for installation changes to be effective.

2.2.2 Upgrade the Installer

1. Right-click on **Setup** file and then click **Run as administrator**.

    The **welcome to installShield Wizard** appears:.

2. Click **Next**.

    The **License Agreement** window appears:

3. Read all license agreement and select "**I accept the terms in the license agreement**".

4. Click **Next**.

The **Select Installation Option window** appaers:
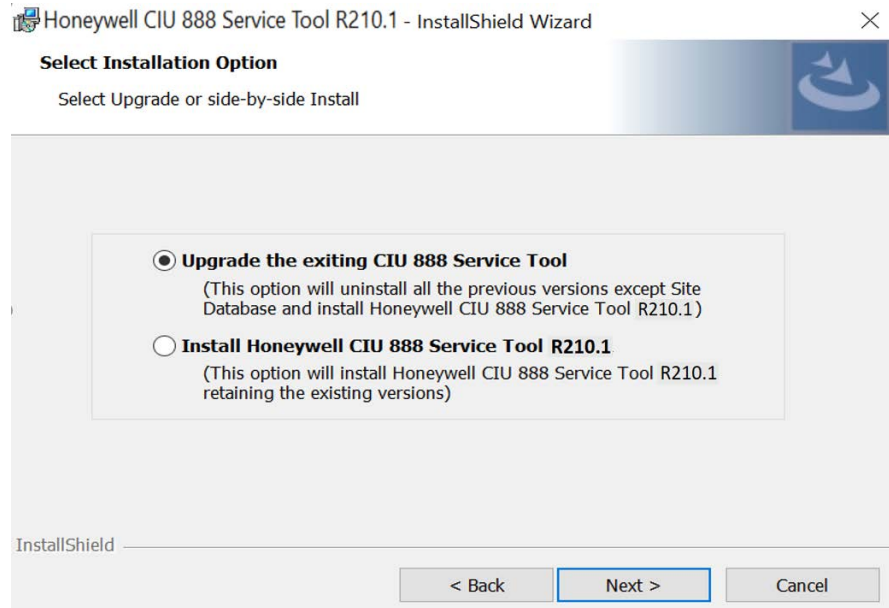
5. Select **Upgrade the existing CIU 888 Service Tool** to uninstall the previous version and install the new version.

   The dialogue box appears to give message on the selected option.
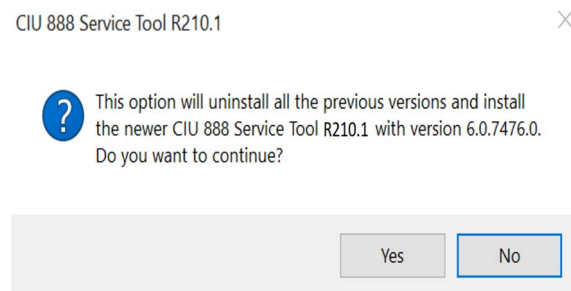
6. Click **Yes**.

NOTE: *This option removes the previous installation and then installs the new service tool.*

The **Ready to Install the Program** window appears:
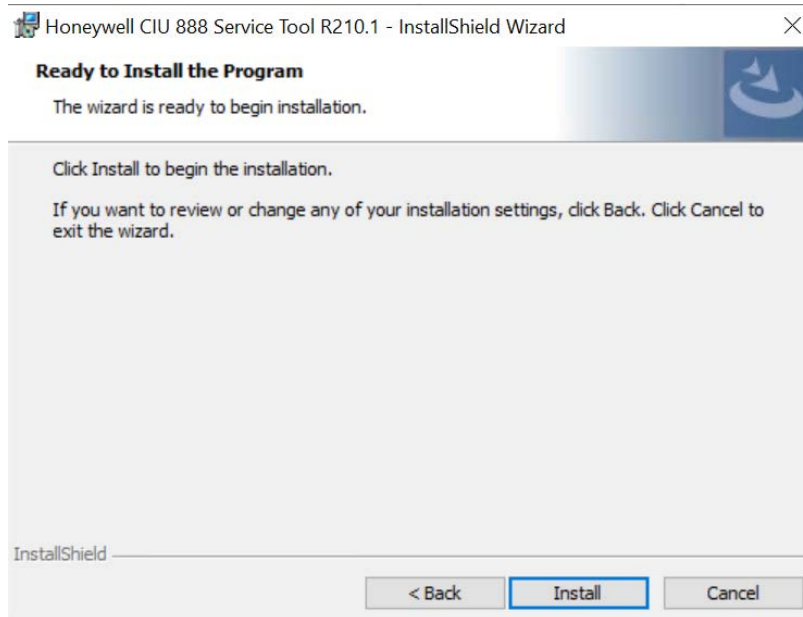
7. Click **Install**.

8. The **Installing Honeywell CIU 888 Service Tool R210** installation progress status window appears:
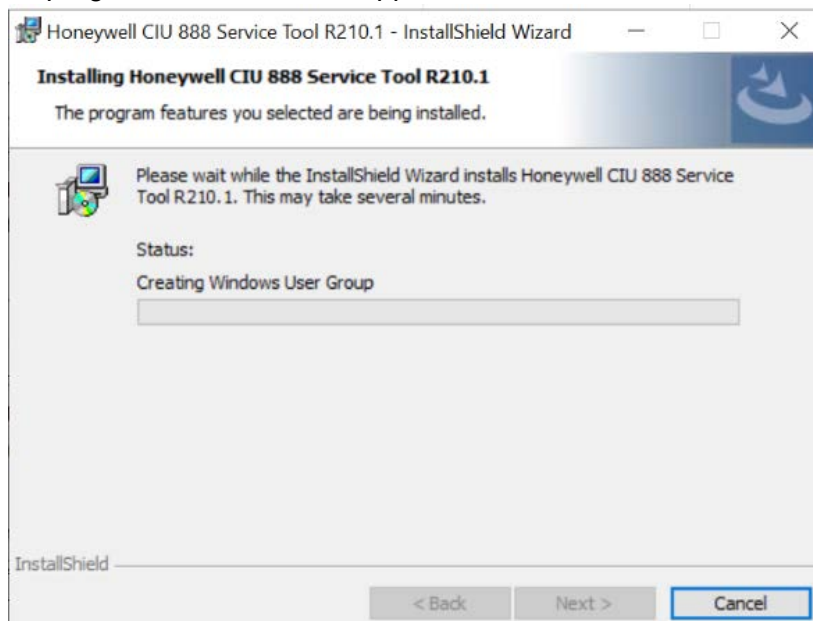
9. The **InstallShield Wizard Completed** window appears after successfull installation:
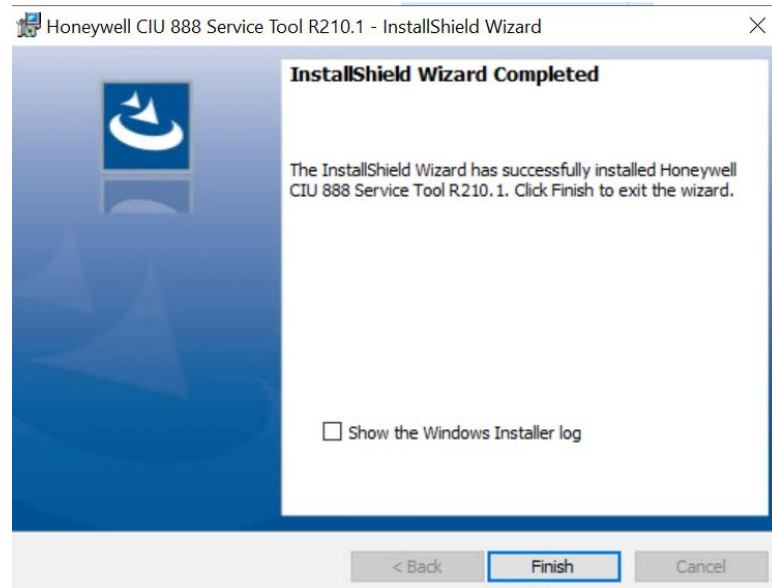
NOTE: *The "Local Engineers" group will be created by default and the current user will be added to the "Local Engineers" group.*

10. Click **Finish** to close the wizard.

11. The message box appears to logoff and login to the machine.

NOTE: *If the local engineers group is already existing in the machine and if the current user is already associated with the local engineers group, the message box may not appear to logoff and login the machine.*

12. Click **Yes** for installation changes to be effective.

2.2.3 Side by Side Installation

1. Right-click on **Setup** file and then click **Run as administrator**.

   The **welcome to installShield Wizard** appears:.
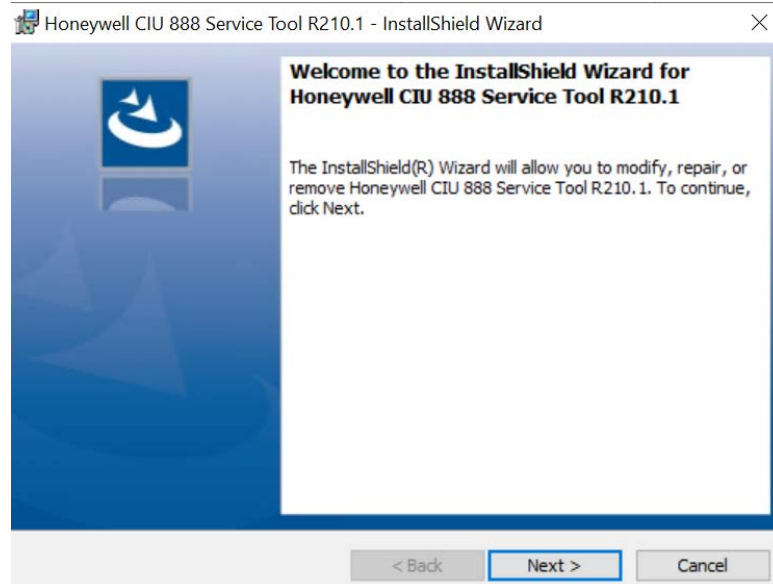
2. Click **Next**.

   The **License Agreement** window appears:
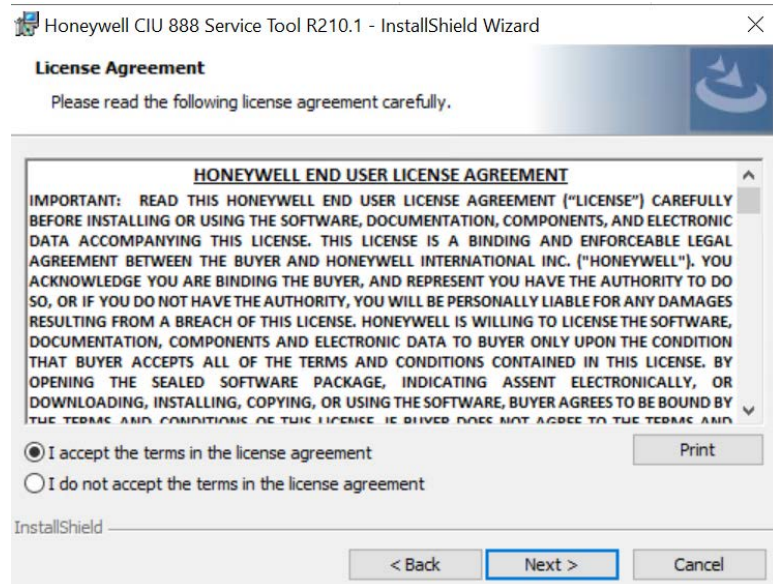
3. Read all license agreement and select "**I accept the terms in the license agreement**".
4. Click **Next**.

The **Select Installation Option window** appears:
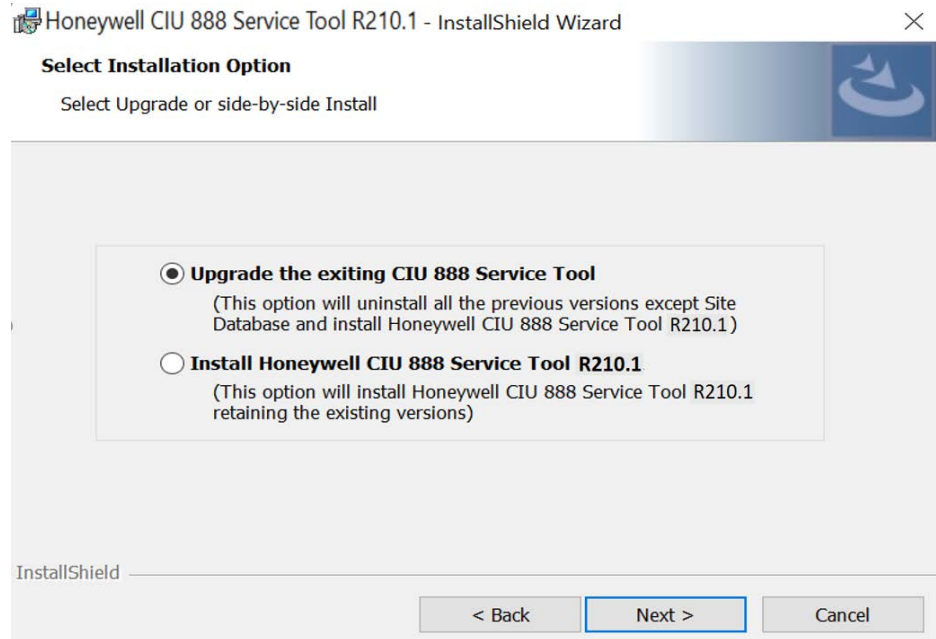
5. Select **Install Honeywell CIU 888 Service Tool R210** to install the R210 version.

NOTE: *This option installs the new version of CIU 888 Service Tool without interrupting older version. This is mainly designed to support multiple versions of CIU 888. Hence the user will be able to see two versions of CIU 888 Service Tool.*

The **Ready to Install the Program** window appears:
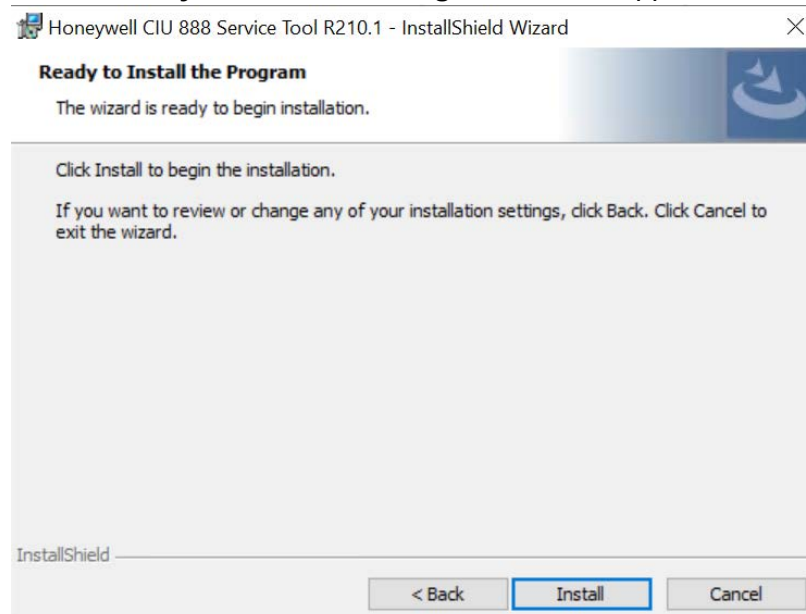
6. Click **Install**.

7. The **Installing Honeywell CIU 888 Service Tool R210** installation progress status window appears:
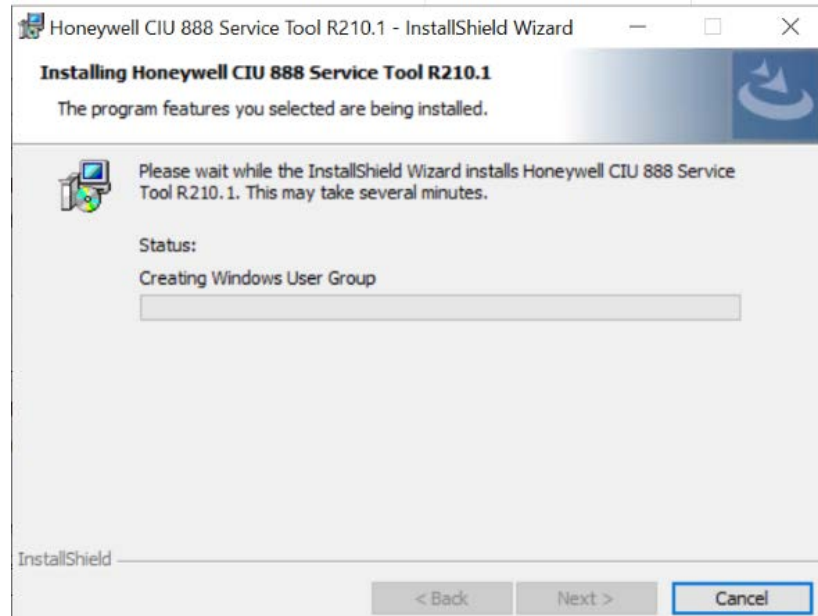
8. The **InstallShield Wizard Completed** window appears after successfull installation:
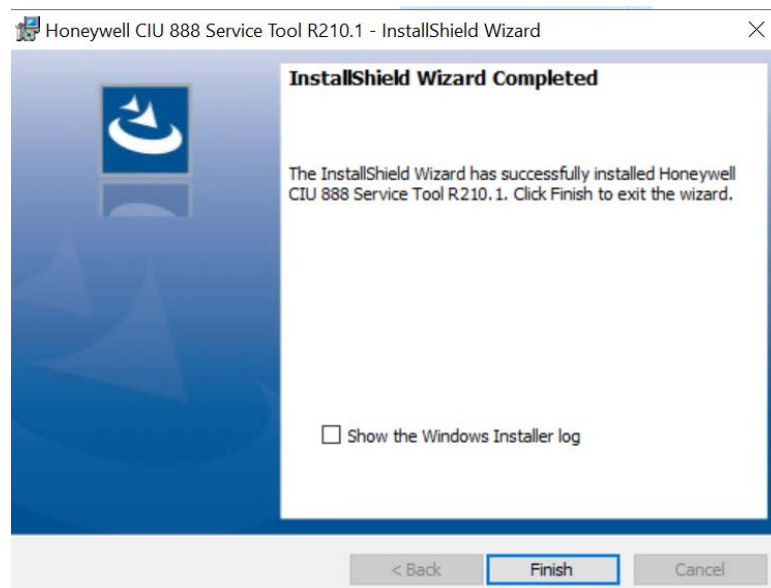
NOTE: The "Local Engineers" group will be created by default and the current user will be added to the "Local Engineers" group.

9. Click **Finish** to close the wizard.

10. The message box appears to logoff and login to the machine.
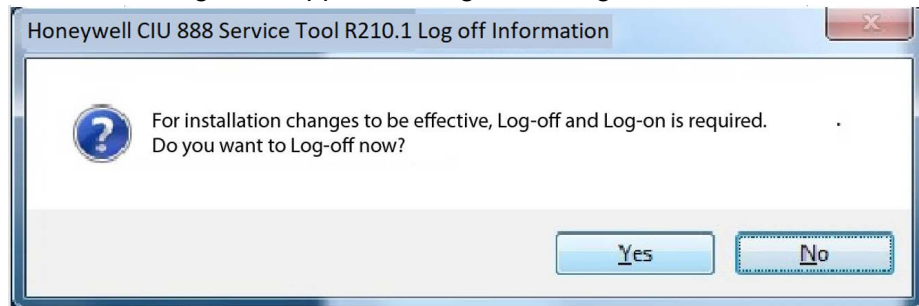
NOTE: *If the local engineers group is already existing in the machine and if the current user is already associated with the local engineers group, the message box may not appear to logoff and login the machine.*

11. Click **Yes** for installation changes to be effective.

2.3 Post-Installation

It is recommended to disable fast user switching.

2.3.1 Add User's to "Local Engineers" Window Group

CIU 888 Service Tool shall be launched only if the user is part of "Local Engineers" group. By default the installing user shall be added to this group.

Users needing access to CIU 888 Service Tool should be added to this windows group using "Manage Users and Groups" program of Windows.

2.3.2 Importing old site databases using CIU 888 Service Tool R210

From CIU 888 Service Tool Rxxx, the site database is stored in the release specific location. Hence requires to import the old site database from its previous location, which in turn shall be stored in the specific location *C:\Users\Public\Documents\Honeywell\CIU 888 Service Tool R210\SiteDatabase.*

2.4 CIU 888 Service Tool License

CIU 888 Service Tool license is generated based on the MAC address of the PC/Laptop where it will be used. To obtain a Service Tool license, you must send the MAC address and the general information of the PC/Laptop (where the CIU 888 Service Tool is installed) to Honeywell GTAC.

NOTE 1: *This procedure would take a minimum of 2-3 days. Please plan for the same, so that you have the license ready before you begin the commissioning process.*

NOTE 2: *CIU 888 Service Tool R150 license has a new encryption algorithm. Hence CIU 888 Service Tool needs a new License to be requested. Existing machines which already have Service Tool R101.1 also need to request for the new license using the above mentioned procedure.*

Once you have received the license file, complete these steps to install the license file.

1. Click (**Start**) > **All Programs** > **Honeywell** > **Configuration** > CIU 888 **Service Tool**. The **Browse For Folder** window appears.
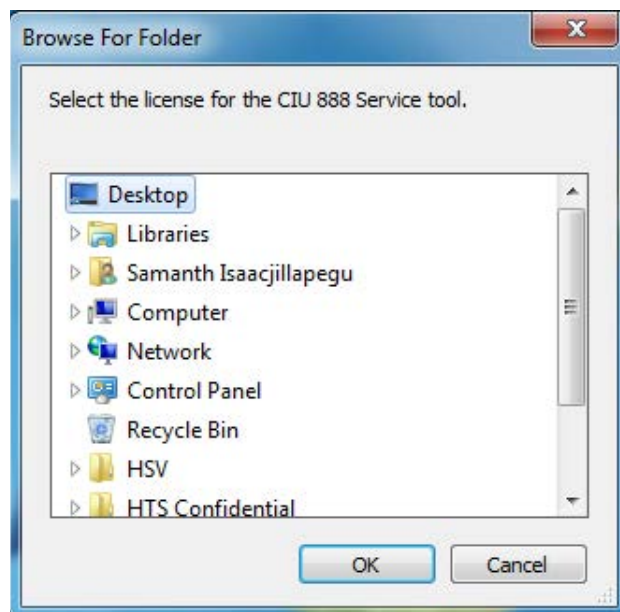
2. Browse to the license file received from the factory. Click **OK**.
3. CIU 888 Service Tool validates the license and starts the application.

NOTE: *Once the license is validated, the same license file will be read automatically for subsequent usage.*

2.5 Uninstalling CIU 888 Service Tool

1. Click ![Start] (**Start**) > **Control Panel** > **Programs** > **Programs and Features** > **Uninstall or change a program**.

   Select **Honeywell CIU 888 Service Tool,** right-click and choose **Uninstall.**
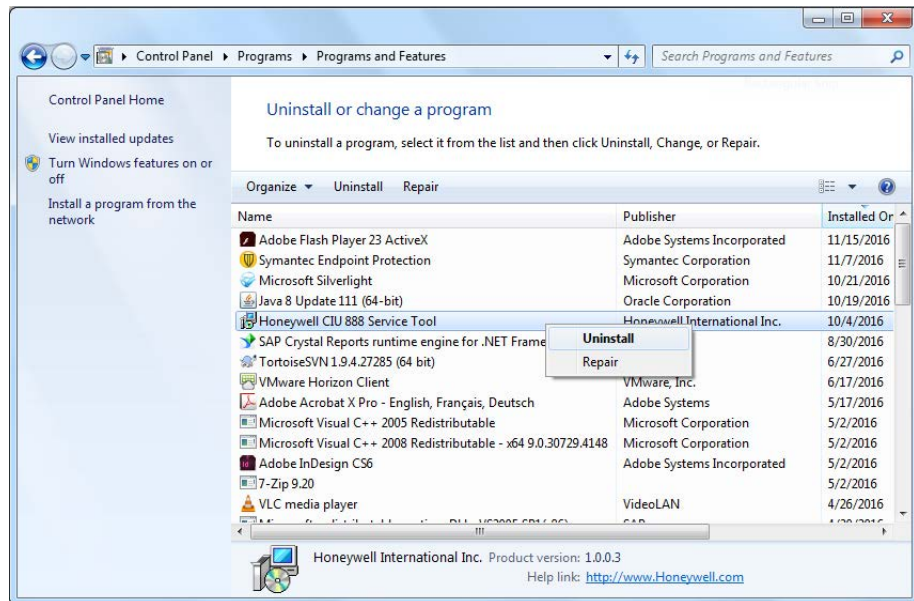
2. A confirmation message appears.
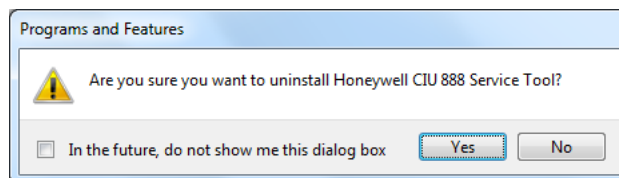
   Click **Yes**.

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CHAPTER 3   GETTING STARTED

The CIU 888 Service Tool is used for commissioning and configuring CIU 888. The CIU 888 Service Tool is typically installed on a PC/laptop running Windows 10, which in turn is connected to the CIU 888 via the Service port located at the front of the CIU 888 (see FIGURE 3-1).
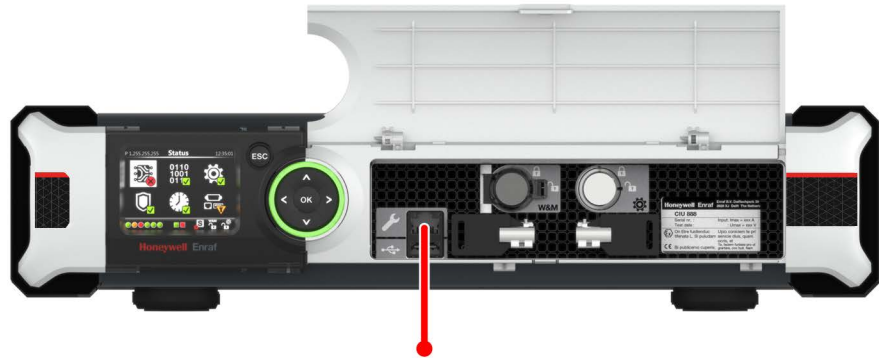
FIGURE 3-1   CIU 888: Service port

FIGURE 3-2 shows a graphical overview of the CIU 888 Service Tool and the CIU 888.
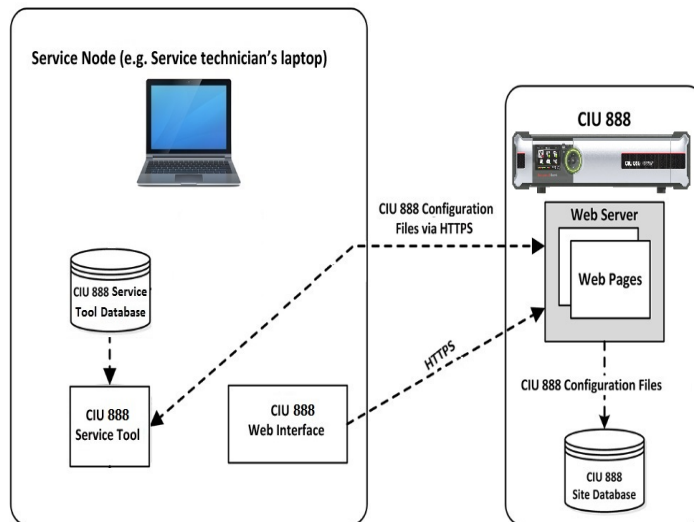
FIGURE 3-2   Graphic overview of the CIU 888 Service Tool and the CIU 888

3.1 CIU 888 Web interface

The CIU 888 Web interface provides access to these functionalities:

■ View the relevant LM and non-LM configuration settings of the CIU 888

■ Display the system status, for example, the role of the CIU 888 in a redundant system setup, the status of the W&M lock key switch and the configuration lock key switch

■ View system hardware diagnostics, for example, CIU 888 system status, Field port communication status, CIU version, and so on

■ View audit and event records logged by CIU 888

■ Install firmware upgrades

■ Update the CIU 888 license

To view the CIU 888 web interface, it is recommended to have a PC screen resolution of 1280 x 1024 or higher.

The CIU 888 Web interface can be accessed using a standard browser, refer to section 2.1 for supported browsers.

3.1.1 Changing the settings of Internet Explorer

To access the CIU 888 using Internet Explorer 10 or 11, the following changes in the browser settings must be implemented:

1. Launch Internet Explorer.
2. Disable compatibility mode:
   a) From the *Tools* menu, select the **Compatibility View settings** option.

The *Compatibility View Settings* window is displayed (see FIGURE 3-3).
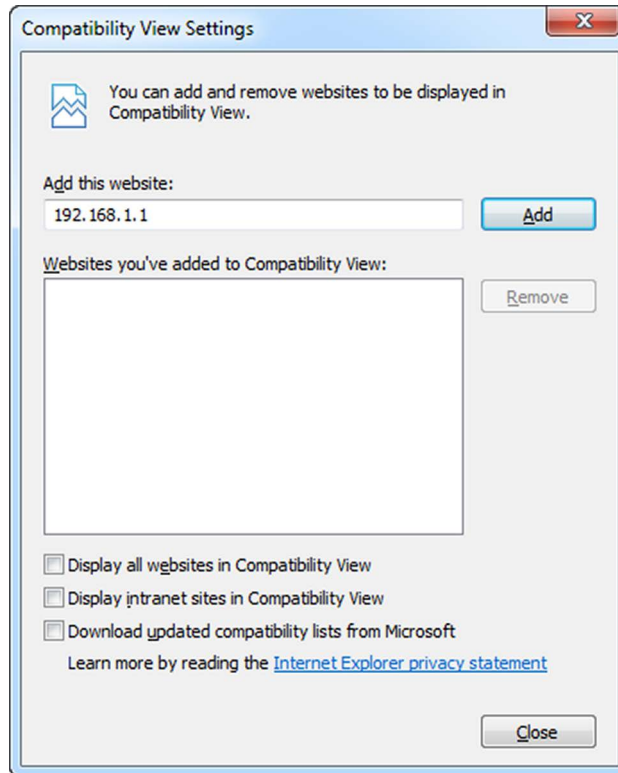
FIGURE 3-3   *Compatibility View Settings* window

b) De-select (uncheck) all check boxes.

c) Click the **Close** button to close the window.

REMARK: Make sure you **do not add** the CIU 888 website to the compatibility view.

3. Add the CIU 888 website to the trusted sites.

a) From the *Tools* menu, select the **Internet Options** option.
The *Internet Options* window is displayed (see FIGURE 3-4).

b) Go to the **Security** tab.
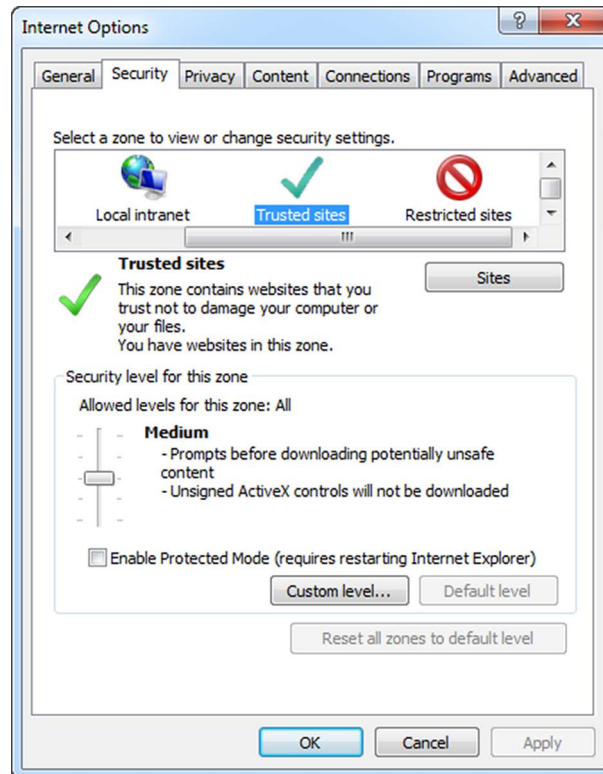
FIGURE 3-4   *Internet Options* window - *Security* tab

c) Click the **Trusted Sites** icon.
d) Click the **Sites** button.
The *Trusted sites* window is displayed (see FIGURE 3-5).
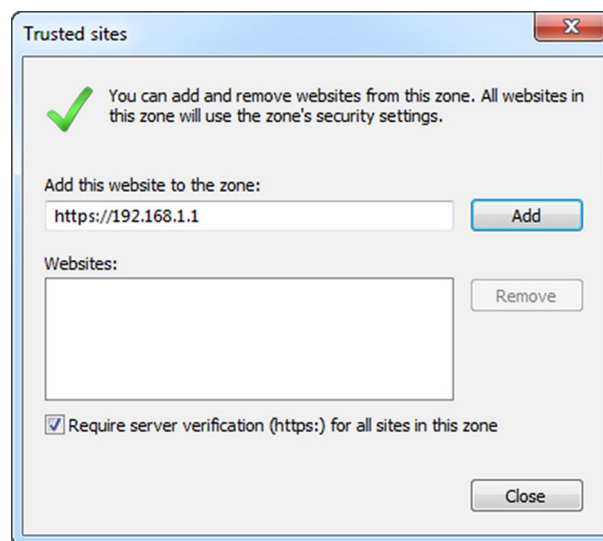
FIGURE 3-5   *Trusted sites* window

e) In the **Add this website to the zone** text box enter the IP address of the CIU 888 website (i.e. **https://192.168.1.1**). Next, click the **Add** button.
The IP address of the CIU 888 is added to the trusted sites and is displayed under *Websites* (see FIGURE 3-6).
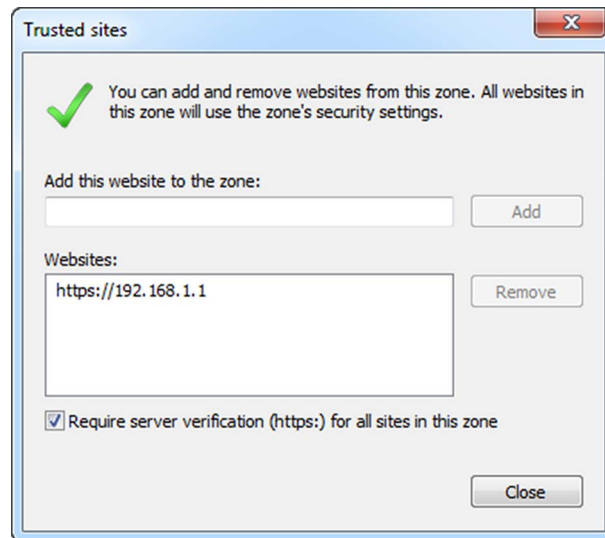
FIGURE 3-6   *Trusted sites* window - CIU 888 website added to Trusted sites zone

f) Click the **Close** button to close the window.
You will go back to the *Internet Options* window.

g) Click **OK** to save the settings and to close the window.

4. Enable the "Initialize and script ActiveX controls not marked as safe for scripting" setting:

a) From the *Tools* menu, select the **Internet Options** option.
The *Internet Options* window is displayed (see FIGURE 3-4).

b) Go to the **Security** tab.
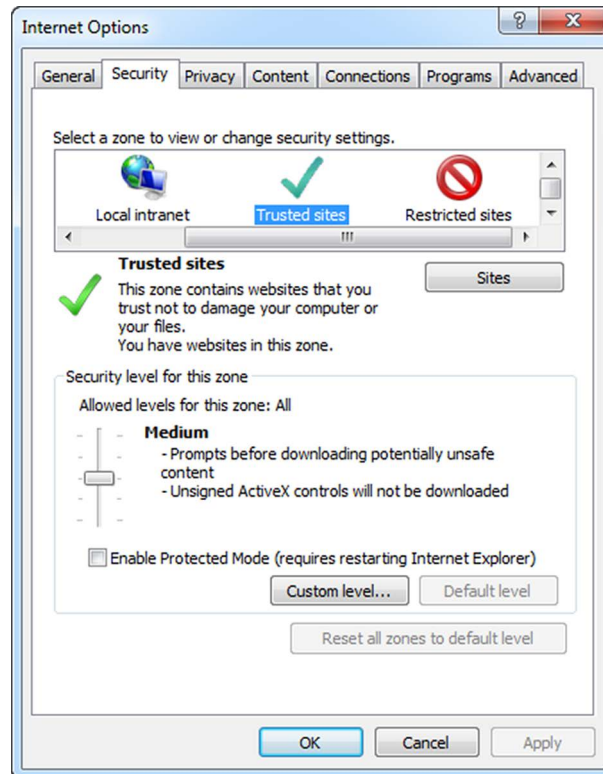
FIGURE 3-7   *Internet Options* window - *Security* tab

c) Click the **Trusted Sites** icon.

d) Click the **Custom level...** button.
The *Security Settings - Trusted Sites Zone* window is displayed (see FIGURE 3-8).
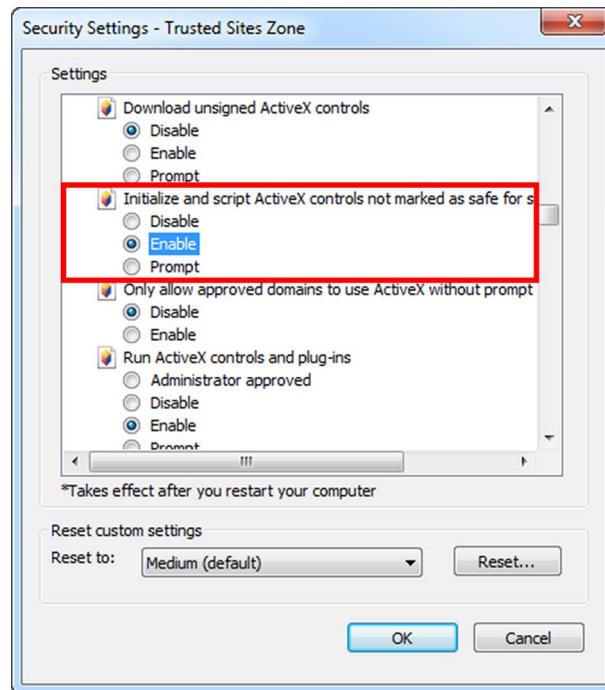
FIGURE 3-8   *Security Settings - Trusted Sites Zone* window

e) Set the "Initialize and script ActiveX controls not marked as safe for scripting" to **Enable**.

f) Click the **OK** button to save the settings and to close the window. You will go back to the *Internet Options* window.

g) Click the **OK** button to save the settings and to close the window.

5. Enable the "Include local directory path when uploading files to a server" setting:

a) From the *Tools* menu, select the **Internet Options** option.
The *Internet Options* window is displayed (see FIGURE 3-9).

b) Go to the *Security* tab.
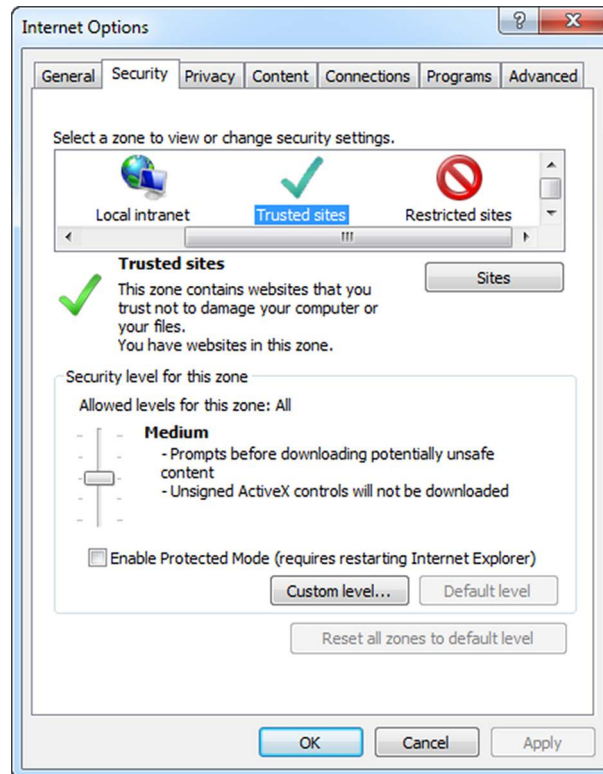
FIGURE 3-9   *Internet Options* window - *Security* tab

c) Click the **Trusted Sites** icon.

d) Click the **Custom level...** button.
The *Security Settings - Trusted Sites Zone* window is displayed (see FIGURE 3-10).
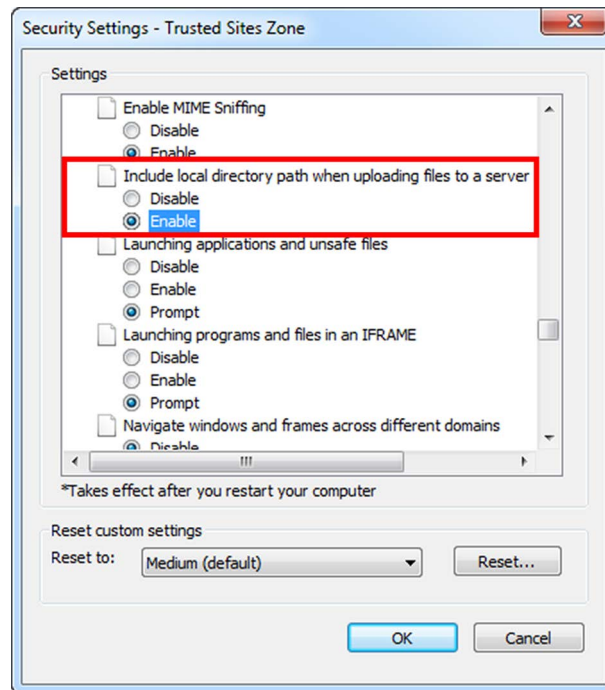
FIGURE 3-10   *Security Settings - Trusted Sites Zone* window

e) Set the "Include local directory path when uploading files to a server" to **Enable**.

f) Click the **OK** button to save the settings and to close the window. You will go back to the *Internet Options* window.

g) Click the **OK** button to save the settings and to close the window.

6. Configure the self-signed SSL certificate.

a) Enter the IP address of the CIU 888 (i.e. https://192.168.1.1) in the address bar of the browser. Press the **Enter** key.
The following warning message is displayed (see FIGURE 3-11).
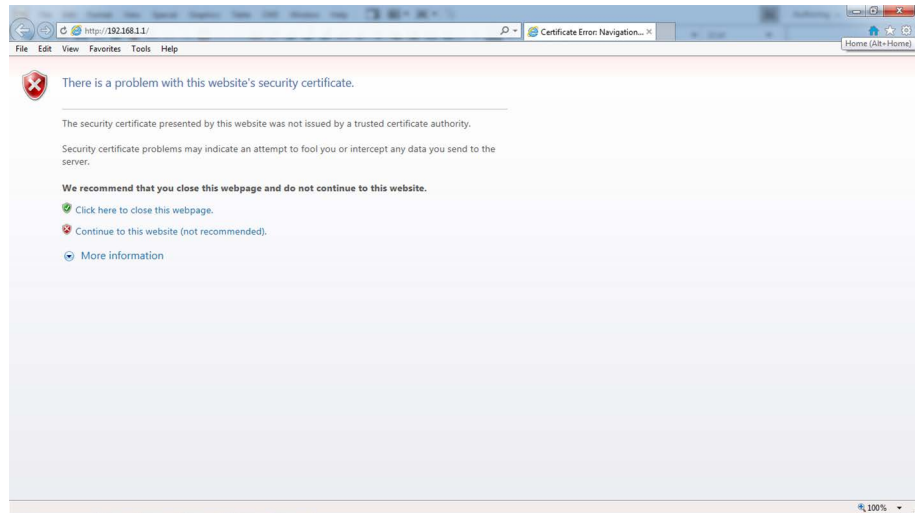
FIGURE 3-11   Website's security certificate problem

b) Click the **Continue to this website (not recommended)** option. You will go back to Microsoft Internet Explorer.

c) At the right of the address bar, click **Certificate Error**.
The *Untrusted Certificate* pop-up window is displayed (see FIGURE 3-12).
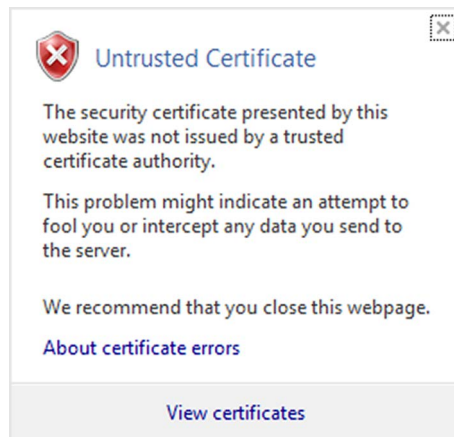
FIGURE 3-12   *Untrusted Certificate* pop-up window

d) Click **View certificates**.
The *Certificate* window is displayed. Verify the certificate details. (see FIGURE 3-13).
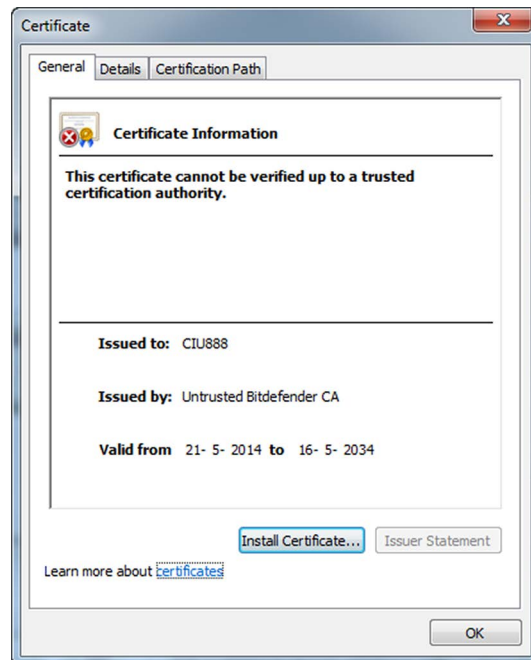
FIGURE 3-13   *Certificate* window

e) Click the **Install Certificate...** button.
The *Certificate Import Wizard - Welcome* window is displayed (see FIGURE 3-14).

FIGURE 3-14   *Certificate Import Wizard - Welcome* window

f) Click the **Next** button.
The *Certificate Import Wizard - Certificate Store* window is displayed (see FIGURE 3-15).
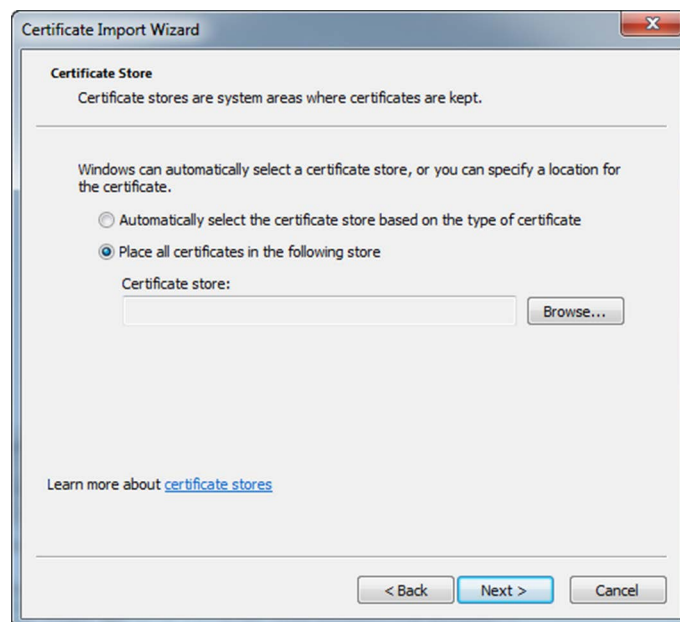
FIGURE 3-15   *Certificate Import Wizard - Certificate Store* window

g) Select the **Place all certificates in the following store** radio button. Click the **Browse...** button.
The *Select Certificate Store* window is displayed (see FIGURE 3-16).
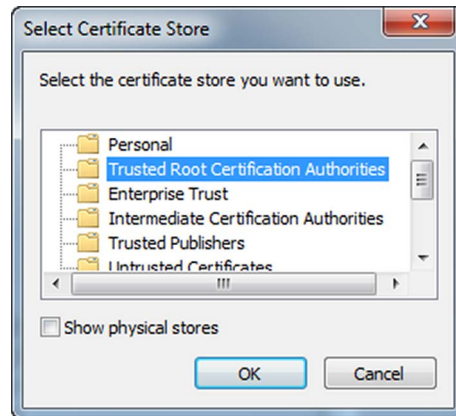
FIGURE 3-16   *Select Certificate Store* window

h) Select **Trusted Root Certification Authorities**. Next, click the **OK** button to save the settings and close the window.

i) Click **Next**.
The *Certificate Import Wizard - Completing* window is displayed (see FIGURE 3-17).
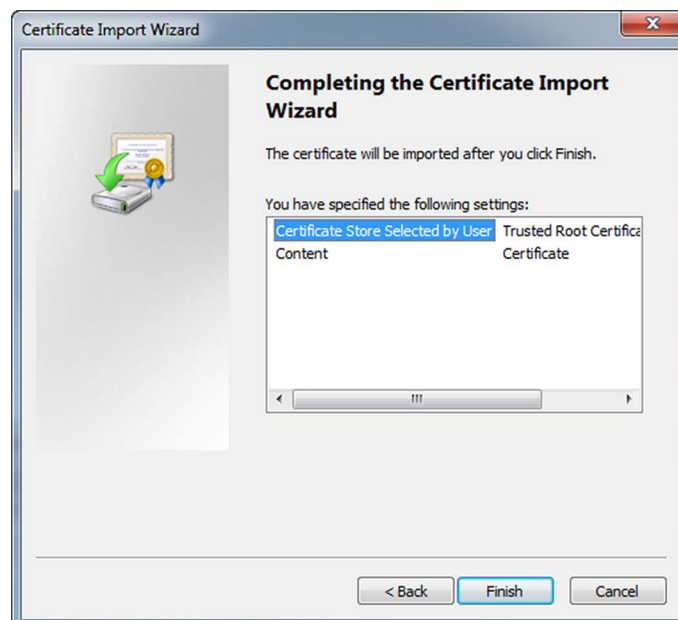
FIGURE 3-17   *Certificate Import Wizard - Completing* window

j) Click **Finish**.

REMARK: If a Security Warning message is displayed (see FIGURE 3-18), click **Yes** and then click **OK**.
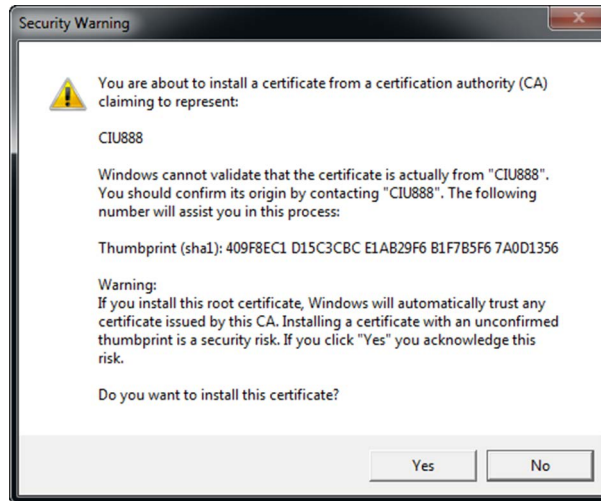
FIGURE 3-18   *Security Warning* message

k) From the *Tools* menu, select the **Internet Options** option.
The *Internet Options* window is displayed.

l) Go to the *Content* tab.
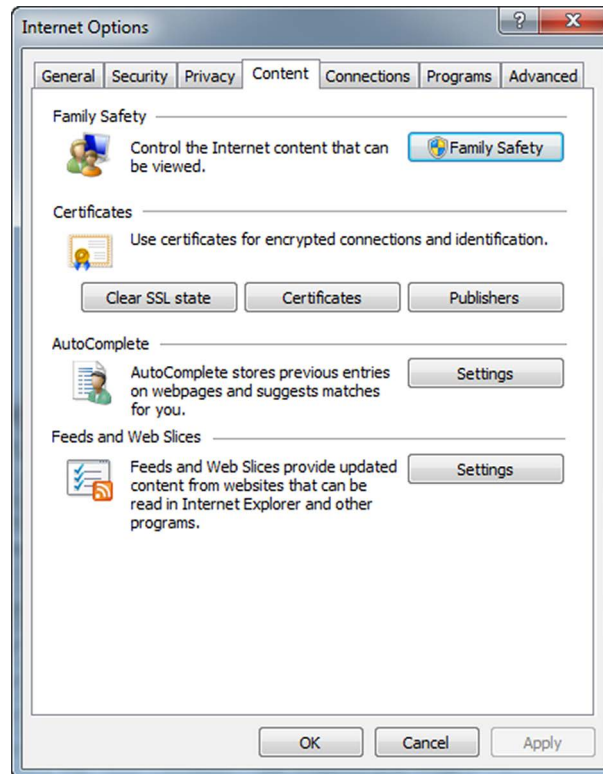
FIGURE 3-19   *Internet Options* window - *Content* tab

m) Click **Certificates**.
The *Certificates* window is displayed.(see FIGURE 3-20).

n) Go to the **Trusted Root Certification Authorities** tab.
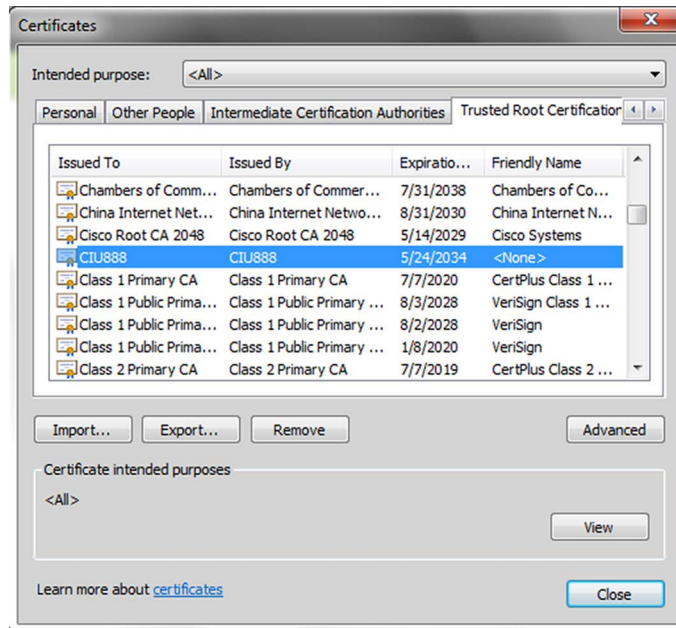
FIGURE 3-20   *Certificates* window - *Trusted Root Certification Authorities* tab

o) Check if the CIU 888 website is listed.
p) Click **Close** to close the window.
   You will go back to the *Internet Options* window.
q) Click **OK** to close the window.
r) Close (all instances of) Microsoft Internet Explorer.
s) Restart Microsoft Internet Explorer.

3.1.2 Changing the settings of Google Chrome

To access the CIU 888 using Google Chrome version 43, the following changes in the browser settings must be implemented:

1. Launch Google Chrome.
2. Configure the self-signed SSL certificate.

a) Go to **Settings** > **Show advanced settings** > **HTTPS/SSL** and click **Manage certificates...** .
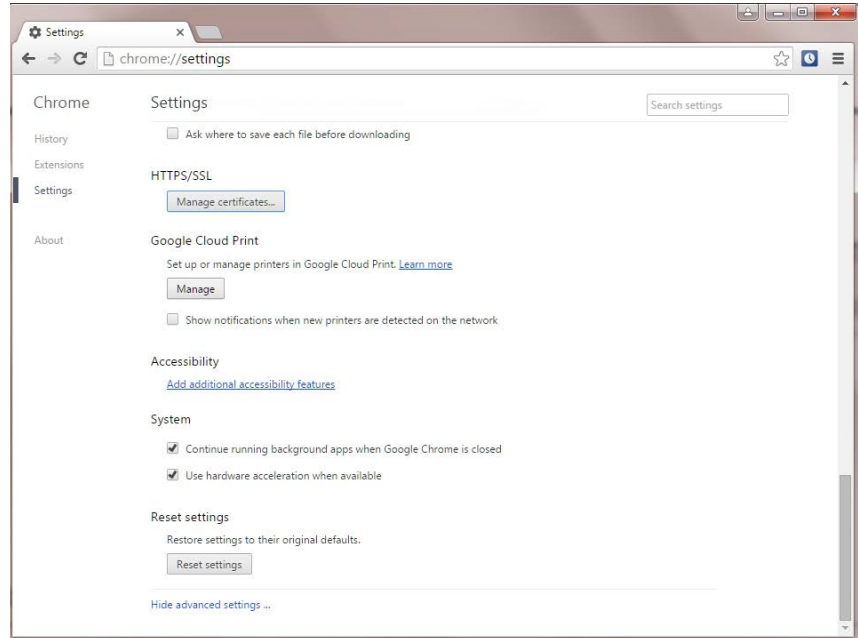
FIGURE 3-21   Navigate to the Manage certificates button on Google Chrome

b) In the ensuing **Certificates** window, click **Import** to launch the Certificate Import Wizard.
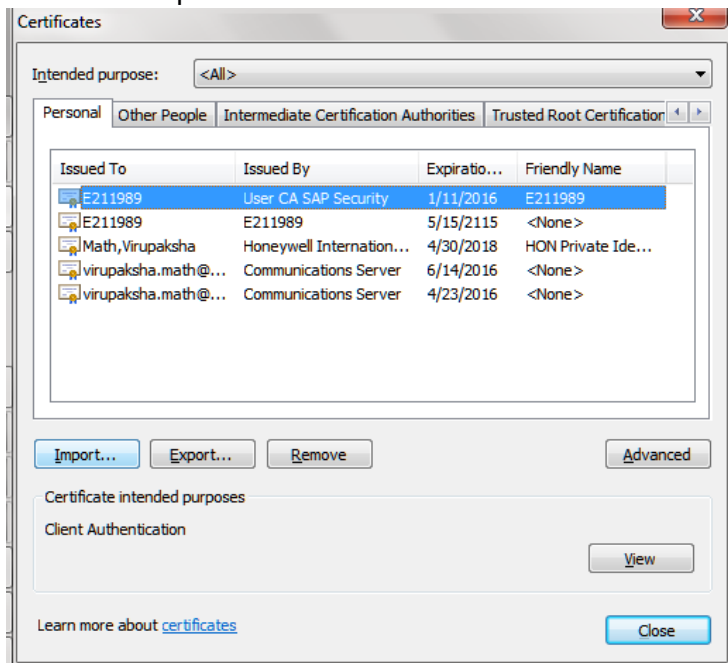
FIGURE 3-22   Certificates window: Import button

c) Click **Next** on the Welcome screen.

FIGURE 3-23   Welcome screen

d) Click **Browse** and select the certificate file with a .p7b extension. You must select PKCS #7 certificates option to view the certificate file with the .p7b extension.
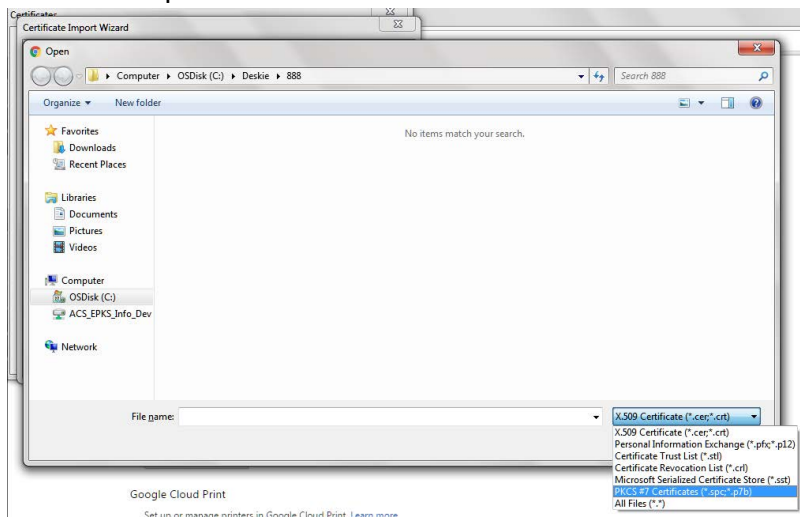
FIGURE 3-24   Browse to the certificate file

e) Click **Next**.

f) In the Certificate Store screen, select the **Place all certificates in the following store option** and click **Browse**.

g) Click the **Trusted Root Certification Authorities** folder and click **OK**.
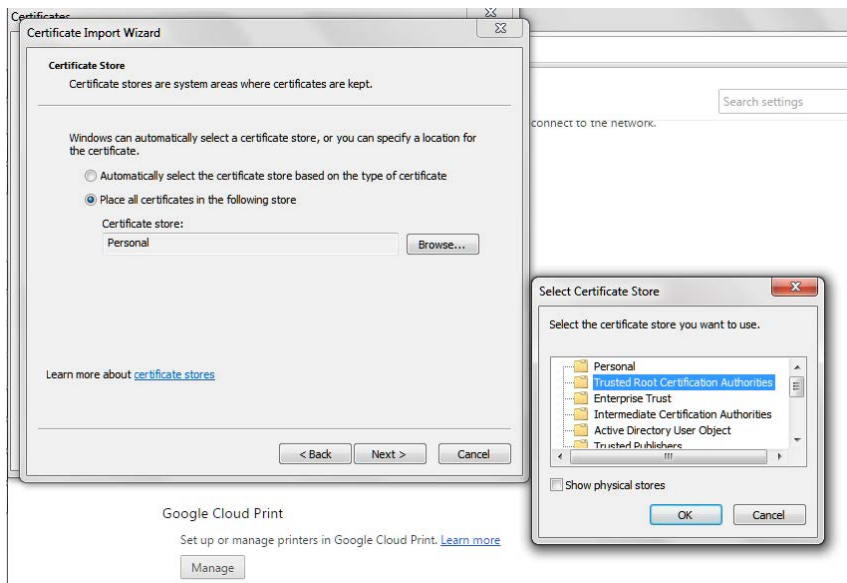
FIGURE 3-25   Select folder to save certificate file

h) Click **Next**. Details of the certificate file you are importing are displayed. Verify the details and click **Finish**.
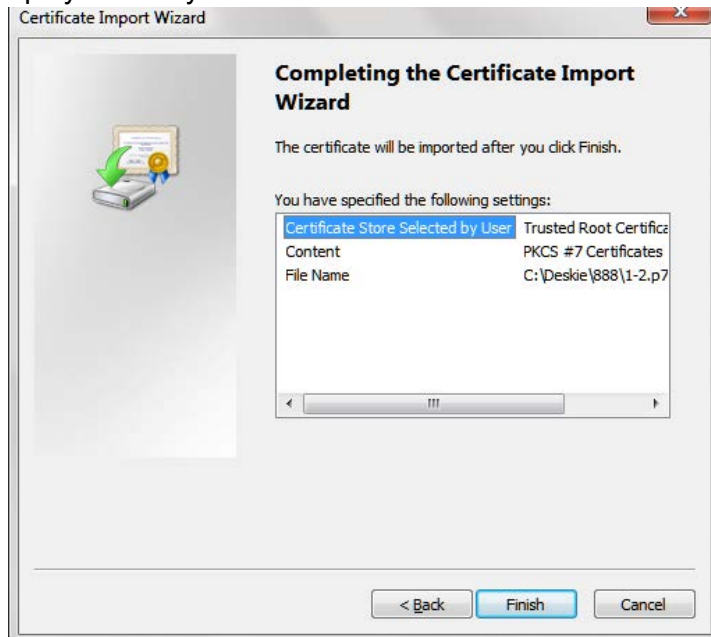
FIGURE 3-26   Verify certificate details

i) If a warning message appears, click **Yes** and continue.
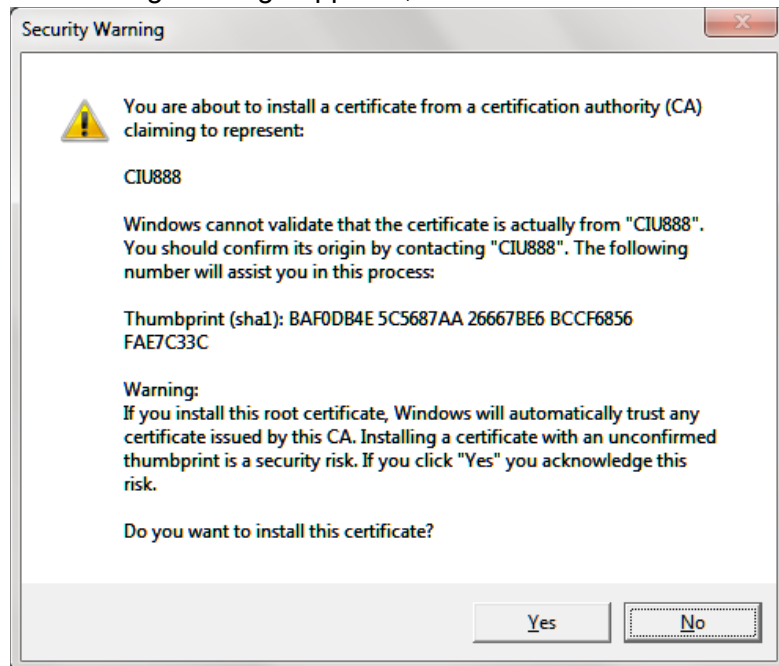
FIGURE 3-27   Warning message

j) After the certificate is installed, a confirmation message appears. Click **OK**.
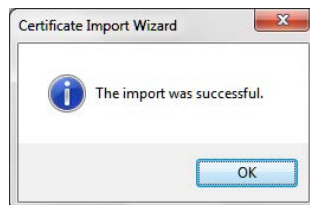
FIGURE 3-28   Confirmation message

k) Click the **Trusted Root Certification Authorities** tab to verify that the certificate CIU 888 is added.
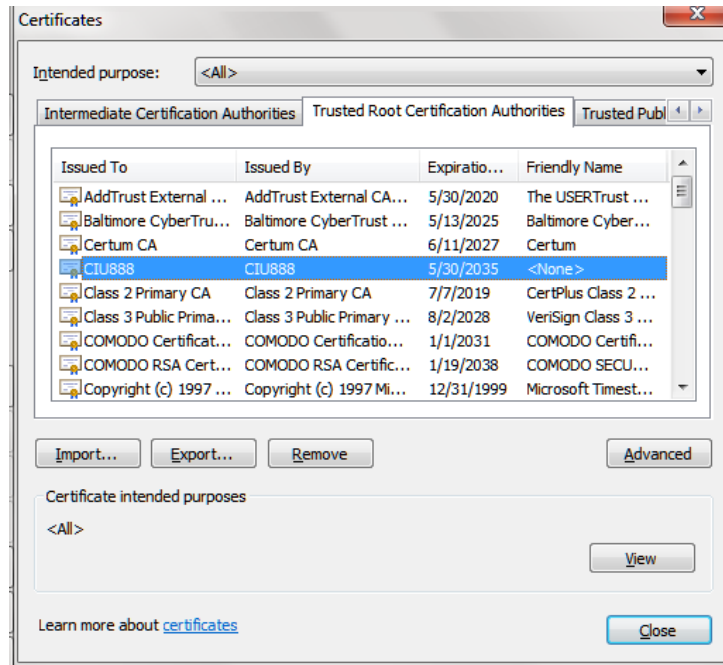
FIGURE 3-29   Verify installed certificate

3.1.3 To Allow Pop-ups for file download

Perform the following steps to allow pop-ups for file download:

1. Open the URL "*chrome://settings/content/popups*".
2. Click on **Allow** > **ADD**.
3. Under **Add a Site**, enter the **Site** as https://192.168.1.1:443 (see FIGURE 3-31).

FIGURE 3-30   *Adding a Site* window

3.1.4 Launching the CIU 888 Web interface

Perform the following steps to launch the CIU 888 Web interface:

1. Launch a browser (refer to section 2.1 for supported browsers).

2. Enter the IP address of the CIU 888 in the address bar of the browser. The IP address is: **192.168.1.1**. Press the **Enter** key.
   The *CIU 888 Login* window is displayed (see FIGURE 3-31).
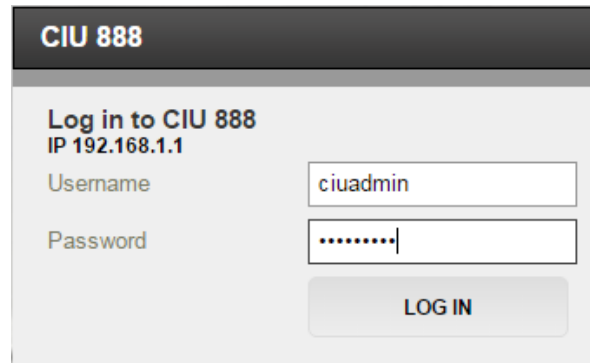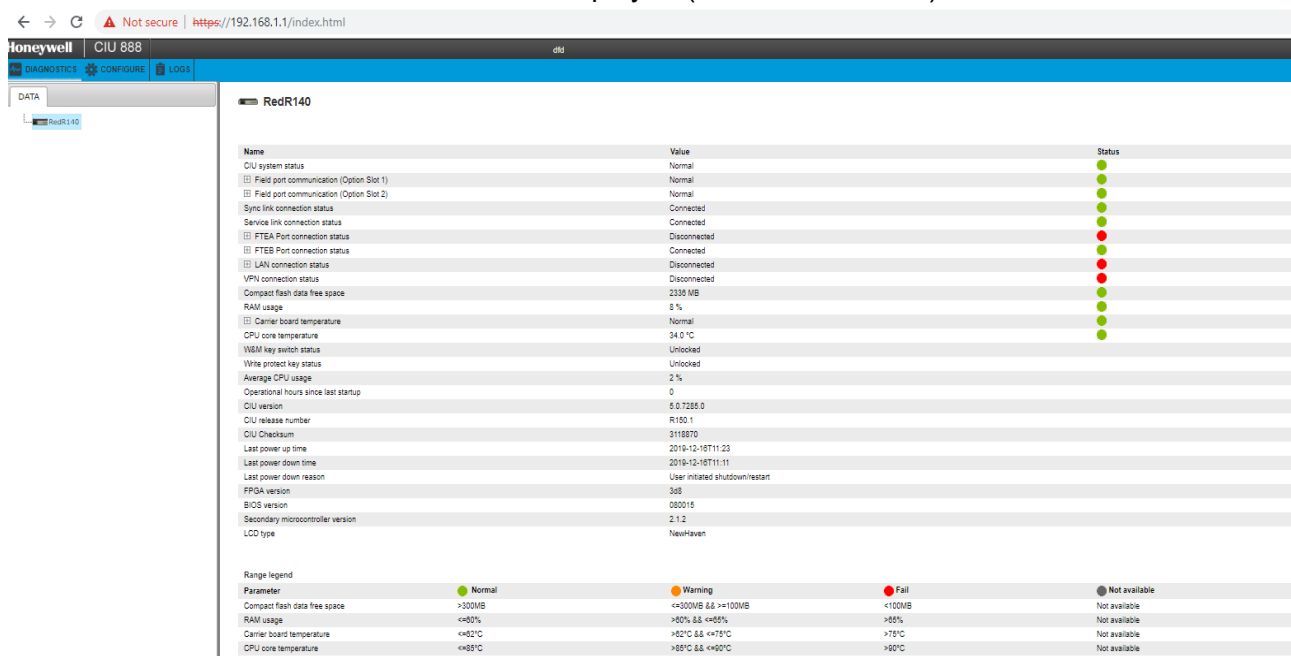
| FIGURE 3-31 | *CIU 888 Login* window |

3. Enter the username and password to log in to the CIU 888. The username is: **ciuadmin**. Click **LOG IN**.
   After entering a valid username and password, the CIU 888 Web interface is displayed (see FIGURE 3-32).

| FIGURE 3-32 | CIU 888 Web interface |

3.2 Configuring a site using CIU 888 Service Tool

The first step in configuration of CIU 888 is the creation of a site using CIU 888 Service Tool. After a new site is created, the program prompts for a set of global settings. Global settings are the overall configuration settings applicable at a site level, see section 3.2.3 for more details. Global settings are required for initiating any site configuration.

After the site global settings are entered, CIU 888 Service Tool prompts for CIU 888 name and then CIU 888 Service Tool creates a site configuration.

A site gives an overview of the configuration at a specific customer's site. The site configuration can be saved offline and opened at a later point in time. Selecting a site gives you access to its configuration. When the site is not available in the list, a new site must be created.

3.2.1 Preparation

Before you start configuring CIU 888, certain preparations are necessary. Make sure the following information is available:

– Site layout
– Field cabling information (which gauges are connected on the same pair of field wires, etc.)
– Tag names of field devices (gauges, CIU and tanks).
– Tank information (strapping tables, or tank capacity tables, roof details, etc.)
– Information on the types of stored product
– Host communication setup
– Modbus TCP/IP Communication set up

3.2.2 Launching CIU 888 Service Tool

1. Click ![Start icon] (**Start**) > **All Programs** > **Honeywell** > **Configuration** > **CIU 888 Service Tool R210**
CIU 888 Service Tool is launched. The CIU 888 Service Tool screen is displayed (see FIGURE 3.1).

FIGURE 3-33   CIU 888 Service Tool

3.2.3 Creating a new site

1. From the **Honeywell CIU 888 Service Tool** window, Choose **File** > **New**.

The **Create new site** window appears.
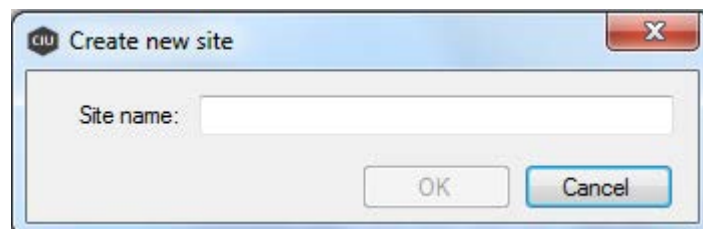
2. Type the **Site name** and click **OK**.

   The **Global Settings - CIU 888 Service Tool** window appears.

The Level can be configurable either -4 or -3 when the unit is m.

The Pressure can be configurable either -1 or -3 when the unit is kPa.

You can view or set the measuring unit of the various parameters in the Global Settings dialog box.

Settings	Units
Level dimension	Select m, mm, ft, in, in/16, fis.
Temperature dimension	Select ˚C or ˚F
Density dimension	Select kg/m^3, ˚API, lbs/ft^3, RD60 or lbs/US gal.
Pressure dimension	Select kgf/cm^2, Pa, kPa or psi (lbf/in^2).
Flow dimension	Select m^3/min, m^3/hr, l/min, l/hr bbls/min, bbls/hr, US gal/min, Us gal/hr or UK gal/hr.
Volume dimension	Select l, m^3, US gal or bbls.
Mass dimension	Select kg, ton, US ton, lbs or long ton.
Area dimension	Select m^2, mm^2, ft^2, in^2, yd^2
Std. ambient air pressure	Enter ambient air pressure in kPa (default = 101.325 kPa).
Air density	Enter air density in kg/m3 (default = 1.226 kg/m3).
Level resolution	This entity contains the desired resolution for rounding in communication of level values. For meter (m) unit of measure, the resolution can be configured as -4 or -3 and the default selection is -4 For millimeter (mm) unit of measure, the resolution can be configured as -1 or 0 and the default selection is -1.
Temperature resolution	This entity contains the desired resolution for rounding in communication of temperature values.

Settings	Units
Density resolution	This entity contains the desired resolution for rounding in communication of density values.
Pressure resolution	This entity contains the desired resolution for rounding in communication of pressure values. For kPa unit of measure, the resolution can be configured as -1 or -3 and default selection is -1.
Flow resolution	This entity contains the desired resolution for rounding in communication of flow values.
Volume resolution	This entity contains the desired resolution for rounding in communication of volume values.
Mass resolution	This entity contains the desired resolution for rounding in communication of mass values.
Area resolution	This entity contains the desired resolution for rounding in communication of area values.
Rounding scheme	Defines the CIU rounding scheme. 0 – CIU880 compatible Round (default) 1 – Bankers rounding 2 – Symmetric rounding 3 – Asymmetric rounding

3. Click **OK,** after the global settings are updated/modified.

A warning message appears.
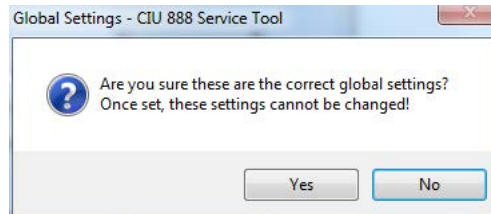
4. Click **Yes** to continue.

The **CIU 888 name** window appears.
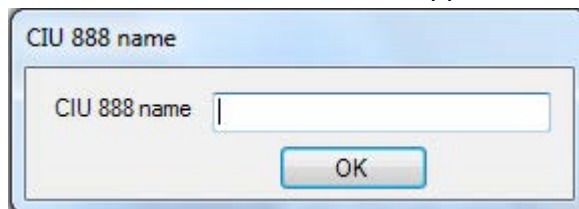
5. In the **CIU 888 name** box, type the name of the CIU 888 and click **OK.**

The **CIU 888 Service Tool** window appears.
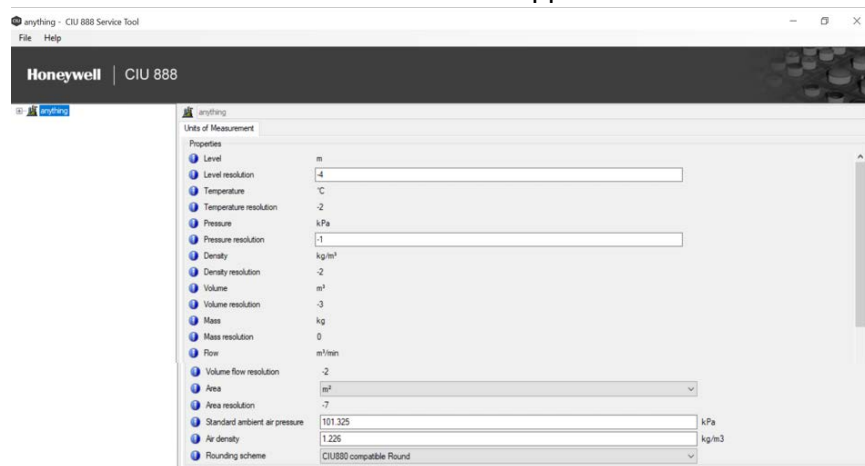
3.2.4 Ensite pro database import option

For CIU 880 migrations with no new CIU 888 features, Migration tool was used to upload the configuration to the CIU 888. For CIU 880 migrations with new CIIU 888 features like TRL/2 field scan, Modbus TCP/IP host connectivity etc.., a new configuration was built from scratch in the Service tool, and it was uploaded to the CIU 888.

Service tool provides a new option to Import the Ensite Pro database. When the user imports an Ensite Pro database into Service tool, Service tool automatically creates the site database using Ensite Pro database contents. This option can be used for CIU 880 migrations with or without new CIU 888 features.

1. From the **Honeywell CIU 888 Service Tool** window, Choose **File** below window appears**.**
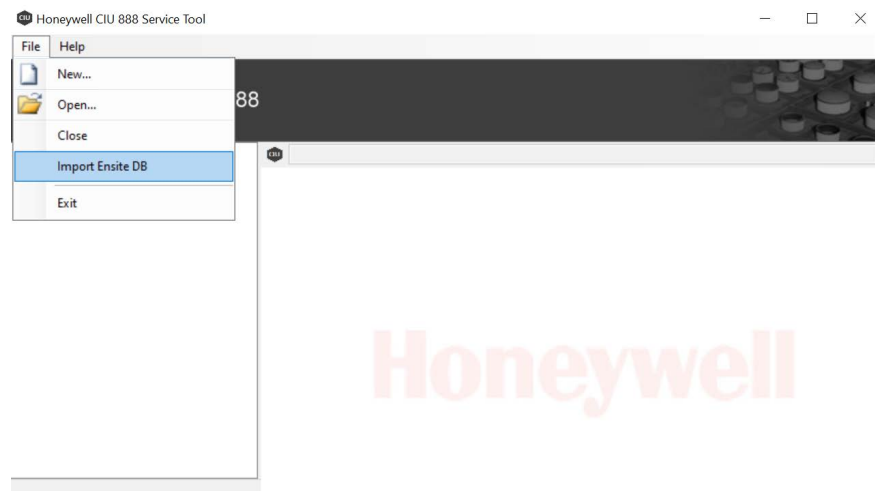
2. click on **Import Ensite DB** and select the file from the folder.
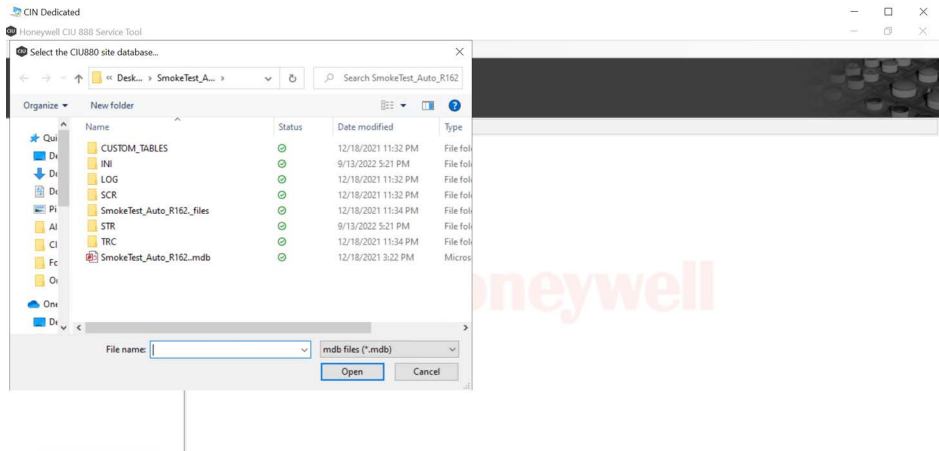
3.2.5 CIU 888 Node Properties/Settings

3.2.5.1 Modify CIU 888 Properties

1. Click **CIU 888** node, by default, the **CIU 888** tab appears displaying the properties.
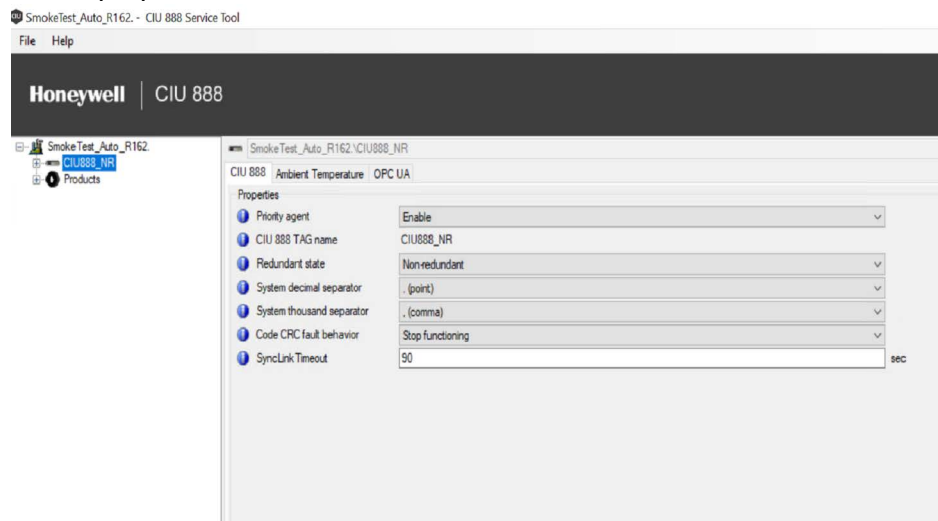
You can view or edit these properties:

Properties	Description
Priority agent	Select Enable or Disable. Refer to Appendix B.9 for more details.
CIU 888 Tag Name	Displays CIU 888 name configured during site creation
Redundant state	Select Primary or Non Redundant This is the configured redundancy role of CIU 888.

Properties	Description
System decimal separator	Select (point) or ,(comma) This indicates the decimal separator in which data would be presented to the user in CIU 888 Service tool and CIU 888.
System thousand separator	Select (point), space or ,(comma) This indicates the thousand separator in which data would be presented to the user in CIU 888 Service tool and CIU 888.
Code CRC fault behavior	This option sets the CIU behavior in the case of code CRC check failure. • Stop functioning - CIU core functionality stops. • CIU operations continue with data set to recalibrated and CIU CRC (Entity96) marked as corrupted so that Signature Alarm will be raised in Entis Host System.
Sync Link Timeout	This indicates the time interval after which passive CIU would set all the field and calculated values to timeout status when sync link is broken.

3.2.5.2 Modify Ambient Temperature Properties

1. Click the **Ambient Temperature** tab, the properties detail appears.
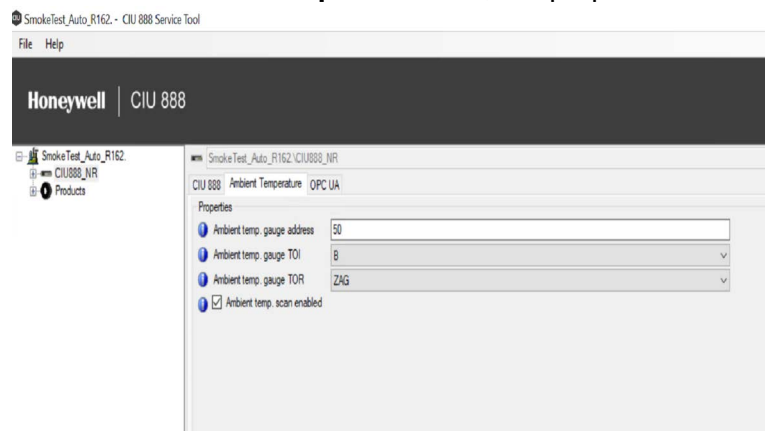
You can view or edit these properties:

Properties	Description
Ambient temp. gauge address	Enter ambient temperature transmission address.
Ambient temp. gauge TOI	Select A, B, C, E or M*.
Ambient temp. gauge TOR	Select C or ZAG*.
Ambient temp. scan enabled	Check to enable ambient temperature scan.
Refer to TABLE 3-1 for additional information.	

Properties	Description
Note: *Configure the Ambient Temperature settings only if ambient temperature is measured with a GPU gauge. If ambient temperature is measured with a Modbus gauge then configure it in Modbus Data input (refer to section 3.2.10.2). *If ambient temperature is measured with a TRL/2 gauge then configure it in TRL/2 Data input (refer to section 3.2.10.4)*	

3.2.5.3 Modify OPC UA Properties

1. Click the **OPC UA** tab, the properties detail appears.
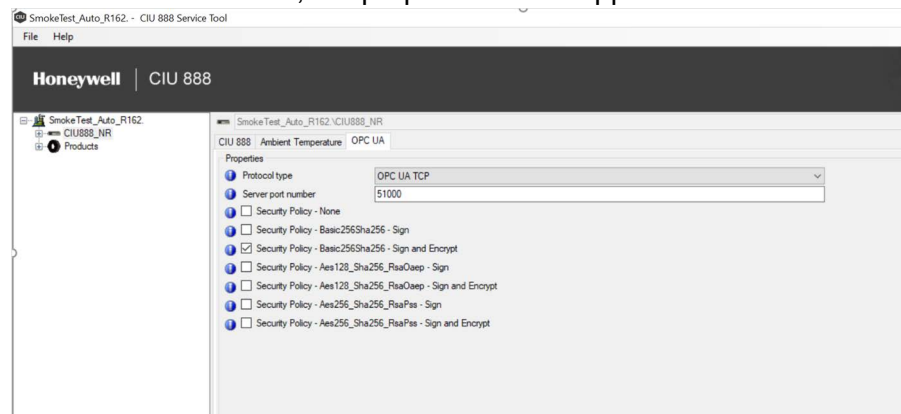
You can view or edit these properties:

Properties	Description
Protocol type	This setting depicts the different OPC Protocol type. The following type is supported. 0 – OPC UA TCP Default value: 0 Note: OPC UA HTTPS is not supported
Server port number	This setting depicts the server port number. Range 0- 65535 Default value: 51000

Properties	Description
Security Policy - None	Security Mode and Security Policies are used in combination to secure endpoints. The security policy describes various algorithms and different key length, which is used to establish secure channel between client and server application. Security mode of the application defines the security level for a message being exchanged during communication between client and server.
Security Policy - Basic256Sha256 - Sign	
Security Policy - Basic256Sha256 - Sign and Encrypt	
Security Policy - Aes128_-Sha256_RsaOaep - Sign	**Available Modes:**
Security Policy - Aes128_-Sha256_RsaOaep - Sign and Encrypt	None: non secure communication Sign: secure communication without encryption Sign and Encrypt: secure communication with encryption
Security Policy - Aes256_-Sha256_RsaPss - Sign	**Available Policies:** Basic256Sha256 Aes128Sha256 Aes256Sha256
Security Policy - Aes256_-Sha256_RsaPss - Sign and Encrypt	

3.2.6 Configuring a Field port

3.2.6.1 Serial Field Ports

1. On the CIU 888 node, right-click and choose **Add > Field port/Host port.**

2. The **Add Site Element** window appears.
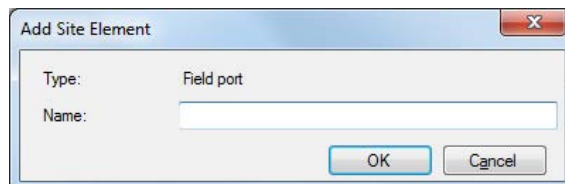
3. In the **Name** box, type the name of the Field port and click **OK.**

   A field port node is created and displayed under **CIU 888**.
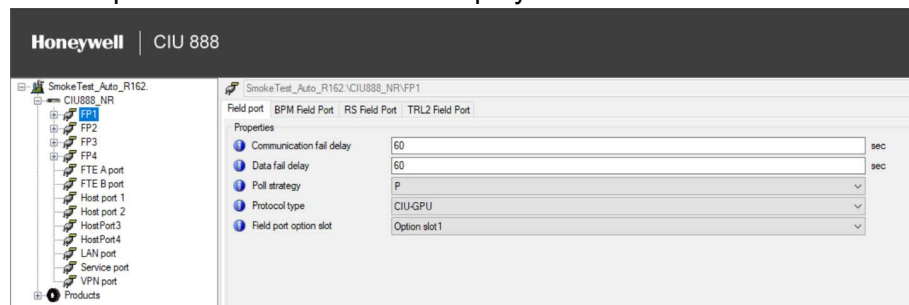
4. By default, the **Field port** tab appears.

You can view or edit these properties:

Properties	Description
Communication fail delay	Enter a time between 0 and 255 seconds (default = 60). See Note 3.
Data fail delay	Enter a time between 0 and 255 seconds (default = 60). See Note 4.
Poll strategy	Select P, 1, 2, or 3. See Note 5.
Protocol Type	Select None, Modbus RTU (= RS-Communication), CIU-GPU (= RS-Communication), or BPM-GPU (= Honeywell Bi-Phase Mark) or Modbus TRL/2. See Note 1 and Note 2.
Field port option slot	Select Option Slot 1, Option Slot 2, Option Slot 3, Option Slot 4, Option Slot 5, or Option Slot 6.

NOTE 1: *BPM field card is used to interface with the Honeywell Enraf BPM field bus devices and RS-232C/RS485 field card is used to interface with the downlink CIU 880 / CIU 888 / CIU 858 and third party Modbus field devices. The TRL/2 field card is used to interface with the Honeywell TRL/2 gauges and Rex gauges.*

NOTE 2: *If Protocol type is Modbus RTU / CIU-GPU, configure Field port tab and RS Field Port tab. If Protocol type is BPM-GPU, configure Field port tab and BPM Field Port. If Protocol type is Modbus TRL/2, configure Field port tab and TRL/2 Field Port tab.*

NOTE 3: *When a field communication fails it is possible to maintain last valid scan data in the CIU 888 database during a configurable amount of time. The communication fail delay mechanism is reset on the reception of data.*
For Example:
- modem delays bad cabling.
- no answer because of re-initializing gauge.

NOTE 4: *When a data fails it is possible to maintain the last valid scan data in the CIU 888 database during a configurable amount of time. The data fail mechanism is reset on the reception of valid data.*
For Example:
- re-initialization of a gauge.
- 802/811 digitizer failure.

NOTE 5: *The setting in 'Poll strategy' determines the sequence in which the Field ports are scanned:*
PPPPPP = all ports scan parallel (= default).
P11111 = port 1 scans parallel, others scan sequentially.
112233 = ports 1 & 2, ports 3 & 4 and ports 5 & 6 scan in a separate sequence.

5. Click the **BPM Field Port** tab, the **Properties** detail appears.
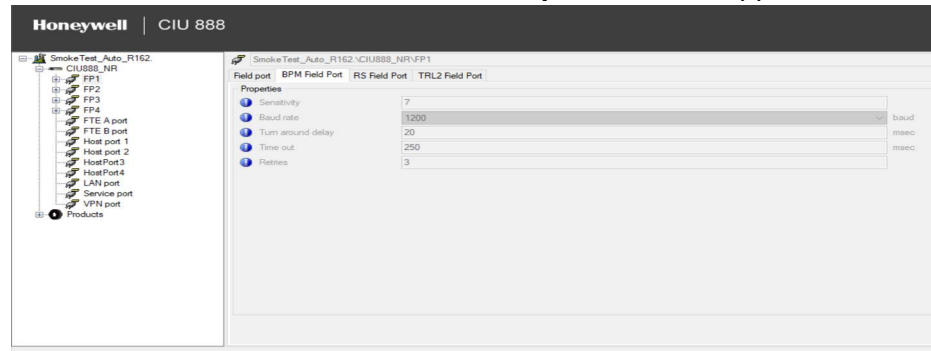
You can view or edit these properties:

Properties	Description
Sensitivity	Enter sensitivity in the range of 1 through 7 (default = 7).
Baud rate	Select 1200, 2400, or 4800.
Turn around delay	When CIU 888 receives a response from a field instrument (in a field port) it waits for this time period before sending a new request on the same field port. Enter time in ms (default = 20 ms).
Time out	Enter timeout in ms (default = 250 ms).
Retries	Enter number of retries in the range of 1 through 10 (default = 3).

6. Click the **RS Field Port** tab, the **Properties** detail appears.
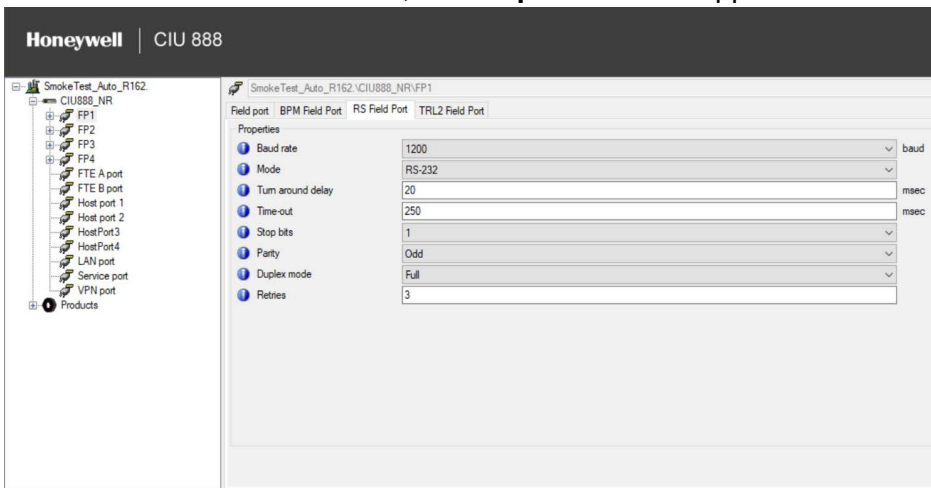
You can view or edit these properties:

Properties	Description
Baud rate	Select 1200, 2400, 4800, 9600, 19200, or 38400
Mode	Select RS 232 or RS 485 (default = RS-232C).
Turn around delay	Enter reply waiting time in ms (default = 20 ms).

Properties	Description
Time-out	Enter timeout in ms (default = 250 ms). Note: For Modbus field ports, the default timeout of 250 ms might not be sufficient in case of lower baud rates (1200, 2400 etc.,) and needs to be increased. Calculate the field port timeout as **Field port timeout = (1000 / baud rate) * No of bits in a byte * Maximum number of bytes retrieved from Modbus device in a single request** ms and configure it accordingly.
Stop bits	Select 1 or 2 (default = 1).
Parity	Select Odd, Even, or None (default = Odd).
Duplex mode	Select Full or Half (default = Full).
Retries	Enter number of retries (default = 3)

7. Click the **TRL2 Field Port** tab, the **Properties** detail appears.
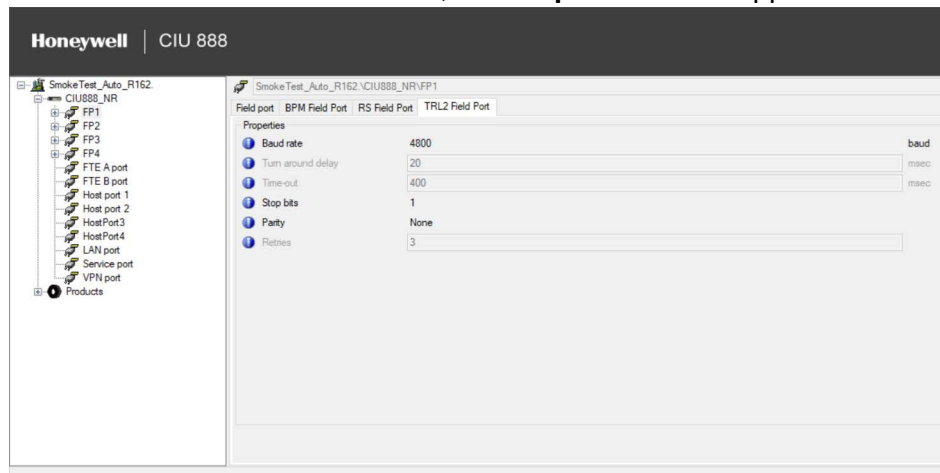
You can view or edit these properties:

Properties	Description
Baud rate	Baud rate is fixed and not editable (default = 4800 ms).
Turn around delay	Enter reply waiting time in ms (default = 20 ms).
Time-out	Enter timeout in ms (default = 400ms).
Stop bits	Stop bit is fixed and not editable (default = 1 at Parity= None).
Parity	Select Odd, Even, or None (default = None).
Retries	Enter number of retries (default = 3)

3.2.6.2 Ethernet Field Port

On CIU 888 node click FTEA port.

By default FTE tab appears displaying various properties

You can view or edit these properties.

Parameters	Configuration options
Device name	This indicates the device name of the Ethernet port.
IP Address	IP address of the corresponding Ethernet port in the CIU. *Format:* a.b.c.d *Example:* 10.70.100.101
Subnet Mask	Subnet mask of the corresponding Ethernet port in the CIU. In case of redundant CIUs, this also indicates the Subnet mask of the corresponding Ethernet port in the partner CIU. *Format:* e.f.g.h *Example:* 255.255.255.0
Default Gateway	Default Gateway of the corresponding Ethernet port in the CIU. In case of redundant CIUs, this also indicates the default gateway of the corresponding Ethernet port in the partner CIU. *Format:* i.j.k.l *Example:* 10.79.100.1 *Note:* If no gateway is required, then this setting can be left blank.

Parameters	Configuration options
Field Scan Enable	This indicates enable/disable of Field scan on the ethernet port. That is, based on the need the user shall enable / disable filed scan on a particular ethernet port. *Note:* Only one ethernet port (FTEA , FTEB or Office LAN), filed scan can be enabled out of 3 ethernet ports. *Note:* Either modbus server or field scan functionality can be enabled for a ethernet port.
FieldScan IP	IP address of wireless device manager (WDM) *Note:* CIU 888 is connected to WDM via ethernet and wireless gauges communicate to WDM via ISA 100.
FieldScan Port	Port number of wireless device manager (WDM) . *Note:* The default port number is 55598.
Turn around delay	When CIU 888 receives a response from a field instrument (in a field port) it waits for this time period before sending a new request on the same field port. Enter time in ms (default = 20 ms).
Time out	Enter timeout in ms (default = 250 ms).
Retries	Enter number of retries in the range of 1 through 10 (default = 3).
Communication fail delay	Enter a time between 0 and 255 seconds (default = 60). See Note 3.
Data fail delay	Enter a time between 0 and 255 seconds (default = 60). See Note 4.
OPC UA server enable	This setting would enable / disable the OP CUA Server on the CIU 888's ethernet port (FTEA / FTEB / LAN). 0 - OPC UA server is disabled 1 - OPC UA server is enabled
Server URL	This setting depicts the server URL. The OPC UA clients to CIU 888 using this URL. The URL shall be in the below format. opc.tcp://192.168.20.10:51000 Default value: Empty string

NOTE 6: *When a field communication fails it is possible to maintain last valid scan data in the CIU 888 database during a configurable amount of time. The communication fail delay mechanism is reset on the reception of data. For Example:*
- modem delays bad cabling.
- no answer because of re-initializing gauge.

NOTE 7: *When a data fails it is possible to maintain the last valid scan data in the CIU 888 database during a configurable amount of time. The data fail mechanism is reset on the reception of valid data.*
For Example:

- re-initialization of a gauge.
- 802/811 digitizer failure.

NOTE 8: *"Time out" parameter needs to be configured based on the wireless network topology.*
It is recommended to configure 1500ms as "Time out" value when there are 6 hops wireless network.

NOTE: *Procedure to configure FTEB and Office LAN will be same as that of FTEA mentioned above.*

3.2.7 Configuring a Tank

3.2.7.1 Configuring tank under serial field port

1. After Field port is configured, you need to link the Tanks to the Field port.
2. On the **Field Port 1** node, right-click and choose **Add > Tank.**
3. The **Add Site Element** window appears.
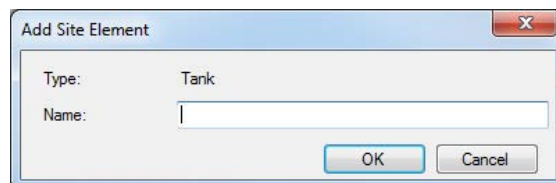
4. In the **Name** box, type the name of the Tank and click **OK.**
5. The **Tank1** node is created and displayed under **Field port 1**.
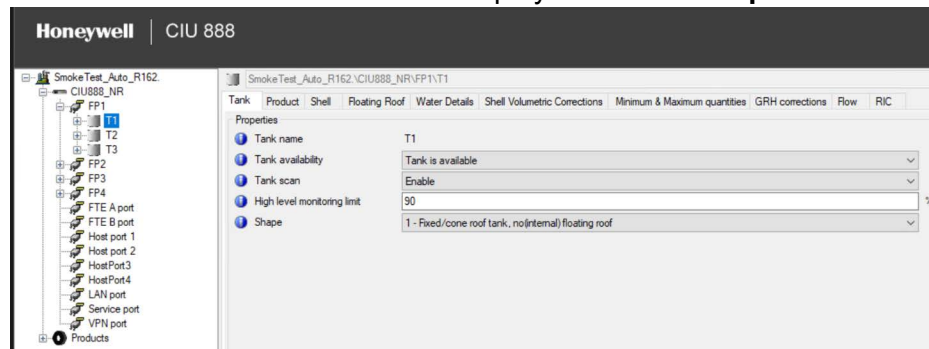
6. By default, the **Tank** tab appears.

   You can view or edit these properties:

Properties	Description
Tank name	Name of the Tank
Tank available	Check, if allowed
Tank Scan	Select Enable or Disable
Level type	Select Innage or Ullage/Outage

Properties	Description
Shape	Select the tank shape for this tank
	0 = No shape defined, 1 = Cylindrical fixed roof, 2 = Cylindrical with floating roof, 3 = Cylindrical with internal floater, 4 = Spherical tank, 5 = Bullet, 6 = Underground bullet, 7 = Irregular cavern, 8 = External floating roof with geodesic roof, 9 = Horizontal cylindrical tank
	10...255: Reserved for future expansion by Honeywell

7. Click the **Product** tab, the **Properties** detail appears.
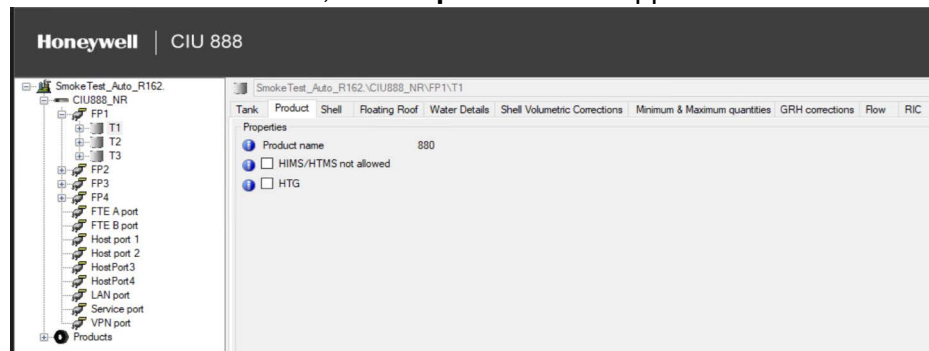
You can view or edit these properties:

Properties	Description
HIMS/HTMS not allowed	Check to disable Hybrid Inventory Management System.
HTG	Check to enable Hydrostatic Tank Gauging.

8. Click the **Shell** tab, the **Properties** detail appears.
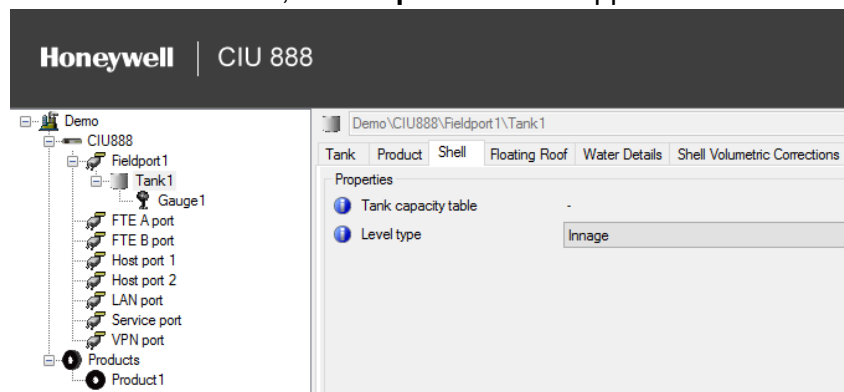
You can view or edit these properties:

Properties	Description
Tank capacity table	The file name and path of the TCT file selected by the user. This entity is stored in the site database but will not be downloaded to any CIU.
Level type	Tank type This is a bit coded entity which contains the following information: Bit 0 = 1 Level measurement is Ullage if bit is set : the Level value decreases when product is pumped into the tank, level 0 is at or near the top of the tank [Innage (0): lev

9. Click the **Floating Roof** tab, the **Properties** detail appears.
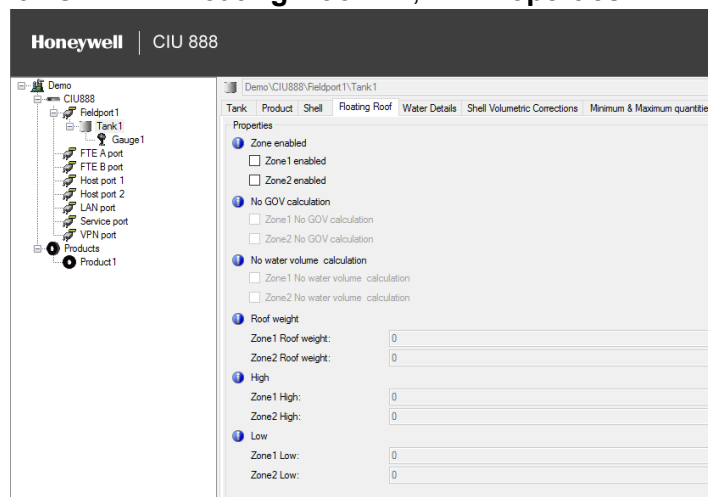
You can view or edit these properties:

Properties	Description
Zone enabled:	
Zone 1 Enabled	Check to enable the option.
Zone 2 Enabled	Check to enable the option.
No GOV calculation:	
Zone 1 No GOV calculation	Check to disable volume calculation when level is in zone 1.
Zone 2 No GOV calculation	Check to disable volume calculation when level is in zone 2.
No Water Volume calculation:	
Zone 1 No Water Volume calculation	Check to disable the option.
Zone 2 No Water Volume calculation	Check to disable the option.
Roof Weight:	

Properties	Description
Zone 1 Roof Weight	Enter the weight of the tank roof.
Zone 2 Roof Weight	Enter the weight of the tank roof.
High:	
Zone 1 High	Enter no-go-zone 1 high level.
Zone 2 High	Enter no-go-zone 2 high level.
Low:	
Zone 1 Low	Enter no-go-zone 1 low level.
Zone 2 Low	Enter no-go-zone 2 low level.

NOTE: High/low zones: The program issues a warning if the low value is higher than the high value.

10. Click the **Water Details** tab, the **Properties** detail appears.
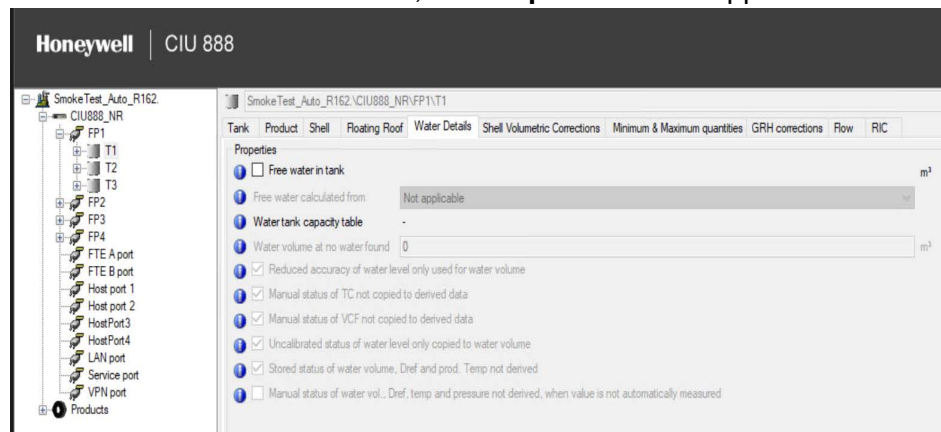
You can view or edit these properties:

Properties	Description
Free water in tank	For those tanks which might contain water we want to perform 'free water' calculations. Note: we call this 'free water' as water might also be dissolved or suspended in the product. Input: Selection: (Free) Water in Tank: Yes | No

Properties	Description
Free water calculated from	This indicates whether Water volume is calculated based on Tank TCT or separate Water TCT. Selection: None | Main TCT | Separate Water TCT Note: Often the water content is much smaller than the actual heel volume of the tank. In these cases the use of the regular TCT for assessing the free water volume is useless. Often also the (free) water level is measured in a separate 'water sump' as innage. Consequently a zero reading is not equivalent with the zero volume of the TCT (which is by definition equal to the heel volume). Hence the need to be able to define a separate (Free) water TCT, which is only used for calculating the water volume which can then be subtracted from the TOV.
Water tank capacity table	The file name and path of the water TCT file selected by the user.
Water volume at no water found	Water Volume under Range. Whenever the Free Water Level drops below the minimum Value, the Water Volume will no longer be calculated. The "WaterVolumeUnderRange" will be used instead. This entity is configured by the service tool.
Reduced accuracy of water level only used for water volume	Status "reduced accuracy" of Water Volume is not inherited by derived data.
Manual status of TC not copied to derived data	Status "manual" of (manually entered) ProductTC (Alpha), is not inherited by derived data.
Manual status of VCF not copied to derived data	Status "manual" of (manually entered) [CTL], is not inherited by derived data.
Uncalibrated status of water level only copied to water volume	Status "not calibrated" of Water Volume is not inherited by derived data if water is measured automatically
Stored status of water volume, Dref and prod. Temp not derived	Status "stored" of the following entities is not inherited by derived data: • WaterVol (WaterLevel was measured via a Water Dip: 811/854/954 gauge) • ProductDRef ([DObs] was measured via a Density Dip: 854/954 gauge)

Properties	Description
Manual status of water vol.,Dref, temp and pressure not derived, when value is not automatically measured.	Status "manual" of the following entities is not inherited by derived data, if the appropriate instrument is not installed on the tank (entity can not be measured): • ProdTemp • AmbientTemp • WaterLevel (status is only copied to WaterVol) • [DObs] status is only copied to ProdDRef) • VapTemp • VapPress

11. Click the **Shell Volumetric Corrections** tab, the **Properties** detail appears.
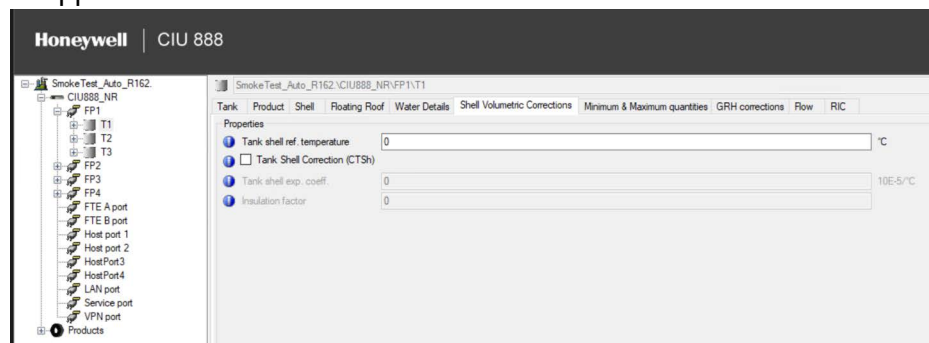
You can view or edit these properties:

Properties	Description
Tank shell ref. temperature	Tank Shell Reference Temperature. Tanks undergo expansion and contraction, due to variations in AmbientTemp and ProdTemp. This results in incorrect level readings, which makes it necessary to correct the calculated volumes.
Tank Shell Correction (CTSh)	Enable the calculation of the Correction of the Tank Shell.

Properties	Description
Tank shell exp. coeff	Tank shell expansion coefficient (TankTC). Tanks undergo expansion and contraction, due to variations in AmbientTemp and ProdTemp. This results in incorrect level readings, which makes it necessary to correct the calculated volumes. TankTC is the expansion coefficient of the Tank Shell material: Tank Shell material TankTC per OC TankTC per OF Mild CarBon steel 0.0000112 0.00000620 304 Stainless steel 0.0000173 0.00000960 316 stainless steel 0.0000159 0.00000883 17-4PH stainless steel 0.0000108 0.00000600 TankTC must be entered in format 10e-5 (shift decimal point 5 positions to the right), e.g. 0.0000112 must be entered as 1.12.
Insulation factor	Tank Shell Insulation Factor. The Insulation Factor (0 < Insulation <= 1.0) indicates how well the tank shell is insulated from the environmental temperature (AmbientTemp) outside the tank. For a fully insulated tank (TankShellTemp = ProdTemp), Insulation = 1.0. Default value : 0.875

12. Click the **Minimum & Maximum quantities** tab, the **Properties** detail appears.
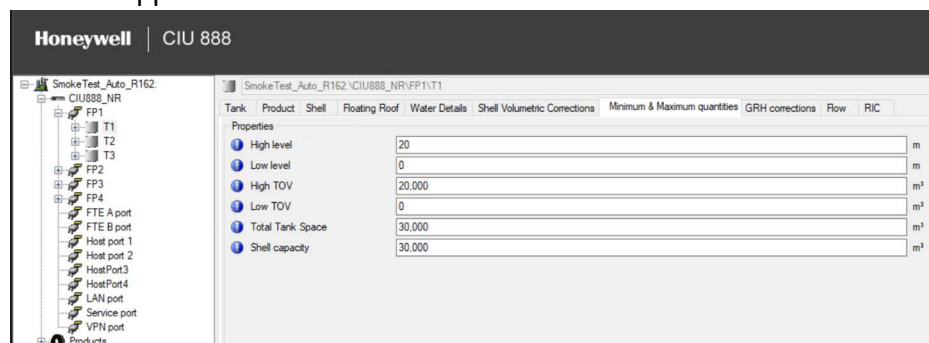
You can view or edit these properties:

Properties	Description
High level	Enter level that corresponds with high TOV (for graphical purposes in Entis Pro).
Low level	Enter level that corresponds with low TOV (for graphical purposes in Entis Pro).

Properties	Description
Note: *The application checks the high level to be higher than the low level for innage. If the tank is set up for ullage the high level value must be lower than the low level value.*	
High TOV	Enter volume that corresponds with high level (for graphical purposes in Entis Pro).
Low TOV	Enter volume that corresponds with low level (for graphical purposes in Entis Pro)
Note: *The application checks the high TOV to be higher than the low TOV for innage. If the tank is set up for ullage the high TOV value must be lower than the low TOV.*	
Total Tank Space	This is the total volume of the tank itself, including all space which will never contain liquid product and is needed for vapor calculations.
Shell capacity	The absolute maximum of liquid which can be contained by the tank shell. Exceeding this level results in a direct overfill.

13. Click the **GRH corrections** tab, the **Properties** detail appears.

You can view or edit these properties:

Properties	Description
Gauge Reference Height	Gauge Reference Height Height of gauge above tank zero. Used to calculate Ullage and corrected Innage.
Temperature GRH Correction	This correction corrects for the temperature effects of the tank shell and/or stilling well. Selection: Enable / Disable
TEC Grh	Thermal expansion coefficient of the Stilling well or Tank Shell. Note: Thermal expansion coefficient values in ppm (10E-6/C (or) 10E-6/F) needs to be converted to 10E-5/C (or) 10E-5/F. For example, the value of 16 10E-6/C (ppm) needs to be converted to 1.6 and then set in Service tool.

Properties	Description
Insulation factor dry	The Insulation Factor Dry (0 < Insulation <= 1.0) indicates how well the tank shell is insulated from the environmental temperature (AmbientTemp) outside the tank for the dry portion (Vapour space).
Insulation factor wet	The Insulation Factor Wet (0 < Insulation <= 1.0) indicates how well the tank shell is insulated from the environmental temperature (AmbientTemp) outside the tank for the wet portion (Liquid space).
Pressure GRH correction	This correction is only applicable on fixed roof tanks without stilling well and corrects for the changes in GRH due to the lifting of the roof caused by the vapor pressure under the roof of the tank.

Selection: Enable / Disable |
| GRHP Factor | GRH Pressure Factor:
This indicates level change per unit pressure. |

14. Click the **Flow** tab, the **Properties** detail appears.
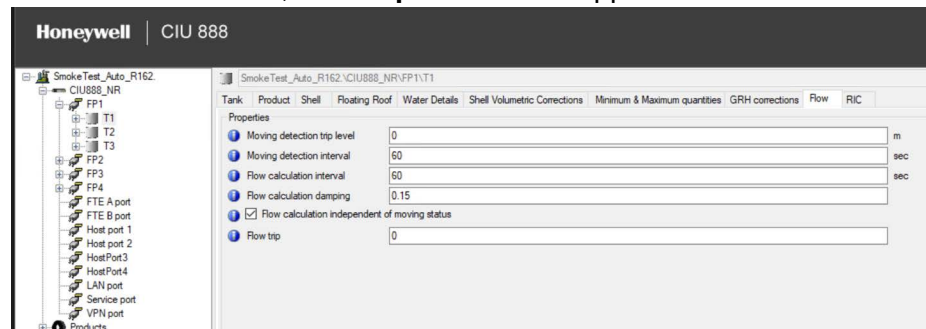
You can view or edit these properties:

Properties	Description
Moving detection trip level	Movement Detection Trip Value. Whenever MoveDir is calculated, the actual measured level is compared with [ProductLevel] at the time of the previous check, see MoveInterval.

If the difference exceeds the value of MoveTrip, thus reducing the effect of ext |
| Moving detection interval | Interval Time for MoveDir Calculation.
MoveInterval (>= 0) is the interval time, in seconds, after which the movement direction of [ProductLevel] must be calculated again.

MoveInterval is checked each time that the tank is calculated ([ProductLevel] is me |

Properties	Description
Flow calculation interval	Interval Time for Flow Rate Calculation. FlowInterval (>= 0) is the interval time, in seconds, after which the the flow rate of TOV must be calculated again. Flow Interval is checked each time that the tank is calculated ([ProductLevel] is measured). Not
Flow calculation damping	Flow Rate Multiplication Factor. Damping Factor for Flow Rate Calculation. To obtain a steady flow rate, a damping factor (0.0 < FlowMul <= 1.0) is used. If FlowMul = 1.0, the flow rate is not damped at all, but it can be very unstable then. If the flow
Flow calculation independent of moving status	Bit 3 from entity 8140
Flow trip	Flow Rate Calculation Trip Value. Whenever FlowTOV is calculated, the actual calculated TOV is compared with TOV at the time of the previous check, see FlowInterval. If the difference exceeds the value of FlowTrip, thus reducing the effect of external in
Note: FlowTOV *is only calculated in case of 880 calculation flow.*	

15. Click the **RIC** tab, the **Properties** detail appears.
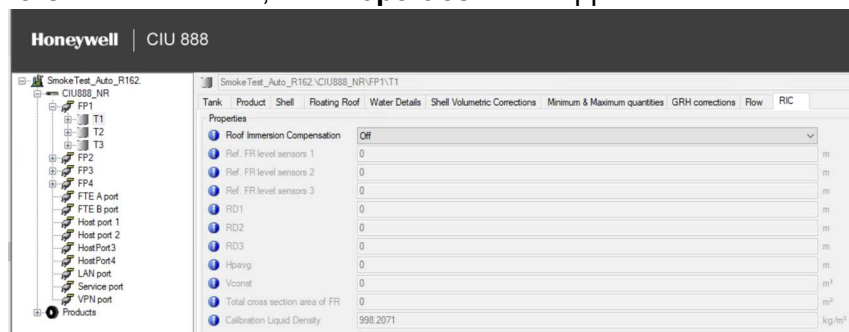
You can view or edit these properties:

Properties	Description
Roof Immersion Compensation	This compensates the volume for the effects of dynamic loads like snow, rain water on top of the floating roof. Selection: Enable / Disable
Ref. FR level sensors 1	Reference floating roof level sensors 1
Ref. FR level sensors 2	Reference floating roof level sensors 2
Ref. FR level sensors 3	Reference floating roof level sensors 3

Properties	Description
RD1	Reference distance from top surface measuring pipe 1 to liquid level
RD2	Reference distance from top surface measuring pipe 2 to liquid level
RD3	Reference distance from top surface measuring pipe 3 to liquid level
Hpavg	Average height top measuring pipe to lowest edge pontoon bottom
Vconst	Liquid volume under the pontoon membrane and bottom, calculated during tank calibration.
Total cross section area of FR	Total cross section area of floating roof
Calibration Liquid Density	Calibration Liquid Density This is the density (observed) of the product under a roof, used during tank calibration, in kg/m3

16. On the **Tank1** node, right-click and choose **Add Tank Capacity Table**.
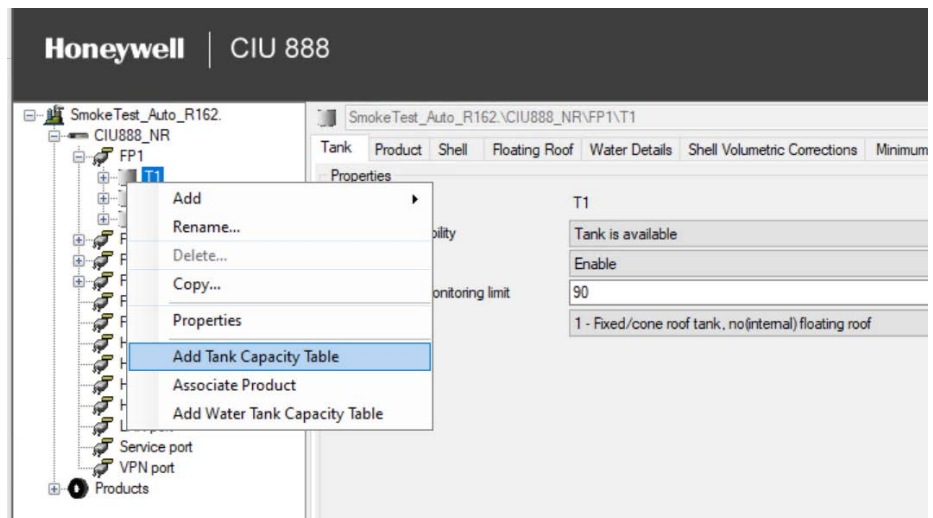
The following window appears.
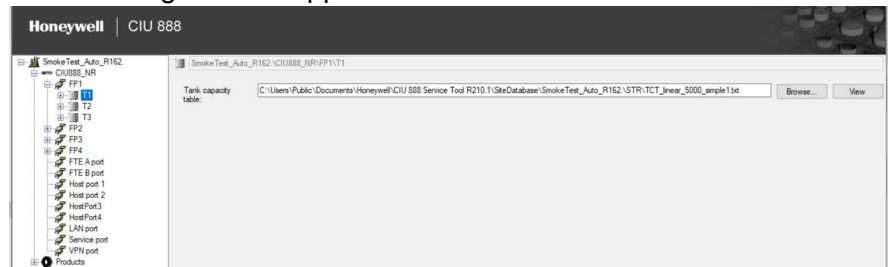
You can add a new Tank Capacity Table or view an existing one.

Properties	Description
Tank Capacity Table	Refer to Appendix D for the format of Tank Capacity Table.
Browse	Click 'Browse' to select a tank capacity table. Selected file is copied to the data environment of the selected site (C:\Users\Public\Documents\Honeywell\CIU 888 Service Tool\SiteDatabase\<sitename>\STR. The copied file gets the name [Tank name].txt.
View	Click 'View' to view the tank capacity table.
Note: *A selected tank capacity table file is only accepted if the used engineering units match the global selected engineering units of the site configuration.*	

17. On the **Tank1** node, right-click and choose **Add Water Tank Capacity Table**
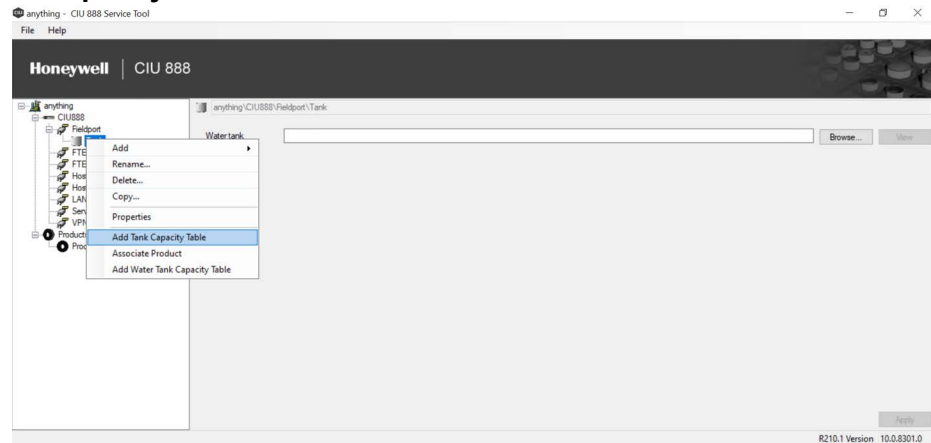
The following window appears.
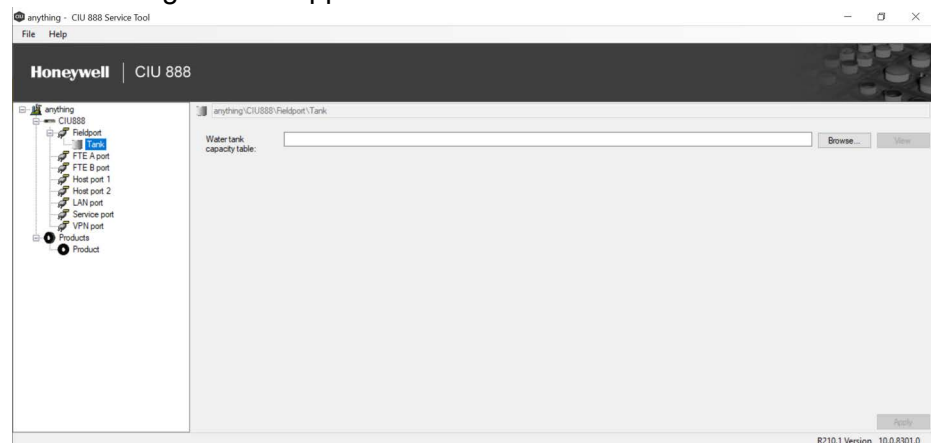
You can add a new Water Tank Capacity Table or view an existing one.

Properties	Description
Water Tank Capacity Table	Refer to Appendix D for the format of Water Tank Capacity Table.

Properties	Description
Browse	Click 'Browse' to select a water tank capacity table. Selected file is copied to the data environment of the selected site (C:\Users\Public\Documents\Honeywell\CIU 888 Service Tool\SiteDatabase\<sitename>\STR. The copied file gets the name [Water Tank name].txt.
View	Click 'View' to view the water tank capacity table.
Note: *A selected water tank capacity table file is only accepted if the used engineering units match the global selected engineering units of the site* configuration. **Note:** In case of a separate water sump in the tank, a water TCT can be used and water TCT should be based on geometry and dimensions of the sump.	

3.2.7.2 Configuring tank under Ethernet field port:

On the FTEA port node, click and choose **Add > Tank**
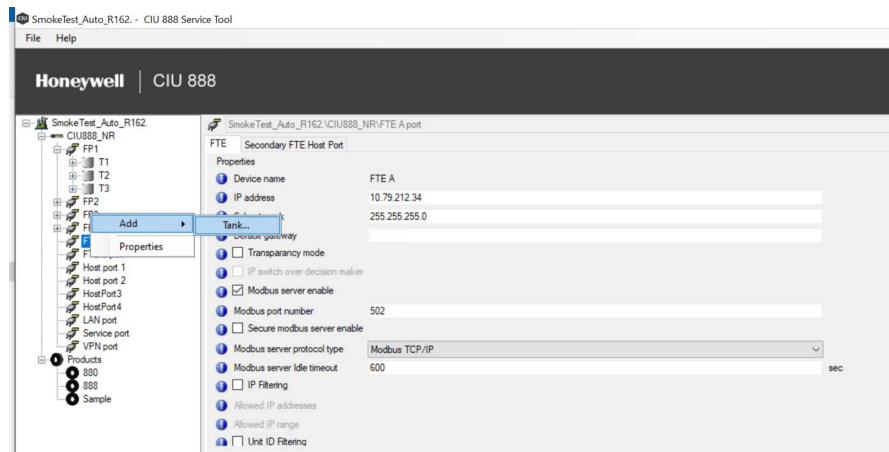
The "Add site element" window appears
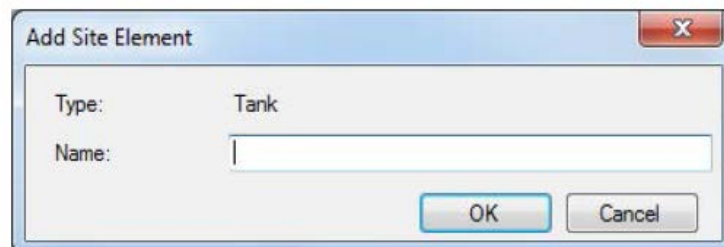
In the name box, type the name and click **OK**.

The tank1 node is created and displayed under ethernet filed port.

NOTE: For configuring tank refer Section 3.2.7.1

3.2.7.3 Associating a Product to Tank

1. On the Tank node, right-click and choose Associate product> Select Product from the drop down and click OK.
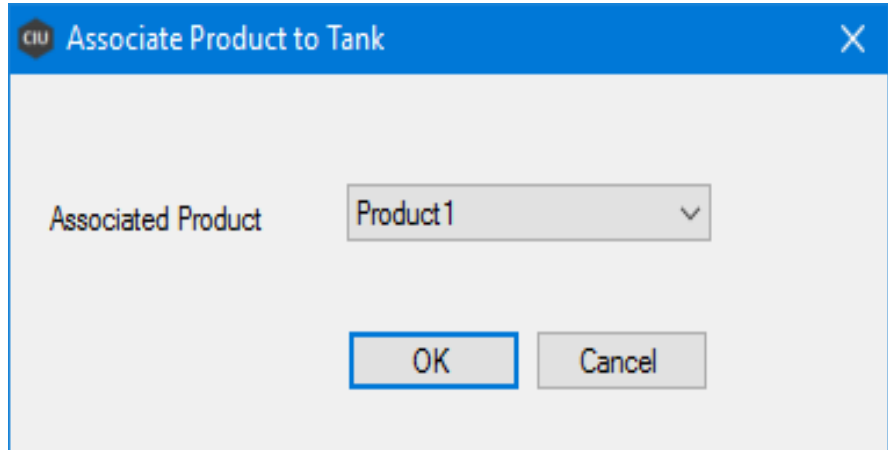
2. Desired Product is successfully associated to the Tank. Click Ok.
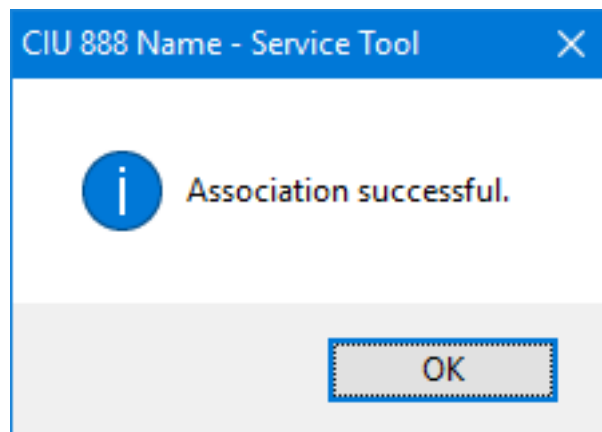
3.2.8 Product configuration

3.2.8.1 Configuring product under products

1. On the **Products** node, right click and choose Add > **Product**
2. The **Add Product** window appears.
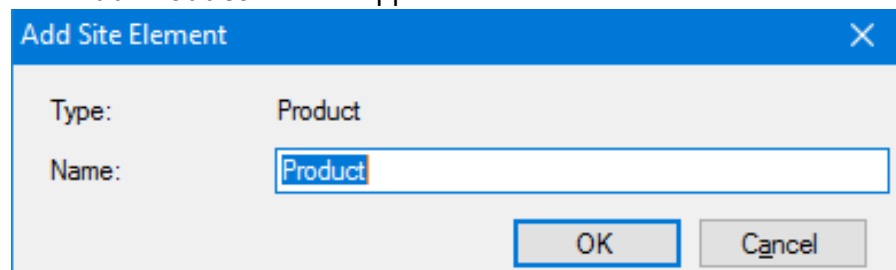
3. In the Name box, type the name of the Product and click OK.

4. The Product node is created and displayed under Products.
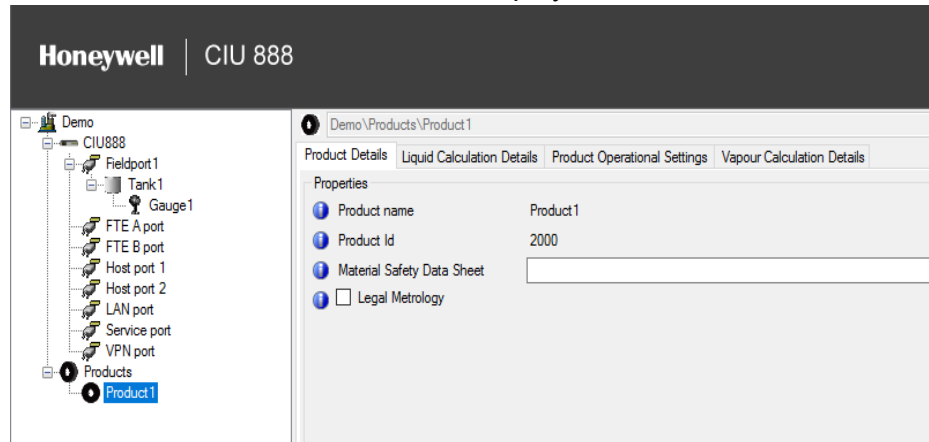
5. By default, the Product Details tab appears.

You can view or edit these properties:

Properties	Description
Product name	Name of the Product. Name can be up to 30 characters.
Product Id	A unique Identifier assigned to a product. This is internally generated by the service tool.
Material Safety Data Sheet	Information on Product Safety sheet can be stored under this option for reference.
Legal Metrology	This is a selection which can be set after configuration is complete and verified, whether the product is configured correctly and can be 'sealed'.

6. Click the **Liquid Calculation Details** tab, the **Properties** detail appears.

You can view or edit these properties:

Properties	Description
Calculation Type	This setting indicates the tank inventory calculation type. Possible values: CIU 880 compatible – User shall select this calculation type for tank inventory calculations that match with that of CIU 880 or CIU 888 (lesser than R161.2 version). For example, for CIU 880 migrations, this calculation type shall be chosen. CIU 888 calculations – User shall select this calculation type for tank inventory calculations adhering to the latest API standards and for new product calculations. Currently vapor inventory calculations are not supported in this type and hence can be chosen for products that involve only liquid inventory calculations. Default value: CIU 880 compatible
User Configurable Table	This setting provides the name of the user configured table associated to the GSV Calc type. Three tables are possible: User configured density table User configured CTL table User configured concentration table
Aromatic HC (ASTM D1555(M))	This setting provides a list of aromatic hydrocarbons that can be selected when GSV Calculation type is ASTM D1555-2016 API @ 60 F / ASTM D1555M-2016 kg/m3 @ 15 C Selection: which Aromatic HC (Benzene | Cumene | Cyclohexane | Ethylbenzene | Styrene | Toluene | m-Xylene | o-Xylene | p-Xylene | 300 to 350 °F (148.9 to 176.7 °C) | 350 to 400 °F (176.7 to 204.4 °C)

Properties	Description
GSV calculation type	This setting provides a list of GSV calculation methods (Liquid calculation methods) supported. Selection: Default: No Liquid calculation method Note: The following methods are only available when Calculation type is selected as CIU 888 calculations. a) ASTM D4311-15 API @ 60 F b) ASTM D4311M-15 kg/m3 @ 15 C c) ASTM D1555-2016 API @ 60 F d) ASTM D1555M-2016 kg/m3 @ 15 C e) EN15940- 2019 f) SGS-2021 g) NBR15639-2016 h) User Configurable Density table i) User Configurable CTL table j) User Configu rable Concentration table
Alpha Type	This setting indicates how Alpha (Product TC) should be interpreted. Selection: Alpha60 Default: Alpha60
Product code/commodity	This setting indicates which product type to be applied for the selected GSV Calculation type.
Reference temperature	Product Reference Temperature. The volume of the product in a tank varies with changes of ProdTemp. This causes changes in the product level which result in incorrect volume calculations. ProdTRef is used to get calculation results (volumes, mass) which are independent of the temperature of the product in the tank at the time of the measurement.
Alpha	Product Temperature Coefficient. Manual: Only with Product Code C the ProdTC is entered manually. It must be entered in 10e-7 format (shift the decimal separator 7 positions to the right), e.g. 0.000612 is entered as 6120 With Product Codes A, B and D, ProdTC is calculated and not used with other calculations. With Product Code E it is not used at all.

Properties	Description
CTL (VCF)	CTL (Correction for the effect of Temperature for Liquid) Historical known as VCF (Volume Correction). With special products CTL can be entered manually Normally, CTL will be calculated according to ASTM/API procedures
TCF	Product Temperature Correction Factor (TCF). Normally, VCF is calculated, using the ASTM/API tables. The TCF method provides an alternative for this calculation. The TCF is used to calculate the CTL with Chemical Products.
DCF	Product Density Correction Factor (DCF). The DCF is used to calculate [DObs] with Chemical Products.
Density Input	This setting indicates the type of the density input. Selection: (Reference density | Sample density and temperature | N.A.) Based on the selected GSV Calculation type, Service tool provides options for this setting.
Sample Density	Sample density refers to density data obtained from a manual sample. Sample density always needs to be provided in combination with the sample temperature.
Sample Temperature	Sample temperature is not the temperature of the sample when it was taken, but the temperature when the density was determined (for example using a hydrometer).
Hydrometer correction	The hydrometer correction is needed when the density of the sample is determined using a 'glass' hydrometer. This correction corrects the thermal expansion of the glass of the hydrometer. Selection: Enable | Disable

Properties	Description
Range checking disable	This setting refers to whether range check is enabled / disabled in the tank inventory calculations for the selected GSV calculation type. Selection: Checkbox (Selected) – Extended Range (beyond defined by the standard) is supported. Checkbox (Not Selected) – Extended Range (beyond defined by the standard) is not supported.
Mass calculation	This setting indicates whether Mass calculation is performed for In vacuum or In air. Selection: In vacuum – Mass in vacuum is calculated. In air – Mass in air is calculated. Note: For 888 calculations, Mass In vacuum is only supported as weight can be calculated by configuring WCF method.
Volume mass correction	VolumeCorrections: This setting indicates which correction must be applied to the calculated volume. Selection: None (no vapour mass) S&W corr. (Liq Mass from NSV; no Vap mass) Vapour calc. Liq/Vol ratio ISO/TC28/SC 3N Vapour calc. molar method ISO/TC28/SC 3N Vapour calc. method API research proj. 44 Vapour calc. molar method ISO 6578 Note: For CIU 888 calculations type, vapour calculations are not supported and hence only S&W corr is applicable.
Air density	Air Density is always in kg/m3, regardless of the units in which the system is configured. Default: 1.226

Properties	Description
Density of calibration weights	Brass density is used in some of the standardized mass/weight conversion methods. It is the density of used calibration weights. Default: 8000 kg/m3 Note: • - Unit of measure is always kg/m3
CTL format	This setting indicates the format of CTL (VCF) that gets presented from CIU. Selection: Standard calculations – CTL value would be preseted with 5 decimal digits when value is less than 1 and 4 decimal digits when value is greater than 1. Always 4 decimals – CTL value would be presented with 4 decimal digits. Always 5 decimals - CTL value would be presented with 5 decimal digits. Default: Standard calculations
WCF Method	This setting indicates the method to calculate Weight Correction Factor and thereby calculate Weight. Selection: (NONE | OIML R125 | API MPMS CH11.5 | SIMPLIFIED | CUSTOM) Default: *NONE*

Refer to the following table for information on different WCF methods

WCF Method	TankAirDensity (kg/m3)	VapDensity (kg/m3)	AirBrassDensity (Density of calibration weights) (kg/m3)	Remarks
NO WCF	0	0	0	
OIML R125	TankAirDensity	TankAirDensity	8000	The value of Dair is configurable in the Global settings.

WCF Method	TankAirDensity (kg/m3)	VapDensity (kg/m3)	AirBrassDensity (Density of calibration weights) (kg/m3)	Remarks
API MPMS Ch 11.5	1.199228	1.199228	8000	Use of the 'general' air buoyancy correction equation as detailed in OIML is equivalent to the equation used in API MPMS Ch. 11..5.3. The derivation is even spelled out in Annex B.5 of the same document.
Simplified	TankAirDensity	0	0	
Custom	Custom	Custom	Custom	This method is 'Advanced' and allows users/operators to configure each of the three inputs to any value.

Notes on GSV Calculation Type:

a) Reference density can be an input for the following tables

- ASTM D 1250-80 T5/6, ASTM D 1250-80 T23/24, ASTM D 1250-80 T53/54, ASTM D 1250-80 T59/60
- API MPMS Ch. 11.1 (2004) API @ 60 F (T5/6), API MPMS Ch. 11.1 (2004) RD60 @ 60 F (T23/24), API MPMS Ch. 11.1 (2004) kg/m3 @ 15 C (T53/54), API MPMS Ch. 11.1 (2004) kg/m3 @ 30 C (T59/60)
- ASTM-IP-52 T23/24, ASTM-IP-52 T53/54
- API MPMS Ch. 11.2.4 (2007) (GPA TP-27-07) T23/24, API MPMS Ch. 11.2.4 (2007) (GPA TP-27-07) T53/54, API MPMS Ch. 11.2.4 (2007) (GPA TP-27-07) T59/60

NOTE: Reference density overwrite - For the above mentioned GSV calculation types (Bullet point 1 to Bullet point 4), the host system should overwrite Sample density and Sample temperature with Sample density = Desired Reference density and Sample temperature = Product Reference temperature.

- ASTM D4311-83 T1, ASTM D4311-83 T2, ASTM D4311-96 T1, ASTM D4311-04 T1, ASTM D4311-04 T2, ASTM D4311-15 API @ 60 F, ASTM D1555M-15 kg/m3 @ 15 C
- LinearTCF, ManualCTL, User Configurable CTL table
- EN15940-2019, SGS-2021, NBR15639-2016
- Sample density and sample temperature can be input for the following tables

b) ASTM D 1250-80 T5/6, ASTM D 1250-80 T23/24, ASTM D 1250-80 T53/54, ASTM D 1250-80 T59/60

- API MPMS Ch. 11.1 (2004) API @ 60 F (T5/6), API MPMS Ch. 11.1 (2004) RD60 @ 60 F (T23/24), API MPMS Ch. 11.1 (2004) kg/m3 @ 15 C (T53/54), API MPMS Ch. 11.1 (2004) kg/m3 @ 30 C (T59/60)

■ ASTM-IP-52 T23/24, ASTM-IP-52 T53/54

■ API MPMS Ch. 11.2.4 (2007) (GPA TP-27-07) T23/24, API MPMS Ch. 11.2.4 (2007) (GPA TP-27-07) T53/54, API MPMS Ch. 11.2.4 (2007) (GPA TP-27-07) T59/60

■ ASTM D1555-2016 API @ 60 F, ASTM D1555M-2016 kg/m3 @ 15 C

■ EN15940-2019, SGS-2021, NBR15639-2016

    c) For NBR15639-2016, the order of precedence is Reference density, mass concentration and Sample density & sample temperature. Set the Density input to N.A, to set mass concentration as the input.

    d) For SGS-2021, the order of precedence is Reference density, Sample density & sample temperature.

    e) For EN15940-2019, the order of precedence is Reference density, Sample density & sample temperature.

    f) For User Configurable Density table, associate a user defined density table by right clicking product site element and selecting "Add density table" option. Refer to Appendix E for the format of the user defined density table.

    g) For User Configurable CTL table, associate a user defined density table by right clicking product site element and selecting "Add CTL table" option. Refer to Appendix F for the format of the user defined CTL table.

    h) For User Configurable Concentration table, associate a user defined density table by right clicking product site element and selecting "Add concentration table" option. Refer to Appendix G for the format of the user defined concentration table.

7. Click the **Product Operational Settings** tab, the **Properties** detail appears.
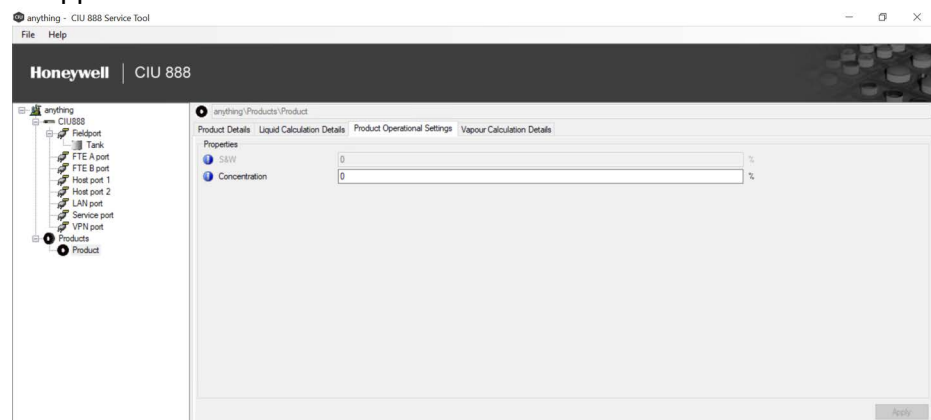
You can view or edit these properties:

Properties	Description
S&W	The product in tank can contain Sediment and Water which is dissolved in it. Range: 0 to 100 (%)
Concentration	The concentration of the product. Range: 0 to 100 (%) Notes: - For "User configurable concentration table", this setting indicates volume concentration percentage - For "NBR15639-2016", this setting indicates mass concentration percentage

8. Click the **Vapour Calculation Details** tab, the **Properties** detail appears.
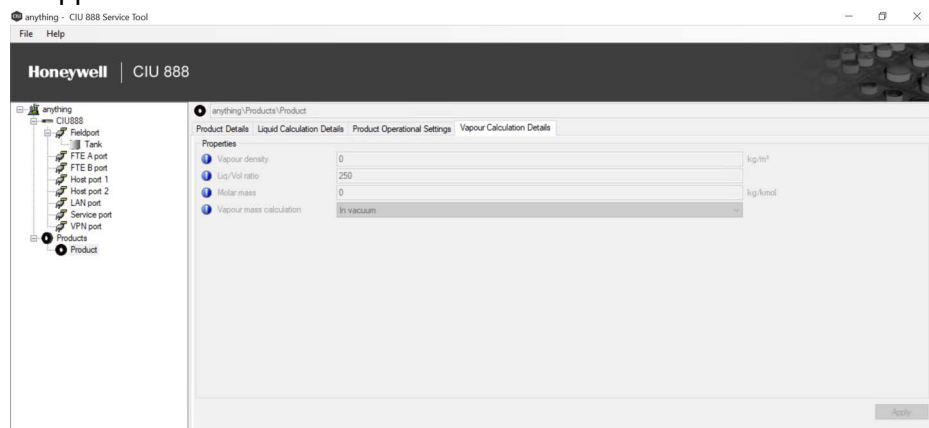
You can view or edit these properties:

Properties	Description
Vapour density	Density of the vapour. Note: - Unit of measure is always kg/m3

Properties	Description
Liq/Vol ratio	This setting refers to Liquid to Volume Ratio. In some tanks (pressurized) the room above the product is filled with vapour which, in condensed form, would take a certain amount of product (volume). This volume can be calculated. Typical values for LiqVolRatio with various products, measured at the standard ProdTRef of 15C or 60F, are: Ethane 293.3 Cis-Butene-2 255.9 Butane 229.5 Propene 288.3 Trans-Butene-2 248.9 ISO-Pentane 193.7 Propane 266.7 ISO-Butene 245.0 Pentane 194.8 Butene-1 245.2 ISO-Butane 221.9 If the gas is a mixture of above products, LiqVolRatio can easily be calculated from the appropriate factors, according to the contribution of each gas component.
Molar mass	Molar weight of the gas composition. In some tanks (pressurized) the room above the product is filled with vapour which, in condensed form, would take a certain amount of product (volume). This volume can be calculated. Typical values for MolarWeight (expressed in kg/kmol) with various products, measured at the standard ProdTRef of 15 C or 60 F, are: Ethane 30.070 Propane 44.097 Butane 58.124 ISO-Butane 58.124 Pentane 72.151 ISO-Pentane 72.151 MolarWeight is used with the calculation of: • LiqVap, using the molar method according to: -ISO/TC28/SC3 N411 (molar method) -ISO 6578 -API research Project 44

Properties	Description
Vapour mass calculation	This setting is used to indicate which correction must be applied to the calculated volume. Selection: None (no vapour mass) - No correction applied S&W corr. (Liq Mass from NSV; no Vap Mass) – Sediment and Water correction applied Vapour calc. Liq/Vol ratio ISO/TC28/SC 3N - LiqVap calculations according Liq/Vol Ratio ISO DP 4267/1 1982 (ISO/TC28/SC 3 N 411) Vapour calc. molar method ISO/TC28/SC 3 N - LiqVap calculations according Molar method according to ISO DP 4267/1 1982 (ISO/TC28/ SC 3 N 411) Vapour calc. method API research proj. 44 - LiqVap calculations according Molar method according to API research project 44 Vapour calc. molar method ISO 6578 - LiqVap calculations according Molar method according to ISO 6578 Notes: - when S&W correction (NSV calculation) is selected, Vapour calculations are disabled.

3.2.9 Product configuration Export and Import

Service tool supports product configuration export and import. On Export, product configuration is saved into a file (JSON). On Import of the product configuration from a file (JSON), Service tool creates the products in the CIU configuration database in accordance with the content specified in the product configuration file.

For sites with multiple CIU 888s, the product settings across all the CIU configuration databases should be same. When CIU configuration database is loaded to ENTIS configuration tool, it compares the product settings across CIU configuration databases and flag an error in case of a mismatch. For sites with multiple CIUs, the recommendation is to create all products in one CIU configuration database, export the product configuration from it and import the same into other CIU configuration databases.

3.2.9.1 Export of product configuration

1. On the Products node, right-click and click Export Products from the drop down.
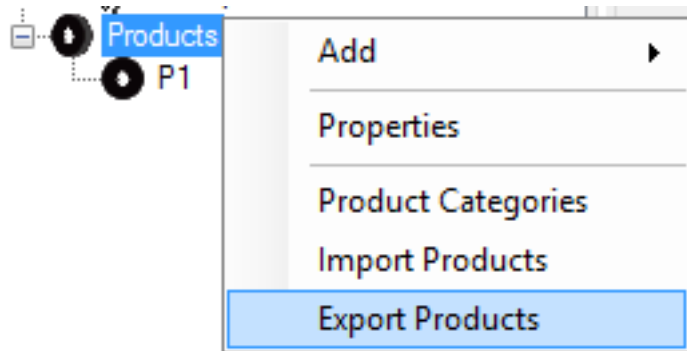
2. Choose a file name and click Save.
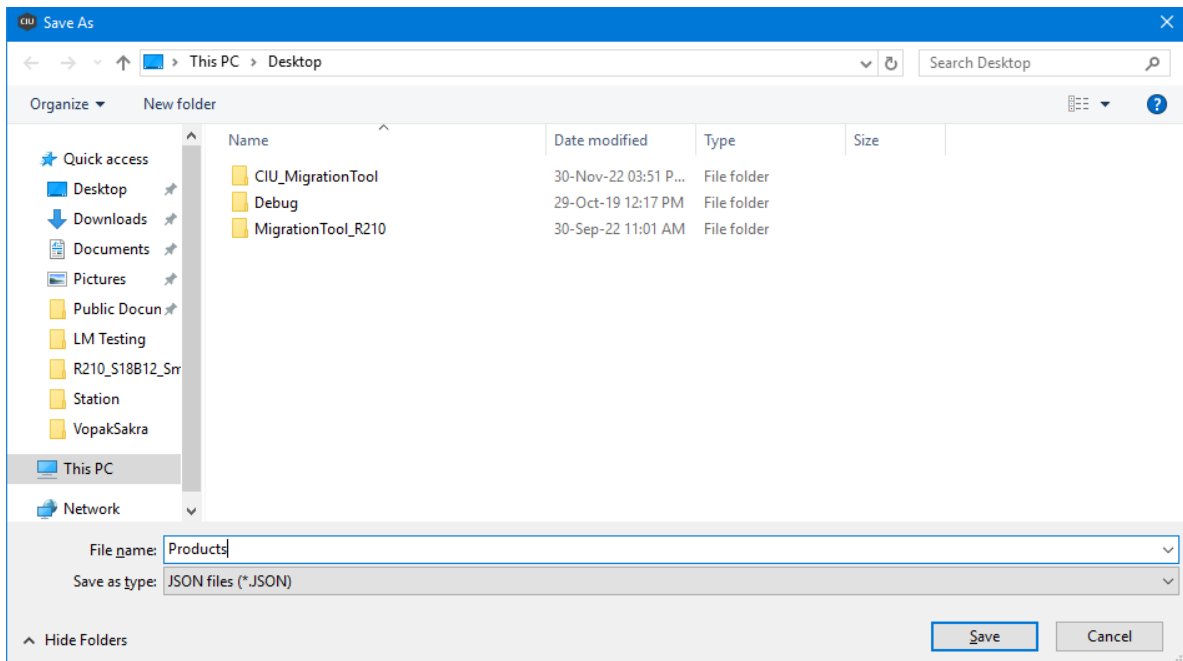
3. Product configuration is successfully exported, and a confirmation message pops up. Click OK.
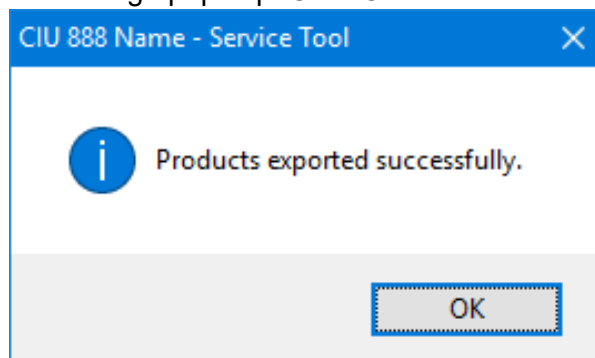
3.2.9.2 Import of product configuration

1. On the Products node, right-click and click Import Products from the drop down.
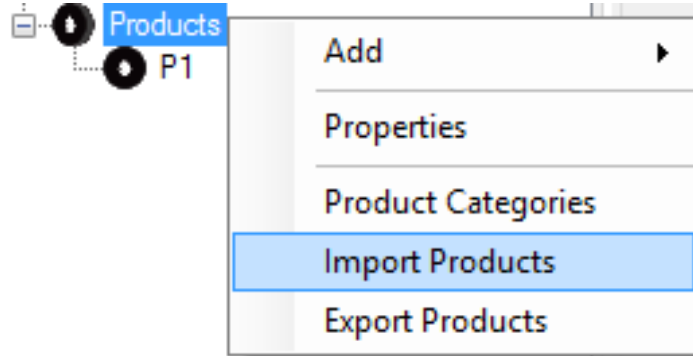
2. Browse to the desired product configuration file and click Import.
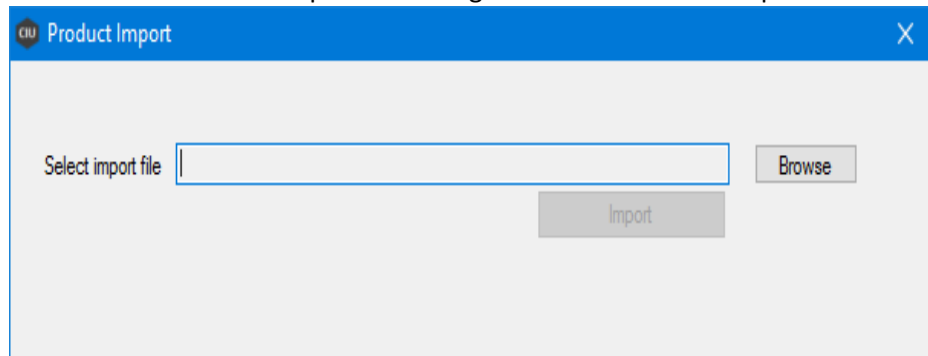
3. Message on reconfirmation of deletion of existing products pops up. For proceeding, click Yes.
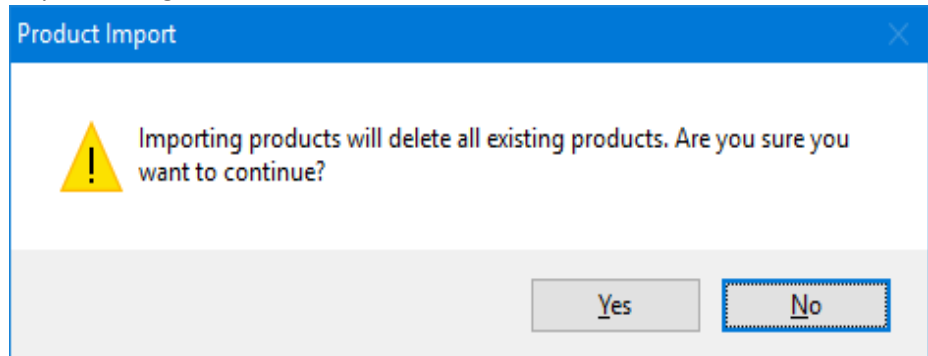
4. Product configuration is successfully imported, and a confirmation message pops up. Click OK.
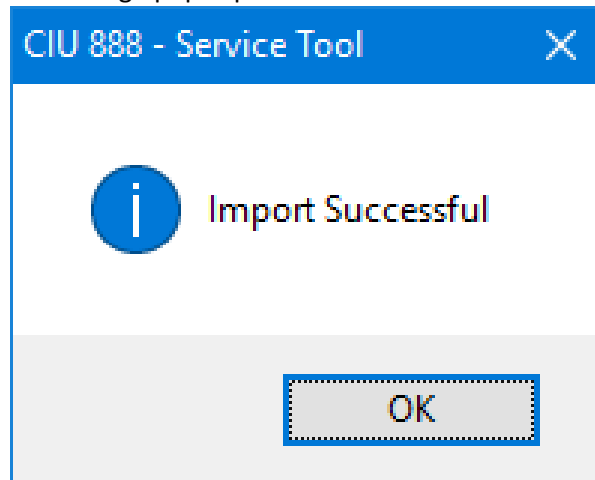
3.2.10 Configuring a GPU Data Input or Modbus Data Input or TRL/2 Data Input

After Tanks are linked to the applicable Field ports, you should add either GPU Data Input or Modbus Data Input or TRL/2 Data Input to the respective Tanks.

3.2.10.1 GPU Data Input

3.2.10.1.1 *Data Integration supported*

1. Product Level etc

The CIU 888 collects measurement data like Product level, Product temperature etc., from the BPM gauges and exposes the data in its Modbus output (Modbus RTU and Modbus TCP/IP) based on the configuration. Using this mechanism any Modbus host system can get the data from CIU 888 and visualize it in its user interface.

2. Temperature profiles

The CIU 888 also collects temperature profiles data from the BPM gauges and exposes the data in its Modbus output (Modbus RTU and Modbus TCP/IP) based on the configuration. The CIU 888 collects data for a maximum of 16 temperature elements. Using this mechanism any Modbus host system can get the temperature profiles data from CIU 888 and visualize the data in its user interface.

3. Density profiles

The CIU 888 collects density profiles data from the BPM gauges and expose the data in its Modbus output (Modbus RTU and Modbus TCP/IP) based on the Modbus coil command from the host system. The CIU 888 collects data for a maximum of 50 density points. Using this mechanism, any Modbus host system can issue a density profile command via Modbus coils and get the density profiles data from CIU 888 and visualize the data in its user interface.

The CIU 888 supports density profile upward, density profile downwards, interface profile upward, interface profile downward, combined profile upward and combined profile downward commands via Modbus coils.

The following steps detail out the configuration procedure.

1. On the **Tank1** node, right-click and choose **Add > GPU Data Input.**
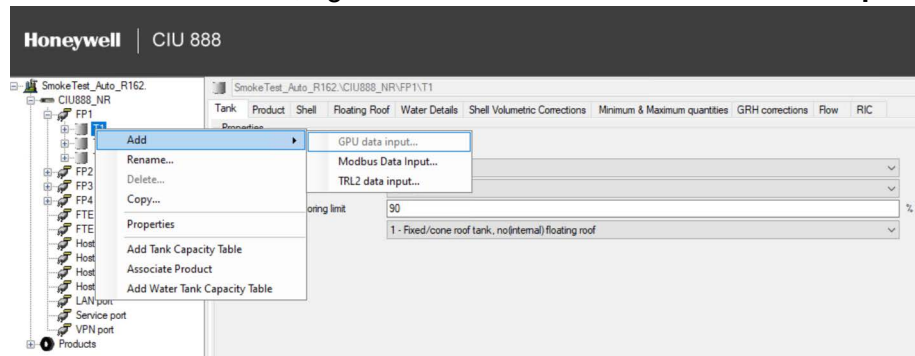
2. The **Add Site Element** window appears.
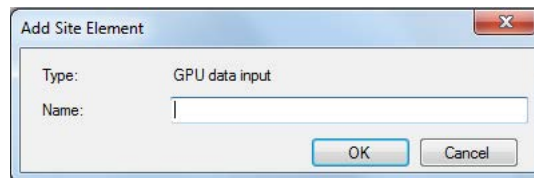
3. In the **Name** box, type the name of the GPU Data Input and click **OK.**

4. The **G1** node is created and displayed under **Tank1**.
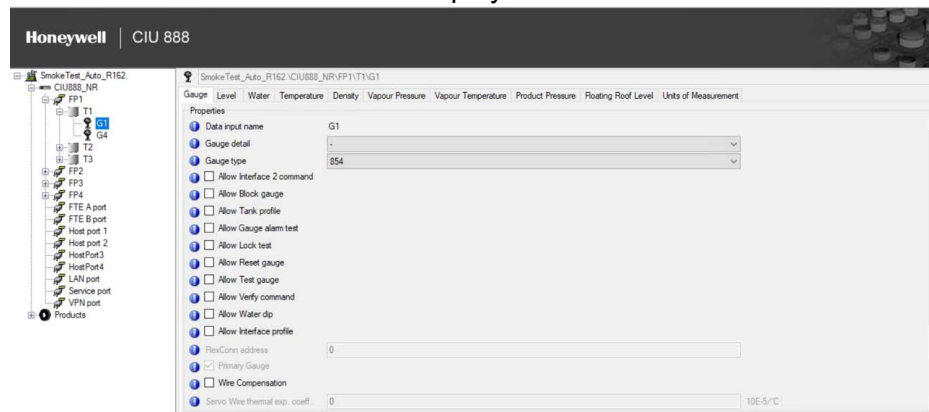
5. By default, the **Gauge** tab appears.

    You can view or edit these properties:

Properties	Description
Data Input Name	You can see the name of the GPU Data Input
Gauge Detail	Select 'h' for 854 gauges using the ZLQ record (up to software version SPUA1.0) or select '-' for 854 gauges (with software version SPUA2.0 onwards).
Gauge Type	Select Unknown, 811, 854, 866, 872, 873, 877, 894, 954, 970, 971, 973, or 990.

Properties	Description
Allow Interface 2 command	Check the option, if allowed (**I2**; 854, 894, 954 only).
Allow Block gauge	Check the option, if allowed (**BL**; 811, 854, 894, 954 only).
Allow Tank profile	Check the option, if allowed (**TP**; 854, 894, 954 only).
Allow Gauge alarm test	Check the option, if allowed (**AT**; 873 only).
Allow Lock test	Check the option, if allowed (**LT**; 811, 854, 894, 954 only).
Allow Reset gauge	Check the option, if allowed (**RS**).
Allow Test gauge	Check the option, if allowed (**TG**; 811, 854, 894, 954 only).
Allow Verify command	Check the option, if allowed (**CA**; 854, 894, 954 only).
Allow Water dip	Check the option, if allowed (**I3**; 811, 854, 894, 954 only).
Allow Interface profile	Check the option, if allowed (**IP**; 854, 894, 954 only).
FlexConn address	Set the option, if allowed (954, 990 Only).
Primary Gauge	This indicates whether the gauge is primary or not. For primary gauge, all measurements can be enabled for scan and gauge commands can be enabled. For second gauge (non-primary), only product level measurement can be enabled for scan and gauge commands are not supported.
Wire Compensation	This setting enables (or) disables servo wire correction. This is applicable only for Servo gauge. When enabled, product level is corrected for the temperature effects on the Servo wire. Note: - Servo wire correction is supported by 954 Servo gauge, if enabled in gauge do not enable this correction in CIU.
Servo Wire thermal exp. coeff.	Thermal expansion coefficient of the servo wire. Unit of measure is 10E-5/C (or) 10E-5/F. Note: Thermal expansion coefficient values in ppm (10E-6/C (or) 10E-6/F) needs to be converted to 10E-5/C (or) 10E-5/F. For example, the value of 16 10E-6/C (ppm) needs to be converted to 1.6 and then set in Service tool.

6. Click the **Level** tab, the **Properties** detail appears.
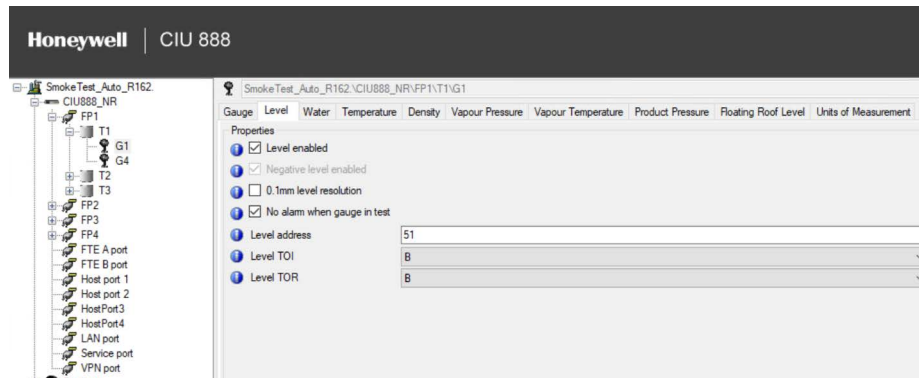
You can view or edit these properties:

Properties	Description
Level enabled	Check to enable level scan.
Negative level enabled	Check to enable the option. This selection is only possible for gauge types 854, 872, 873, 894 and 954.
0.1 mm level resolution	Check to enable the option. This selection is only possible if the level engineering unit is set to 'm' or 'mm' and if the gauge type is not 811, 813, 866 or 872.
No alarm when gauge in test	Check to disable gauge alarms during operational commands.
Level address	Enter level transmission address.
Level TOI	Select B, C, E, or M*.
Level TOR	Select B, ZLQ or L (the combination of level TOR 'ZLQ' and level type 'Ullage' is not possible. With level type 'Ullage', use level TOR 'L')*.
Refer to TABLE 3-1 for additional information.	

7. Click the **Water** tab, the **Properties** detail appears.
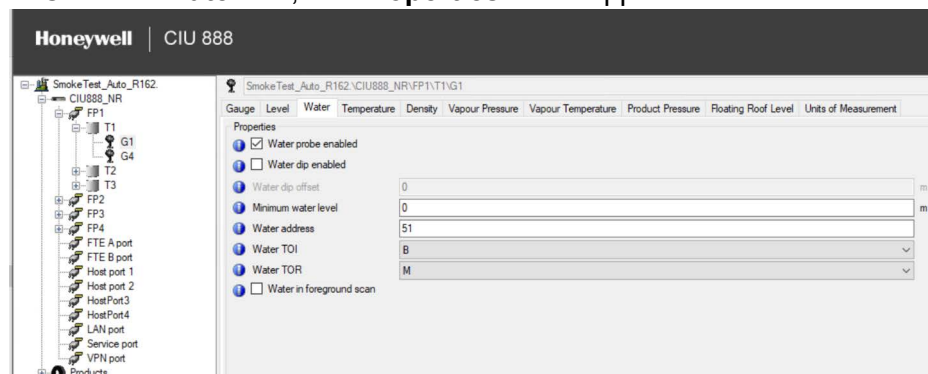
You can view or edit these properties:

Properties	Description
Water probe enabled	Check to enable water level scan from external probe.

Properties	Description
Water dip enabled	Check to enable water level scan from servo gauge.
Water dip offset	Enter water level offset.
Minimum water level	Enter minimum water level. This value is used when no water level is found.
Water address	Enter water level transmission address.
Water TOI	Select B, C, E, or M*.
Water TOR	Select M, J, B, L or ZLQ
Water in foreground scan	Check to enable the option.
* Refer to TABLE 3-1 for additional information.	

8. Click the **Temperature** tab, the **Properties** detail appears.

You can view or edit these properties:

Properties	Description
Temperature enabled	Check to enable product temperature scan.
Element type	Select No element available, MRT, MRT with bottom spot, MRT with bottom and top spot, One spot element, Two spot element or MTT.
Lowest element Position	Enter lowest temperature element position.
Temperature address	Enter product temperature transmission address.
Temperature TOI	Select: B, C, E, or M*.
Temperature TOR	Select: C or ZAG*.
Temperature in fore-ground scan	Check to enable the option.
Temperature profile scan enable	This parameter enables / disables the temperature pro-files data collection from a BPM gauge by CIU. When this option is selected, CIU collects temperature profiles data from the BPM gauge that is configured for product temperature. **Note**: CIU would collect the temperature profile data from the gauge from which product temperature is scanned.

Properties	Description
Temperature profile scan period	This parameter defines the time period within which the temperature profile data needs to be collected from a BPM gauge. The scan period is defined in terms of minutes.
* Refer to TABLE 3-1 for additional information.	

NOTE: *How to configure scan period for gauges in a Field Port.*

For each temperature profile scan, CIU 888 reserves a time period of 3 minutes so that enough field port bandwidth is given for scanning periodic foreground and background measurement items.

When the user enables temperature profile scan for a tank through "CIU 888 Service tool" or "Modbus host system" the CIU 888 Service tool runs the following logic to determine whether the temperature profile scan enable can be accepted or not without affecting the regular periodic scan items (foreground and background).

Temperature profile scan enable is allowed if the available slots is greater than or equal to 0.

> *Available slots = Total slots – ((Number of frames / 1) * Number of Gauges in 1st frame) - ((Number of frames / 2) * Number of Gauges in 2nd frame) - ((Number of frames / N) * Number of Gauges in Nth frame)*

where

> *Total slots = Number of frames * (Number of slots per frame - 1)*
>
> *Number of frames = Maximum_scan_period / frame interval*
>
> *Maximum_scan_period is the highest temperature profile configuration period in that field port or field port group.*
>
> *Frame interval = Number of slots per frame * 3*
>
> *Number of slots per frame = Minimum_scan_period / 3*
>
> *Minimum_scan_period = smallest temperature profile scan period in that field port or field port group*
>
> *Number of Gauges in N^{th} frame = (configuration period / (Frame Interval * N))*

Examples:

a) *Field port has 3 gauges with 15 minutes as temperature profile scan period and the user enables one more gauge for temperature profiles scan with scan period as 15 minutes.*

> *number of slots = 15/3 = 5*
>
> *frame interval = 5 * 3 = 15*
>
> *number of frames = 15/15 = 1*
>
> *total slots = 1 * (5-1) = 4*
>
> *number of gauges that comes once in one iteration i.e, gauges with configuration period between 15 and 29 = 4*
>
> *available slots = 4 - (1*4) = 0*
>
> *The CIU 888 accepts the temperature profile scan enable for the 4th gauge.*

If one more gauge (5th) is enabled for temperature profiles with scan period as 15.

*Available slots = 4 - (1*5) = -1 which is not acceptable and CIU 888 does not allow temperature profile scan enable for the 5th gauge. In this case, the user needs to disable the tank profiles scan for a gauge that is of no interest that point in time and enable the tank of interest.*

b) *Field port has 1 gauge with 15 minutes as temperature profile scan period, 5 gauges with 30 minutes as temperature profile scan period and the user enables one more gauge for temperature profiles scan with scan period as 30 minutes.*

number of slots = 15/3 = 5

number of frames = 30/15 = 2

*total slots = 2 * (5 -1) = 8*

number of gauges that comes once in one iteration i.e, total number of gauges with configuration period between 15 and 29 are = 1

Number of gauges that comes once in 2 iterations i.e, total number of gauges with configuration period between 29 to 44 are = 6

*Available slots = 8 - (2*1) - ((2/2)*6) = 0*

The CIU 888 accepts the temperature profile scan enable for the 7th gauge.

If one more gauge (8th) is enabled for temperature profile scan then the CIU 888 does not allow temperature profile scan enable for the 8th gauge. In this case, the user needs to disable the tank profiles scan for a tank that is of not interest that point in time and enable the tank of interest.

9. Click the **Density** tab, the **Properties** detail appears.
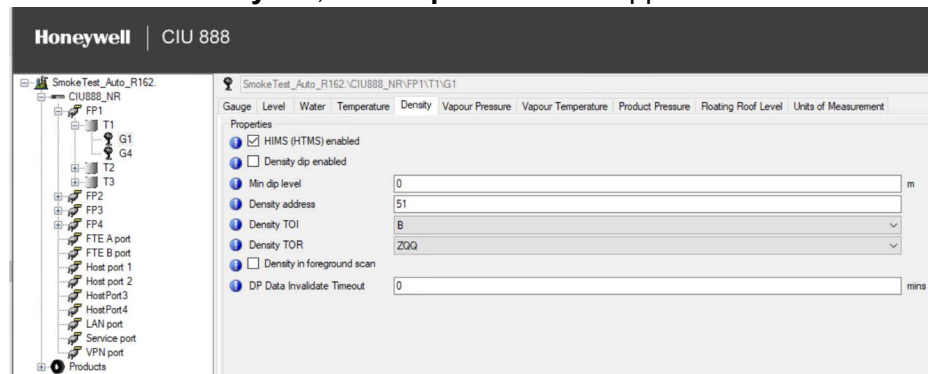
You can view or edit these properties:

Properties	Description
HIMS (HTMS) enabled	Check to enable density scan from HIMS configuration.
Density dip enabled	Check to enable density scan from servo gauge.
Min dip level	Enter minimum density level.
Density address	Enter density transmission address.
Density TOI	Select: B, C, or E*.
Density TOR	Select: ZQQ*.

Properties	Description
Density in foreground scan	Check to enable the option.
DP data invalidate time-out	This is a configurable time period after which the system will set the density profile related entities to invalid
* Refer to TABLE 3-1 for additional information.	

10.Click the **Vapour Pressure** tab, the **Properties** detail appears.
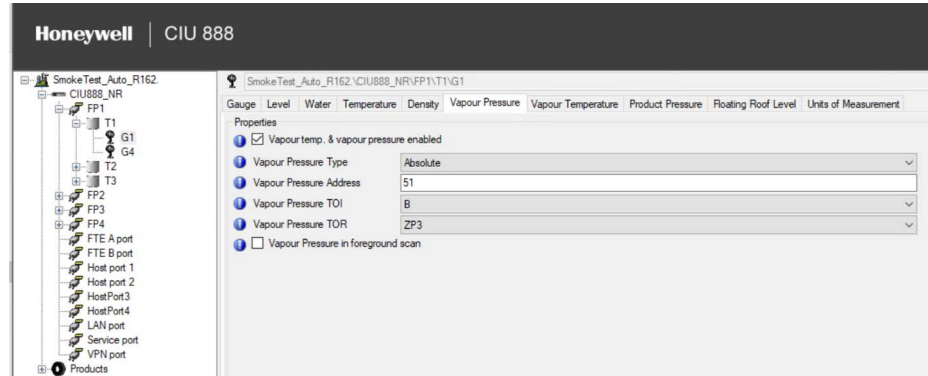
You can view or edit these properties:

Properties	Description
Vapour temp & pressure enabled	Check to enable vapour pressure scan.
Pressure Type:	
Absolute pressure	Select if applicable.
Relative pressure	Select if applicable.
Pressure address	Enter vapour pressure transmission address.
Pressure TOI	Select: B, C, E, or M*.
Pressure TOR	Select: ZP3*.
Vapour Pressure in foreground scan	Check to enable the Pressure in foreground scan.
* Refer to TABLE 3-1 for additional information.	

11. Click the **Vapour Temperature** tab, the **Properties** detail appears.
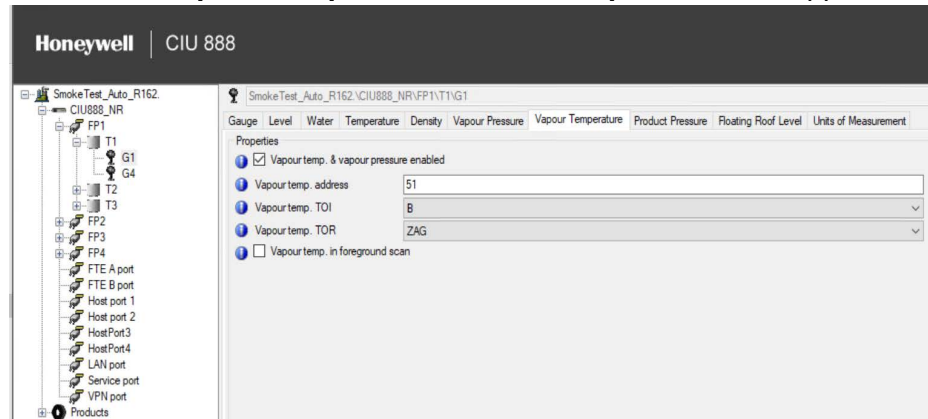
You can view or edit these properties:

Properties	Description
Vapour temp. & pressure enabled	Check to enable Vapour temp. & pressure scan
Vapour temp. address	Enter vapour pressure transmission address.
Vapour temp. TOI	Select the Type of Instrument: B, C, E, or M*.
Vapour temp. TOR	Select the Type of Record for the Vapour Temperature measurement: C or ZAG*.
Vapour temp. in foreground scan	Check to enable the Vapour temp. in foreground scan.
* Refer to TABLE 3-1 for additional information.	

12. Click the **Product Pressure** tab, the **Properties** detail appears
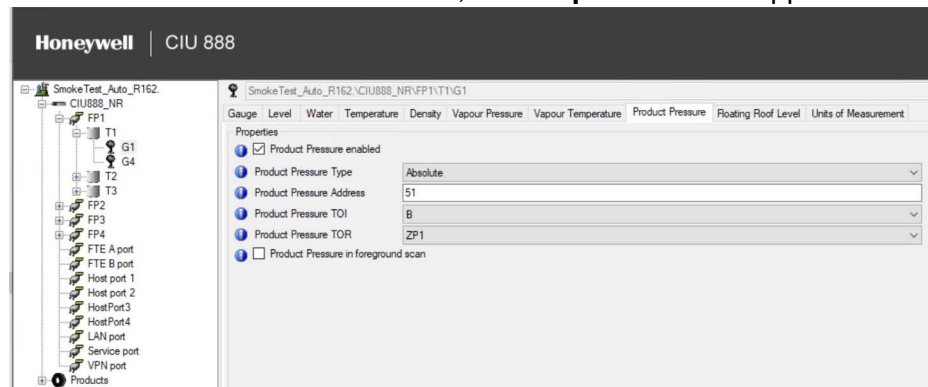
You can view or edit these properties:

Properties	Description
Product pressure enabled	Check to enable product pressure scan.
Product Pressure Type:	
Absolute pressure	Select if applicable.

Properties	Description
Relative pressure	Select if applicable.
Pressure address	Enter product pressure transmission address.
Pressure TOI	Select: B, C, E, or M*.
Pressure TOR	Select: ZP1*.
Product Pressure in fore-ground scan	Check to enable the Pressure in foreground scan.
Refer to TABLE 3-1 for additional information.	

13. Click the **Floating Roof Level** tab, the **Properties** detail appears.
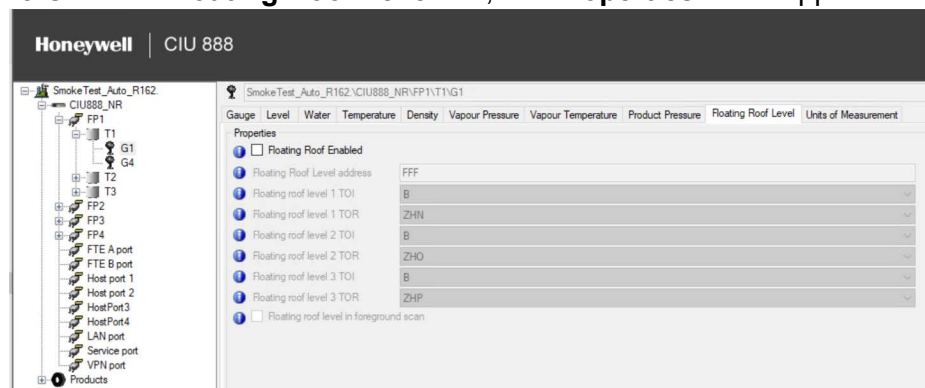
You can view or edit these properties:

Properties	Description
Floating Roof Enabled	Check to enable floating roof levels scan.
Floating Roof Level address	Enter floating roof level transmission address.
Floating Roof level 1 TOI	The TOI of the first floating roof level (B)
Floating Roof level 1 TOR	The TOR of the first floating roof level (ZHN)
Floating Roof level 2 TOI	The TOI of the second floating roof level (B)
Floating Roof level 2 TOR	The TOR of the second floating roof level (ZHO)
Floating Roof level 3 TOI	The TOI of the third floating roof level (B)
Floating Roof level 3 TOR	The TOR of the third floating roof level (ZHP)
Floating roof level in fore-ground scan	Set the floating roof to be scanned in the foreground or background. Default background. CAUTION: Setting Floating roof levels scan in foreground would have impact on the product level and other measure-ments scan rate.
Refer to TABLE 3-1 for additional information.	

14. Click the **Units of Measurement** tab, the **Properties** detail appears.
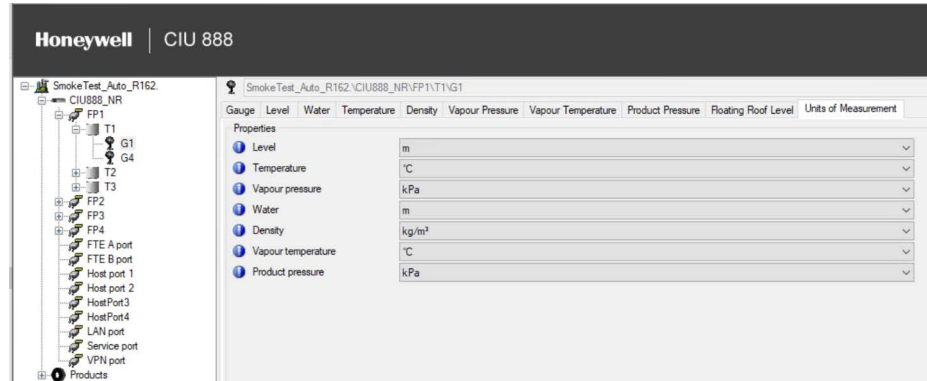
You can view or edit these properties:

Properties	Description
Level	Select m, mm, ft, in, in/16, fis, or 1/256 in.
Temperature	Select °C or °F
Vapour Pressure	Select kgf/cm^2, Pa, kPa, psi, psi_r100, or psi_r1000
Water	Select m, mm, ft, in, in/16, fis, or 1/256 in.
Density	Select kg/m^3, °API, lbs/ft^3, RD60, or lbs/US gal.
Vapour Temperature	Select °C or °F
Product Pressure	Select kgf/cm^2, Pa, kPa, psi, psi_r100, or psi_r1000

NOTE: *Make sure that Gauge Units of Measurement matches with the Units of Measurement configured in the gauge. Default gauge Units of Measurement are based on the configured global Units of Measurement.*

TABLE 3-1   Special Characters

Special Characters	Description
TOI	A = 802/812 gauge.
	B = 811 gauge with GPU protocol and devices with gauge type=B.
	C = 813 MGT and devices with gauge type=C.
	E = 811 gauge with external alarms and devices with gauge type=E.
	M = 816 /818.

Special Characters	Description
TOR	B = Alarm status + [contact status] if TOI is C or E + product level.
	C = Alarm status + [contact status] if TOI is C or E + temperature.
	J = Alarm status + water level.
	L = Alarm status + [contact status] if TOI is C or E + signed level.
	M = Water alarm status + [contact status] if TOI is C or E + water level status + water level record.
	ZAG = Average vapour temperature (854, 873, 877, 970, 971 & 973 only).
	ZLQ = Innage servo level (854 only).
	ZQQ = Abbreviated hydrostatic density (854, 866, 873, 877, 970, 971 & 973 only).
	ZP3 = Pressure sensor P3 (854, 866, 873, 877, 970, 971 & 973 only).
	ZP1 = Pressure Sensor P1 (854, 866, 873, 877, 970, 971 & 973 only)

3.2.10.2 Configuring Dual Gauges

The CIU 888 supports collection of Product Level data from an additional BPM gauge and this data is exposed to its Modbus output (Modbus RTU and Modbus TCP/IP) based on the configuration. Using this mechanism, any Modbus host system can get the data from CIU 888 and visualize it in its user interface.

To add an additional level gauge to a tank, a GPU data-input should be configured again as described in *Section 3.2.10.1* . The additional gauge only supports configuration of Level parameter. Configuration of

other parameters (Water, Temperature, Density etc.) and gauge commands is disabled.

FIGURE 3-34   Dual gauges configured
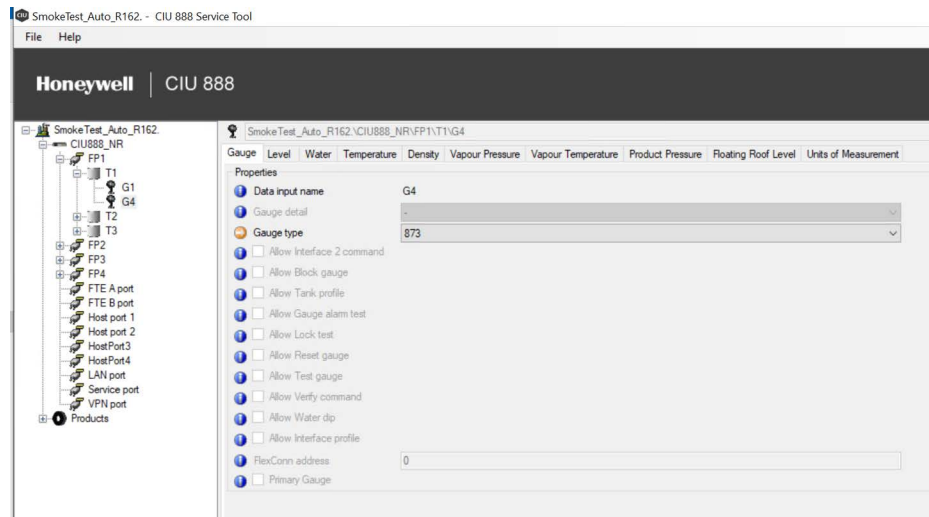
FIGURE 3-35   Gauge level parameter can be configured
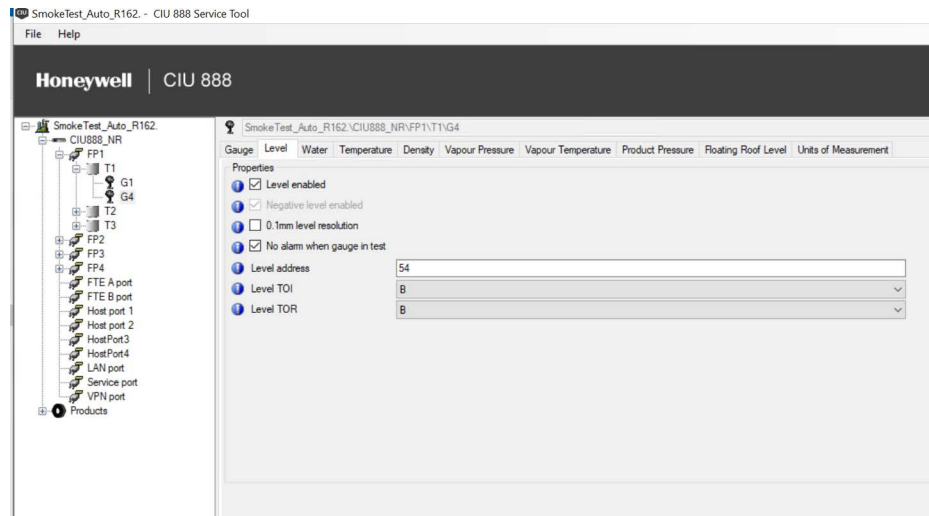
3.2.10.3 **Modbus Data Input**

1. On the **CIU 888** node, right-click and choose **Import MODBUS device type file**.

NOTE: Modbus device configuration file for Honeywell Smartline level transmitter SLG700 is available by default in the CIU 888 Service tool. For new field device, import its Modbus device configuration file to the CIU 888 Service tool.
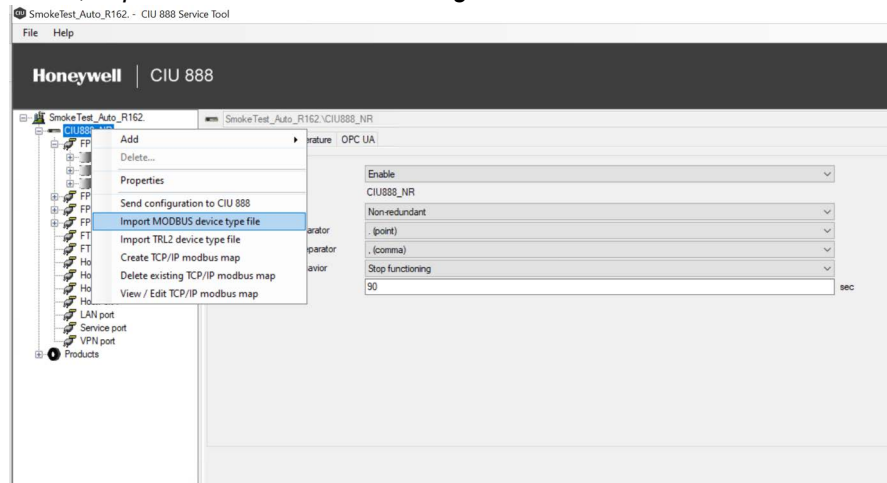
2. **Device Type- CIU 888 Service Tool** window appears.
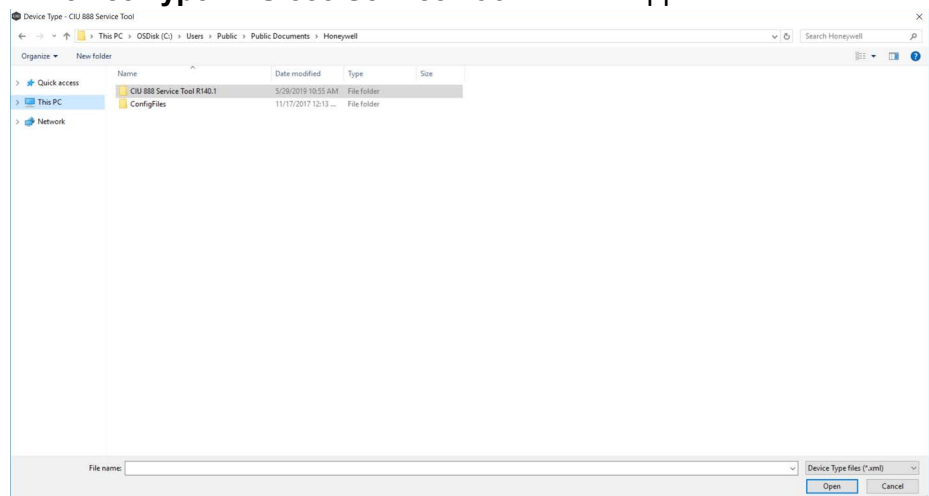
3. Select the XML of the Modbus device and click **Open.**

   The details of the specified XML file are loaded.

   Refer to Appendix H for the creation of a new Modbus field device configuration file.

4. On the **Tank** node, right-click and choose **Add > Modbus Data Input.**
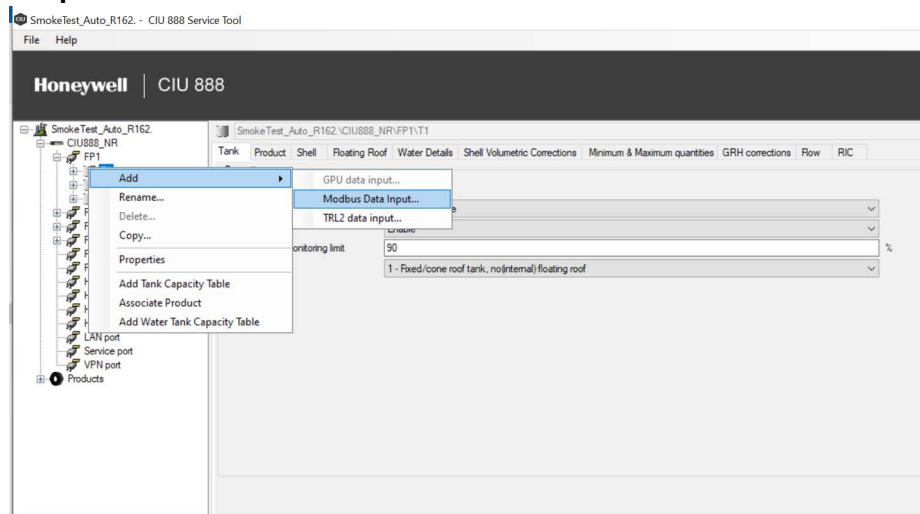
5. The **Add Site Element** window appears.
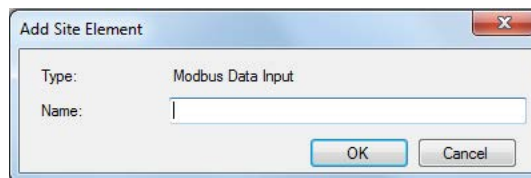
6. In the **Name** box, type the name of the Modbus Data Input and click **OK.**

7. The **M1** node is created and displayed under **Tank1**

You can view or edit these properties.

Properties	Description
DeviceGPUAddress	This indicates the GPU address of the Honeywell TRL2 field device.
CIU Parameter	This indicates the CIU parameter name to which the scanned Modbus field device parameter has to be mapped. CIU Service tool displays all the CIU Parameters which can be scanned from Modbus field devices in a drop down menu.
Device Type	This is the Modbus field device type. For example, this can be Smartline Level Transmitter, E+H ProServo. CIU Service tool displays all the supported device types in a drop down menu.
Device Slave ID	Each Modbus device is addressed with a unique slave ID. That is, when a request is received by a Modbus device, it checks the Modbus slave ID in the request and if it matches with its configured slave ID, it responds back, else it skips the request. This indicates the Modbus RTU address of the field device.
Device Modbus Start Address	This parameter indicates the address from where the Modbus mapping starts for a device. In case of Modbus field devices that are directly connected to CIU this could be 0 and in case of Modbus data concentrator, the user has to configure it based on the device number in the Modbus data concentrator. For example, for E+H ProServo Modbus field device, this value could be 0 and for Smartline Level Transmitter connected as second HART device to a HCS Modbus-HART converter, this value could be 264.
Device Parameter Name	This indicates the name of the parameter in the Modbus field device which needs to be scanned by CIU. This parameter would be used by CIU to interpret data in case of custom value mapping.
Modbus Register Address	This indicates the relative Modbus address of the selected parameter. Absolute Modbus address of Parameter = Device Modbus Start Address + Modbus Register Address
Scan Priority	This indicates the scanning priority for a device parameter. This can be configured as Foreground / Background. While scanning the field device, if multiple field device parameters are retrieved in one Modbus request, then highest priority within the scanned field device parameters is set for that request. For example, if Product Level (Foreground priority), Product Temperature (Background priority), Product Density (Background priority) are retrieved from the field device with a single Modbus request, then the Modbus request would be scheduled to the field with Foreground priority.

Properties	Description
Device Engineering Unit	This indicates the unit in which data is exposed by the Modbus field device. For example, E+H ProServo Modbus field device can expose "Liquid Level" parameter in 5 different units (mm, cm, m, ft, inch) and the user has to select the appropriate device unit based on the Modbus field device configuration.

3.2.10.4 TRL/2 Data Input

The CIU 888 collects measurement data like Product level, Product temperature etc., from the TRL2 gauges and exposes the data in its Modbus output (Modbus RTU and Modbus TCP/IP) based on the configuration. Using this mechanism any Modbus host system can get the data from CIU 888 and visualize it in its user interface.

The CIU 888 also collects temperature profiles data from the TRL2 gauges and exposes the data in its Modbus output (Modbus RTU and Modbus TCP/IP) based on the configuration. The CIU 888 collects data for a maximum of 14 temperature elements. Using this mechanism any Modbus host system can get the temperature profiles data from CIU 888 and visualize the data in its user interface.

The following steps detail out the configuration procedure.

1. On the **CIU 888** node, right-click and choose **Import TRL/2 device type file**.

NOTE: *TRL2 device configuration file for Honeywell Radar TRL2 gauge, Rex RTG gauge, SDAU2100, Honeywell VITO are available by default in the CIU 888 Service tool. For new field device, import its TRL2 device configuration file to the CIU 888 Service tool.*
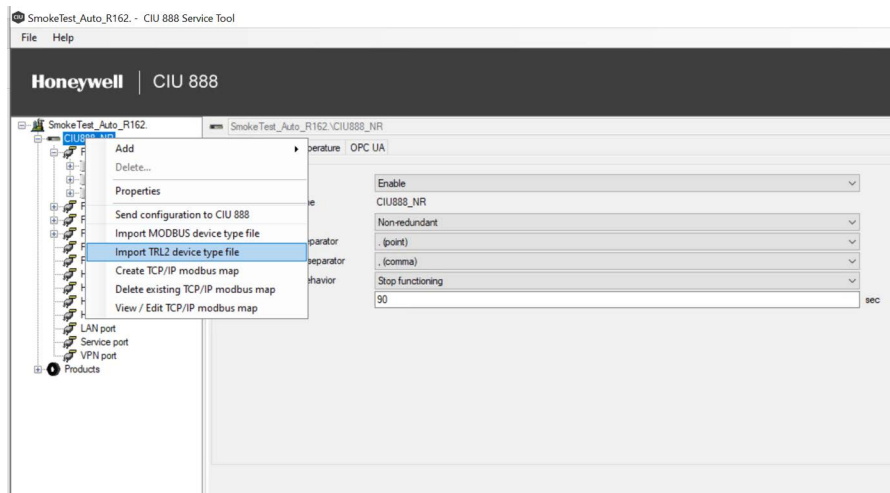
2. **Device Type- CIU 888 Service Tool** window appears.
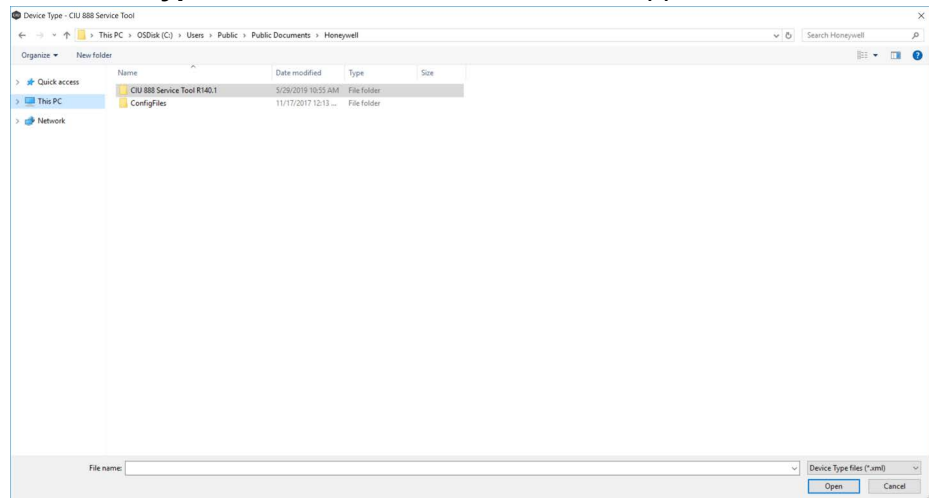
3. Select the XML of the TRL/2 device and click **Open.**

   The details of the specified XML file are loaded.

   Refer to Appendix H for the creation of a new TRL/2 field device configuration file.

4. On the **Tank** node, right-click and choose **Add > TRL/2 Data Input.**
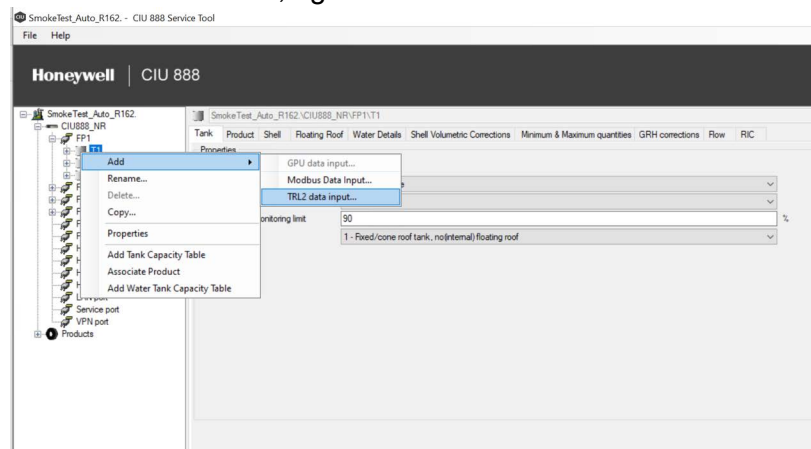
5. The **Add Site Element** window appears.
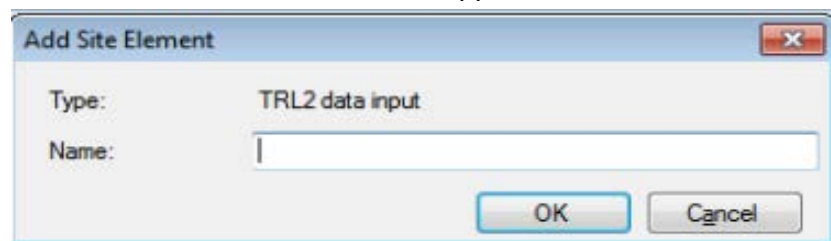
6. In the **Name** box, type the name of the TRL/2 Data Input and click **OK.**

7. The **G1** node is created and displayed under Tank **T1**.

You can view or edit these properties.

Properties	Description
DensityCalculationType	This parameter indicates the HIMS density calculation type.
P1SensorPosition	The position of the center of the Liquid Pressure sensor membrane. This is expressed in m.
P3SensorPosition	The position of the center of the Vapor Pressure sensor membrane. This is expressed in m.
HybridMinLevel	This value specifies the lowest product level at which the Observed Density would be calculated.
CIU Parameter	This indicates the CIU parameter name to which the scanned TRL/2 field device parameter has to be mapped. CIU Service tool displays all the CIU Parameters which can be scanned from TRL/2 field devices in a drop down menu.
Device Type	This is the TRL/2 field device type. For example, Emersion Rex, Honeywell TRL/2 Gauge. CIU Service tool displays all the supported device types in a drop down menu.
Device Slave ID	Each TRL/2 device is addressed with a unique slave ID. That is, when a request is received by a Modbus device, it checks the TRL/2 slave ID in the request and if it matches with its configured slave ID, it responds back, else it skips the request. This indicates the TRL/2 RTU address of the field device.

Properties	Description
Device GPU Address	This indicates the GPU address of the Honeywell TRL2 field device.
Device Flexconn Address	This indicates the Flexconn address of the Honeywell TRL2 field device.
Device Modbus Start Address	This parameter indicates the address from where the TRL/2 mapping starts for a device. In case of TRL/2 field devices that are directly connected to CIU this could be 0 and in case of TRL/2 data concentrator, the user has to configure it based on the device number in the TRL/2 data concentrator. For example, TRL/2 data concentrators.
Device Parameter Name	This indicates the name of the parameter in the TRL/2 field device which needs to be scanned by CIU. This parameter would be used by CIU to interpret data in case of custom value mapping.
Modbus Register Address	This indicates the relative TRL/2 address of the selected parameter. Absolute TRL/2 address of Parameter = Device TRL/2 Start Address + TRL/2 Register Address
Scan Priority	This indicates the scanning priority for a device parameter. This can be configured as Foreground / Background. While scanning the field device, if multiple field device parameters are retrieved in one TRL/2 request, then highest priority within the scanned field device parameters is set for that request. For example, if Product Level (Foreground priority), Product Temperature (Background priority), Product Density (Background priority) are retrieved from the field device with a single TRL/2 request, then the TRL/2 request would be scheduled to the field with Foreground priority.
Device Engineering Unit	This indicates the unit in which data is exposed by the TRL/2 field device. For example, E+H ProServo TRL/2 field device can expose "Liquid Level" parameter in different units (example: mm, cm, m, ft, inch) and the user has to select the appropriate device unit based on the TRL/2 field device configuration.
Temperature profile scan enable	This parameter enables / disables the temperature profiles data collection from a BPM gauge by CIU. When this option is selected, CIU collects temperature profiles data from the BPM gauge that is configured for product temperature. **Note**: CIU would collect the temperature profile data from the gauge from which product temperature is scanned. **Note**: If the temperature profile is enabled, then the Scan Period, SlaveID, Modbus Address and Device Type must be configured for temperature profiles to be collected from the gauge.
Temperature profile scan period	This parameter defines the time period within which the temperature profile data needs to be collected from a BPM gauge. The scan period is defined in terms of minutes.

3.2.11 Configuring a Host port

1. On the CIU 888 node, click **Host port 1.**
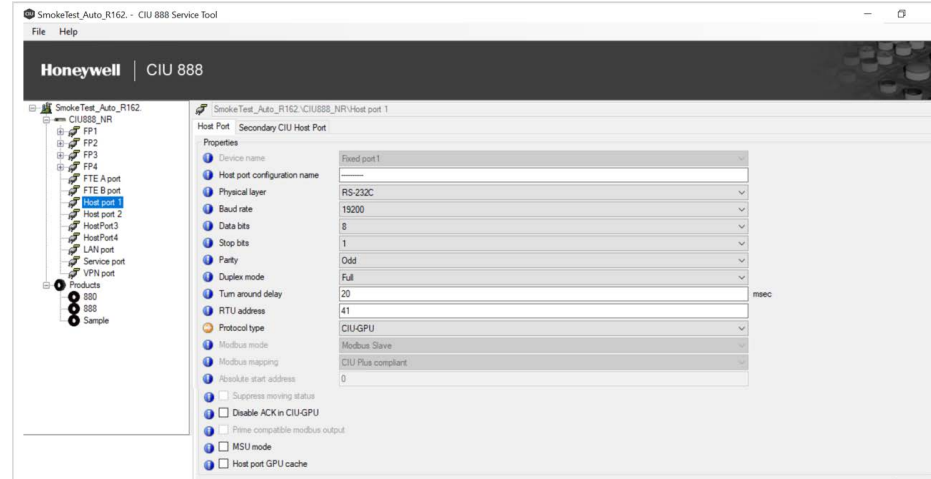
2. By default, the **Host port** tab appears.

   You can view or edit these properties:

Properties	Description
Device Name	Two serial host ports are available by default and device name is fixed for them. For new Host ports created, the user has to select appropriate option slot.
Host Port Configuration name	It is a user friendly configuration name.
Physical Layer	Select RS-232C or RS-485 (default = RS-232C). Note: If 'RS-232C' is selected, while in reality RS-485 hardware is applied, communication cannot be established.
Baud rate	Select 1200, 2400, 4800, 9600, 19200 or 38400 (default = 19200).
Data bits	Select 7 or 8 (default = 8).
Stop bits	Select 1 or 2 (default = 1).
Parity	Select Odd, Even, or None (default = Odd).
Duplex mode	Select Full or Half (default = Full).
Turn around delay	Enter reply waiting time in ms (default = 20 ms).
RTU address	Enter the RTU address in the range 1 through 247 (default= 41). Note: Each RTU address must be unique in the site.
Protocol Type	Select None, Modbus RTU, or CIU-GPU (default = None). Modbus RTU shall be selected if data needs to be presented to Modbus Hosts like Entis Pro, PLC etc and service tool like Tankmaster Winsetup connects to CIU 888. CIU-GPU shall be selected if data needs to be presented to GPU clients like Entis XL, profiling tools like Entemp etc., In this case, the host port would be configured for CIU Emulation.

Properties	Description
Modbus Mode	When host port is configured for Modbus RTU protocol, Modbus Mode property indicates the operation mode for the host port. Note: *Refer to the Protocol Manual - CIU Emulation CIU 888 (Part No. 4417589) section 3.1.2, for more information.*
Modbus Mapping	Select Entis Pro compliant, User specified, or CIU Plus compliant. Entis Pro compliant shall be selected if Entis Pro is connected to this port. All data will be filled in predefined positions. CIU Plus compliant shall be selected if CIU Plus is connected to this port. All data will be filled in predefined positions. *Note: Refer to Protocol Manual - Modbus Host (Part No. 4417588) section 2.4, Input registers and Holding registers, for more information.* User specified shall be selected if a Modbus host like DCS, PLC is connected to this port. Refer to section 3.2.12 'Modbus settings' for details how to configure the Modbus map.
Absolute start address	Enter start address for the User data area of CIU 888 Modbus map (default = 0). For Example: Change the start address to 10000 if 80 tanks need to be supported with Entis pro compliant modbus map.
Suppress moving status	This configuration indicates whether moving status is suppressed (or) not in the CIU 888's Modbus Tank record.
MSU mode	Check to enable the option. MSU mode is mainly for CIU emulation and is applicable only when the protocol type is CIU-GPU. Note: *Refer to the Protocol Manual - CIU Emulation CIU 888 (Part No. 4417589) for more information.*
Host port GPU cache	Check to enable the option. When GPU cache mode is enabled, the CIU 888 gets the data from cache (if available) and responds to GPU host request.
Disable ACK in CIU-GPU	When this option is selected, the CIU does not send ACK characters to the GPU host system.
Prime compatible Modbus output	Select to get the modus output in same way as CIU 880 Prime host port. Default: Not Selected.
Suppress moving status	To ignore moving status and present in Modbus output Default: Not Selected
Disable ACK in CIU-GPU	This configuration indicates whether Moving status is suppressed (or) not in the CIU 888's Modbus Tank record. 0 = Moving status not suppressed 1 = Moving status suppressed

Properties	Description
Prime Compatible modbus output	Prime compatible modbus output 0 = Prime compatible modbus output disabled 1 = Prime compatible modbus output enabled
MSU mode	CIU 888 HostPort MSU mode 0 = MSU mode off 1 = MSU mode on
Host port GPU cache	CIU 888 HostPort Cache mode 0 = GPU Cache disabled 1 = GPU Cache enabled

3. Click the **Secondary CIU Host** tab, the **Properties** detail appears.
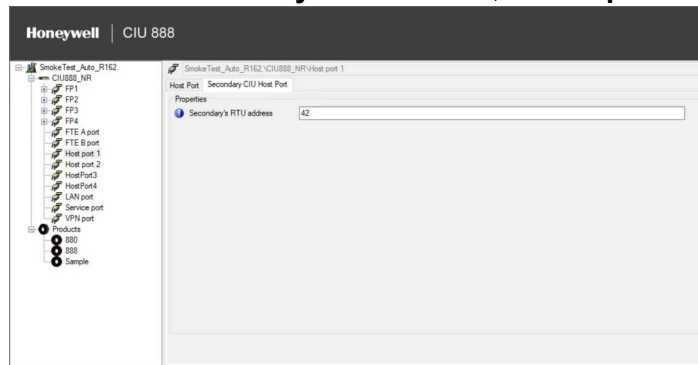
You can view or edit these properties.

Properties	Description
Secondary RTU address	Enter the RTU address in the range 1 through 247 (default= 43). This is the secondary CIU's Host port RTU address. <u>Note:</u> Each RTU address must be unique in the site.

3.2.12 Configuring User defined Modbus map

The CIU 888 provides data in the Modbus area of the host ports for consumption by external hosts. The Modbus mapping of ports not in

use by the Entis Pro system can be modified to become compliant with third party Modbus hosts as described below.
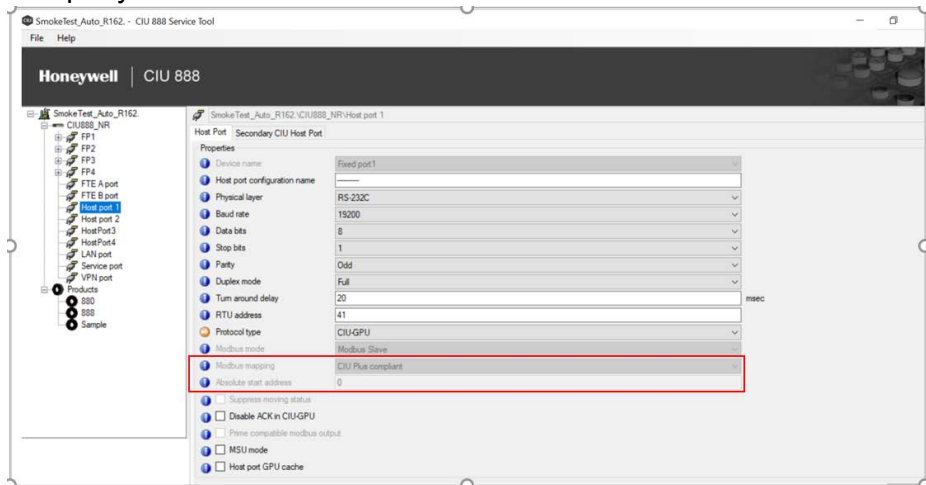
1. Click **Host port 1** and change **Modbus mapping** as **User specified.**

2. Configure the absolute start address to the start of user defined modbus area.

3. Click **Apply.**

   A pop up window appears, Click **OK**.
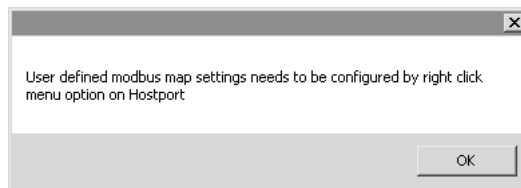
4. On the **Host port 1** node, right-click and choose **User defined modbus map.**
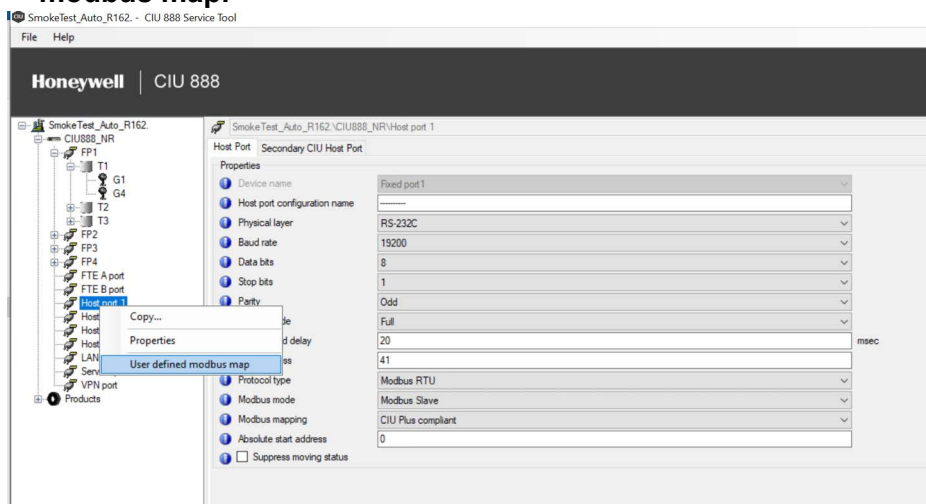
   User defined modbus map window appears.

3.2.12.1 User defined modbus map - Tanks

The configuration settings in this tab will define the layout of modbus data and sequence of the tanks in the modbus map.
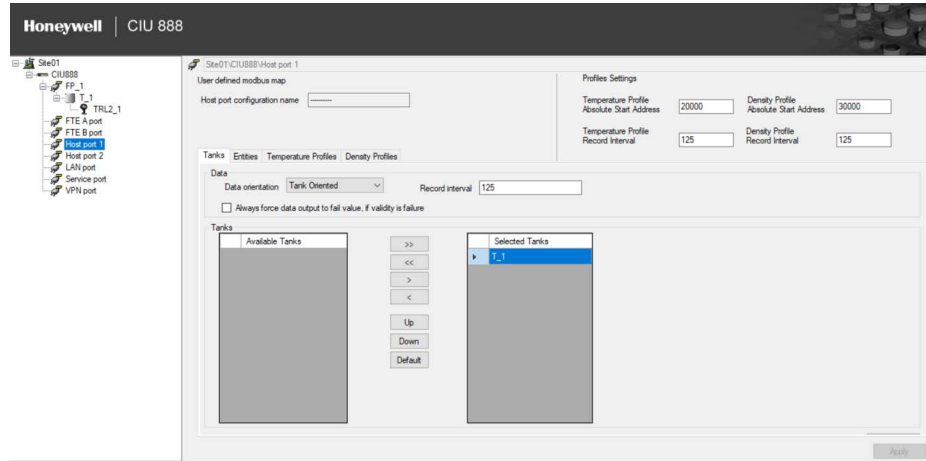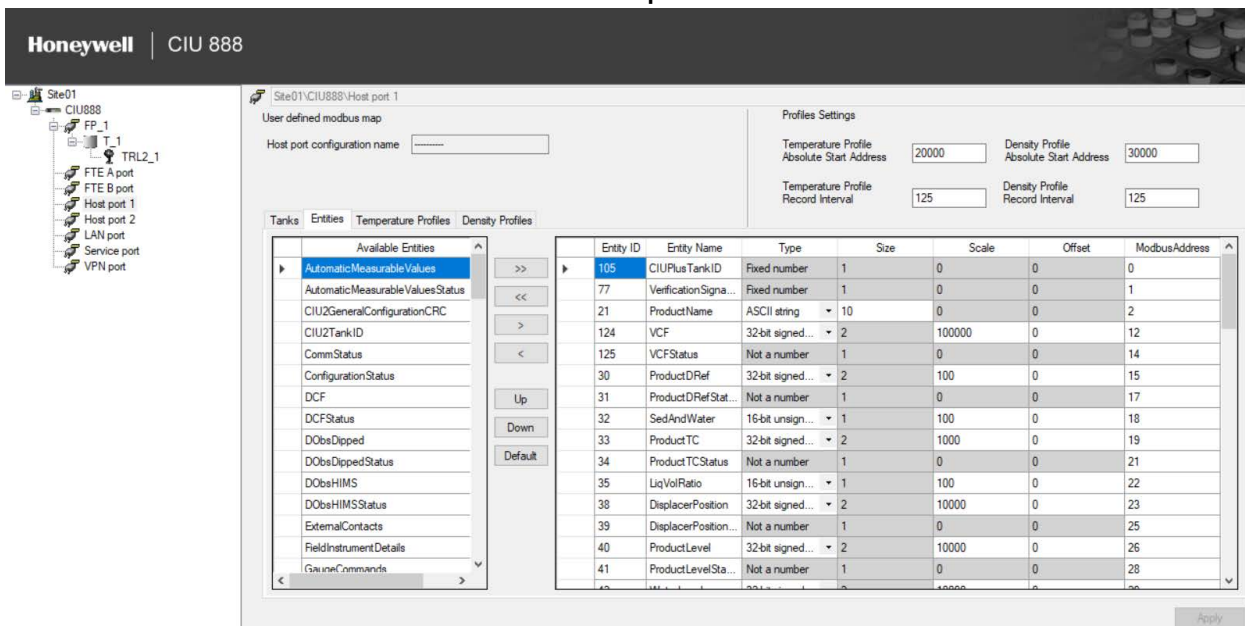
You can view or edit these properties.

Properties	Description
Data Orientation	Select Tank oriented (= data grouped by tank) or Data oriented (= data grouped by entity).
Record interval	Enter the number of registers allocated for each tank record (default = 125).
Always force data output to fail value if validity is failure	Select to force the Modbus registers to invalid data, if the status/validity of the parameter indicates failure. If not selected, the last known value will be retained in the Modbus registers.
Available Tanks	This displays all tanks that are not associated in the modbus map.
>>	Click this button to move all the tanks from 'Available Tanks' to 'Selected Tanks'.
<<	Click this button to move all the tanks from 'Selected Tanks' to the 'Available Tanks'.
>	Click this button to move the selected tank from 'Available Tanks' to 'Selected Tanks'.
<	Click this button to move the selected tank from 'Selected Tanks' to 'Available Tanks'.
Up	Click this button to move the selected tank in the 'Selected Tanks' one position up.

Properties	Description
Down	Click this button to move the selected tank in the 'Selected Tanks' one position down.
Default	Click this button to move all the tanks to 'Selected Tanks' in the creation order.
Selected Tanks	This displays tanks that are associated in the modbus map.

3.2.12.2 User defined modbus map - Entities

NOTE: The selected list of entities is shown on the right part of the entities tab, this is referred as 'Selected entities' in the below description.

You can view or edit these properties.

Properties	Description
Available Entities	This displays all entities which are not associated with modbus map. This includes the list of entities provided by CIU 880 Prime and CIU 880 Plus user defined host port Modbus mapping and also new entities added in CIU 888.
>>	Click this button to move all entities in the 'Available entities' to the 'Selected entities'
<<	Click this button to move all entities in the 'Selected entities' to the 'Available Entities'.
>	Click this button to move the selected entity in the 'Available entities' to the 'Selected entities'.

Properties	Description
<	Click this button to move the selected entity in the 'Selected entities' to the 'Available Entities'.
Up	Click this button to move the selected entity in the 'Selected entities' one position up.
. Down	Click this button to move the selected entity in the 'Selected entities' one position down.
Default	Click this button to select 'Entis Pro' compliant entities in 'Selected entities'.
Definitions	
Entity ID	Entity ID number
Entity Name	Name of the Entity
Type	Modbus data type of the entity.
Size	Number of Modbus registers
Scale	Scaling factor
Offset	Offset value

3.2.12.3 User defined modbus map - Profiles

This section helps the user to configure the Temperature Profiles Modbus area in CIU 888.

The configurable Temperature Profile fields and a brief description on each of them are given in the following table.

Fields	Description
Temperature Profile Absolute Start address	This indicates the absolute start address of the temperature profiles record. Values are in decimal. Default value is 20000. Configurable when modbus mapping is User Specified.
Temperature Profile Record Interval	This indicates the record interval of the temperature profiles record. Values are in decimal. Default value is 125. Configurable when modbus mapping is User Specified.

NOTE: *The selected list of entities is shown on the right part of the entities tab, this is referred as 'Selected entities' in the below description.*

You can view or edit these properties.

Properties	Description
Available Entities	This displays all entities which are not associated with modbus map.
	NOTE:This includes the list of entities provided by CIU 880 Prime and CIU 880 Plus user defined host port Modbus mapping and also new entities added in CIU 888.
>>	Click this button to move all entities in the 'Available entities' to the 'Selected entities'
<<	Click this button to move all entities in the 'Selected entities' to the 'Available Entities'.
>	Click this button to move the selected entity in the 'Available entities' to the 'Selected entities'.
<	Click this button to move the selected entity in the 'Selected entities' to the 'Available Entities'.
Up	Click this button to move the selected entity in the 'Selected entities' one position up.
. Down	Click this button to move the selected entity in the 'Selected entities' one position down.
Default	Click this button to select 'Entis Pro' compliant entities in 'Selected entities'.
Definitions	
Entity ID	Entity ID number
Entity Name	Name of the Entity

Properties	Description
Type	Modbus data type of the entity.
Size	Number of Modbus registers
Scale	Scaling factor
Offset	Offset value

3.2.12.4 User defined modbus map - Density Profiles

This section helps the user to configure the Density Profiles Modbus area in CIU 888.

The configurable Density Profile fields and a brief description on each of them are given in the following table.

Fields	Description
Density Profile Absolute Start address	This indicates the absolute start address of the density profiles record. Values are in decimal. Default value is 30000 Configurable when modbus mapping is User Specified.
Density Profile Record Interval	This indicates the record interval of the density profiles record. Values are in decimal. Default value is 320 Configurable when modbus mapping is User Specified.

NOTE: *The selected list of entities is shown on the right part of the entities tab, this is referred as 'Selected entities' in the below description.*

You can view or edit these properties.

Properties	Description
Available Entities	This displays all entities which are not associated with modbus map. *NOTE:This includes the list of entities provided by CIU 880 Prime and CIU 880 Plus user defined host port Modbus mapping and also new entities added in CIU 888.*
>>	Click this button to move all entities in the 'Available entities' to the 'Selected entities'
<<	Click this button to move all entities in the 'Selected entities' to the 'Available Entities'.
>	Click this button to move the selected entity in the 'Available entities' to the 'Selected entities'.
<	Click this button to move the selected entity in the 'Selected entities' to the 'Available Entities'.
Up	Click this button to move the selected entity in the 'Selected entities' one position up.
. Down	Click this button to move the selected entity in the 'Selected entities' one position down.
Default	Click this button to select 'Entis Pro' compliant entities in 'Selected entities'.
Definitions	
Entity ID	Entity ID number
Entity Name	Name of the Entity
Type	Modbus data type of the entity.
Size	Number of Modbus registers
Scale	Scaling factor
Offset	Offset value

3.2.13 Configuring Ethernet Host port

3.2.13.1 Configuring FTEA and FTEB ports

1. On the CIU 888 node, click **FTEA port**.

2. By default, **FTE** tab appears displaying various properties.

You can view or edit these properties.

Parameters	Configuration options
Device name	This indicates the device name of the Ethernet port.
IP Address	IP address of the corresponding Ethernet port in the CIU. *Format:* a.b.c.d *Example:* 10.70.100.101
Subnet Mask	Subnet mask of the corresponding Ethernet port in the CIU. In case of redundant CIUs, this also indicates the Subnet mask of the corresponding Ethernet port in the partner CIU. *Format:* e.f.g.h *Example:* 255.255.255.0
Default Gateway	Default Gateway of the corresponding Ethernet port in the CIU. In case of redundant CIUs, this also indicates the default gateway of the corresponding Ethernet port in the partner CIU. *Format:* i.j.k.l *Example:* 10.79.100.1 *Note:* If no gateway is required, then this setting can be left blank.

Parameters	Configuration options
Transparency mode	**Transparency mode:** When the check box is selected, it is said to be in Transparency mode.This indicates transparency behavior of the Ethernet port. This setting is applicable only to the redundant CIUs. In this mode, CIU binds the IP address to Ethernet port based on the current redundancy role. • Primary CIU binds to its IP address during active or passive state when all the Ethernet links (marked for IP Switch over decision maker) of the Secondary CIU is down. • Primary CIU binds to Secondary CIU's IP address during passive state when atleast one of the Ethernet links (marked for IP Switch over decision maker) of the Secondary CIU is up. • Secondary CIU binds to its IP address during passive state when atleast one of the Ethernet links (marked for IP Switch over decision maker) of the Primary CIU is up. • Secondary CIU binds to Primary CIU's IP address during active or passive state when all the Ethernet links (marked for IP Switch over decision maker) of the Primary CIU is down.
IP switch over decision maker	This option is applicable only for redundant CIUs and is required for the host initiated switchovers to work properly since CIU doesn't support autonomous switchovers This indicates whether Active CIU's Ethernet port status is monitored by the Passive CIU to make IP switchover decision. If all the ports selected for "IP Switchover Decision Maker" in Active CIU goes down (that means the Modbus TCP/IP Host system cannot communicate to active CIU), then Passive CIU's Ethernet port's bind to Primary CIU's Ethernet port address. In case of Multiple host systems connected to CIU, we need to select this option for the Ethernet ports where the client host system (that can read, write data to CIU and issue switchover command) is connected. For example a site has ExperionPKS connected to FTEA and FTEB ports and a third party Modbus TCP/IP host system connected to LAN port and ExperionPKS is the client host system (Issues switchover command to CIU). In this case, FTEA and FTEB ports need to selected for "IP Switchover Decision Maker" and LAN port is deselected for "IP Switchover Decision Maker". In this case, if both FTEA and FTEB links of Active CIU goes down, then Passive CIU's FTEA and FTEB ports bind to the Primary CIU's IP address so that Host System (ExperionPKS) can issue an ACTIVE CIU command and make the CIU as Active and continue its operations.

Parameters	Configuration options
Modbus Server Enable	This indicates enable / disable of the Modbus TCP Server on the Ethernet port. That is, based on the need the user shall enable / disable Modbus TCP/IP server on a particular Ethernet port.
Modbus Port Number	This indicates the software port number in which Modbus server would be enabled. The default port number is 502.
Secure Modbus server enable	This would enable / disable the secure Modbus TCP Server on the ethernet port. 0 - Modbus TCP/IP server disabled 1 - Modbus TCP/IP server enabled
Modbus Server Protocol Type	This indicates the Modbus server protocol type. Supported protocols are Modbus TCP/IP
Modbus Server Idle time-out	This indicates the idle time period (no Modbus message exchanges) in seconds after which a client connection would be closed by the Modbus TCP/IP server. Value is from 10 to 65535. Default is 60.
IP filtering	This enables / disables IP address filtering by the Modbus TCP/IP server. If enabled, Modbus TCP/IP server only accepts connections from the IP addresses / range configured in "IP addresses / Range" option.
Allowed IP Addresses / Range	This indicates the IP address list (IP addresses / range) from which connection is accepted by the Modbus TCP server. Client connections from any other IP addresses apart from that configured here would be rejected by the Modbus TCP/IP server. The user shall be able to configure multiple IP addresses / ranges. IP addresses Format: IP addresses separated by comma. *Example:* 10.70.50.3,10.70.50.5,10.70.50.10 IP address ranges Format: IP address range is specified with "-" and multiple IP address ranges are separated by comma. *Example:* 10.70.50.3-10.70.50.7,10.70.50.100-10.70.50.105
Unit Id Filtering	This enables / disables Unit Id (Unit identifier) filtering by the Modbus TCP/IP server. If enabled, Modbus TCP/IP server only responds to Modbus requests with Unit Id (Unit Identifier) from the Unit Id list configured in "Unit Ids" option.

Parameters	Configuration options
Allowed Unit IDs	This indicates the Unit Id (Unit Identifier) list for which Modbus TCP/IP server should respond. Modbus requests with any other Unit Id apart from that configured here would be ignored and not responded by the Modbus TCP/IP server. *Example:* 1,2,3,4,5 Multiple Unit IDs are separated by commas.
Field Scan enable	This would enable / disable the Modbus TCP Server on the ethernet port. 0 - Modbus TCP/IP server disabled 1 - Modbus TCP/IP server enabled
Field Scan IP address	The IP address of a CIU 888 TCP/IP host port
Field Scan port number	The IP port number for the modbus host port (which is 502 by default).
Turn around delay	Ensite Pro com port turn around delay. 0-65535 msec This entity, stored in the global area of a site database, is for internal use only. Ensite Pro will not download this entity to any CIU.
Time-out	CIU Prime FieldPort time-out. 0-65535 msec CIU 888 EGDS Device Message parameter. With the message timeout the time to receive data from the device that will be called can be set. This timeout can be set in milliseconds. If the site server (EGDS) sends a
Retries	This entity was originally defined for the number of retries on the FieldPort. However the software of the CIU has implemented differently. Imagine a tank, with number of retries set to five, does not answer. This tank will decrease the scan performance
Communication fail delay	When a field communication fail occurs it is possible to maintain last valid scan data in the CIU 888 database during a configurable amount of time. Minimum time to mask a field communication fail: 0 sec (delay mechanism disabled). Maximum time to mask a
Data fail delay	When a field data fail occurs it is possible to maintain last valid scan data in the CIU 888 database during a configurable amount of time. Minimum time to mask a field data fail: 0 sec (delay mechanism disabled). Maximum time to mask a field data fail:
OPC UA server enable	This setting would enable / disable the OPC UA Server on the CIU 888's ethernet port (FTEA / FTEB). 0 - OPC UA server is disabled 1 - OPC UA server is enabled

Parameters	Configuration options
Server URL	This setting depicts the server URL. The OPC UA clients to CIU 888 using this URL. The URL shall be in the below format. opc.tcp://192.168.20.10:51000 Default value: Empty string

3. Click the **Secondary FTE Host Port** tab to view the Property.
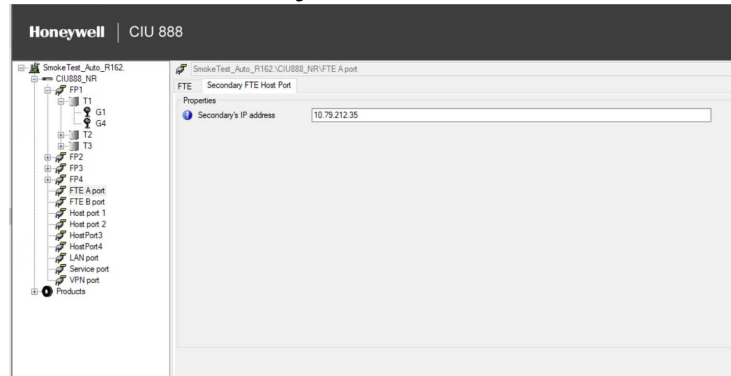
You can view or edit this property.

Parameter	Configuration option
Secondary IP Address	In case of redundant CIUs, this indicates the IP address of the corresponding Ethernet port in the partner CIU. *Format:* w.x.y.z *Example:* 10.70.100.102

NOTES: 1. *If configuring for Experion network, both FTE A and FTEB should be in same subnet.*

2. *If configuring in non-redundancy mode, then Transparency and IP switchover decision maker should be disabled.*

3.2.13.2 Configuring LAN port

1. On the CIU 888 node, click **LAN port**.

2. By default, **LAN** tab appears displaying various Properties.
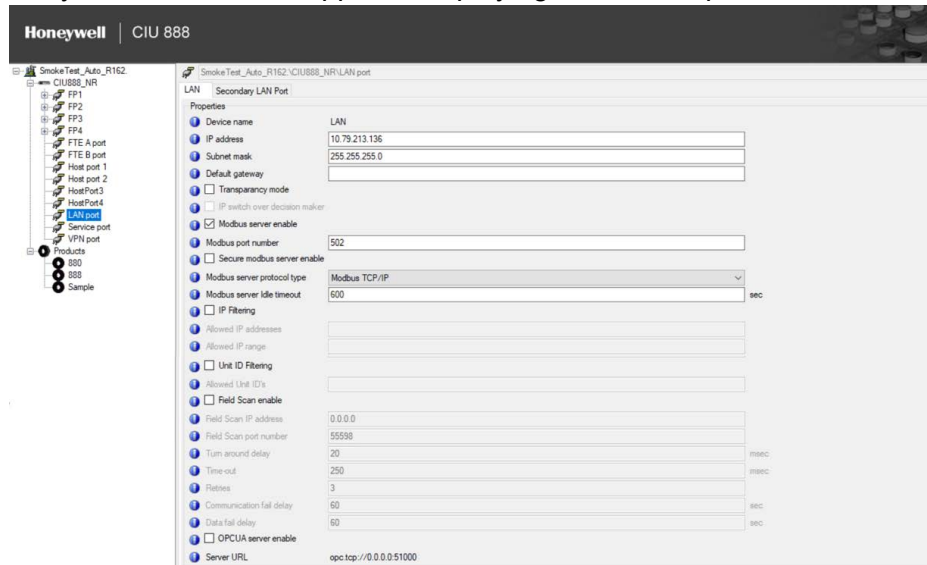
You can view or edit these properties.

Parameters	Configuration options
Device name	Actual device name of the service port (generated by the driver component of the CIU 888 firmware)
IP Address	The IP address of a CIU 888 TCP/IP host port
Subnet Mask	The subnet mask of a CIU 888 TCP/IP host port
Default Gateway	The default gateway of a CIU 888 TCP/IP host port
Transparency mode	This entity indicate transparency behaviour of the CIU 888 host port. 0 => No transparency mode. RTU address is fixed. 1 => Transparency mode. RTU address is dynamic based on the redundancy role.
IP switch over decision maker	This entity indicates whether the ethernet interface is involved in IP address switchover decision (or) not. That is, these ports would be monitored by the passive CIU and IP address binding to Primary CIU's IP addresses would happen in case of failure of
Modbus Server Enable	This would enable / disable the Modbus TCP Server on the ethernet port. 0 - Modbus TCP/IP server disabled 1 - Modbus TCP/IP server enabled
Modbus Port Number	The IP port number for the modbus host port (which is 502 by default).
Secure Modbus server enable	This would enable / disable the secure Modbus TCP Server on the ethernet port. 0 - Modbus TCP/IP server disabled 1 - Modbus TCP/IP server enabled
Modbus Server Protocol Type	This indicates the Modbus server protocol type. Supported types: 1 - Modbus TCP/IP

Parameters	Configuration options
Modbus Server Idle time-out	This indicates the idle time period in seconds after which a client connection would be closed by the Modbus TCP server.
IP filtering	This would enable/disable IP filtering. If enabled, CIU 888 would accept the connections from only configured IP addresses / IP address range 0 - IP address filter is disabled 1 - IP address filter is enabled
Allowed IP Addresses	This indicates the IP addresses from which connection is accepted by the CIU 888's Modbus TCP server. The IP addresses are given with a comma separation. For example, 192.168.1.11,192.168.1.12
Allowed IP Range	This indicates the IP address ranges from which connection is accepted by the CIU 888's Modbus TCP server. The IP address ranges are given with a comma separation. For example, 192.168.1.10-192.168.1.15,192.168.1.25-192.168.1.35
Unit Id Filtering	This indicates if Modbus Unit ID filtering is to be enabled/disabled in CIU 888. 0 - Modbus Unit ID filter is disabled 1 - Modbus Unit ID filter is enabled
Allowed Unit IDs	This indicates the Modbus unit Ids for which CIU 888's Modbus server would respond with data.
Field Scan enable	This would enable / disable the Modbus TCP Server on the ethernet port. 0 - Modbus TCP/IP server disabled 1 - Modbus TCP/IP server enabled
Field Scan IP address	The IP address of a CIU 888 TCP/IP host port
Field Scan port number	The IP port number for the modbus host port (which is 502 by default).
Turn around delay	Ensite Pro com port turn around delay. 0-65535 msec This entity, stored in the global area of a site database, is for internal use only. Ensite Pro will not download this entity to any CIU.
Time-out	CIU 888 HostPort time-out. 0-65535 msec
Retries	This entity was originally defined for the number of retries on the FieldPort. However the software of the CIU has implemented differently. Imagine a tank, with number of retries set to five, does not answer. This tank will decrease the scan performance

Parameters	Configuration options
Communication fail delay	When a field communication fail occurs it is possible to maintain last valid scan data in the CIU 888 database during a configurable amount of time. Minimum time to mask a field communication fail: 0 sec (delay mechanism disabled). Maximum time to mask a
Data fail delay	When a field data fail occurs it is possible to maintain last valid scan data in the CIU 888 database during a configurable amount of time. Minimum time to mask a field data fail: 0 sec (delay mechanism disabled). Maximum time to mask a field data fail:
OPC UA server enable	This setting would enable / disable the OPC UA Server on the CIU 888's ethernet port (LAN). 0 - OPC UA server is disabled 1 - OPC UA server is enabled
Server URL	This setting depicts the server URL. The OPC UA clients to CIU 888 using this URL. The URL shall be in the below format. opc.tcp://192.168.20.10:51000 Default value: Empty string

Refer to the parameters and configuration options in *LAN* tab under *LAN A* port given in section 3.2.10.1 for more information.

3. Click the **Secondary LAN Port** tab to view the Property.

You can view or edit this property.

Parameter	Configuration option
Secondary IP Address	In case of redundant CIUs, this indicates the IP address of the corresponding Ethernet port in the partner CIU. *Format:* w.x.y.z *Example:* 10.70.100.102

Refer to the parameters and configuration option in *Secondary LAN Port* tab under *LAN A* port given in section 3.2.10.1 for more information.

NOTES: 1. *In Experion PKS integration via FTE network, FTE A and FTE B should be in same subnet and LAN should be in different subnet.*

2. *In other host system integration, FTE A, FTE B and LAN should be in different subnets.*

3.2.13.3 Configuring VPN Port

1. On the CIU 888 node, click **VPN port**.

2. By default, VPN tab appears displaying various properties.
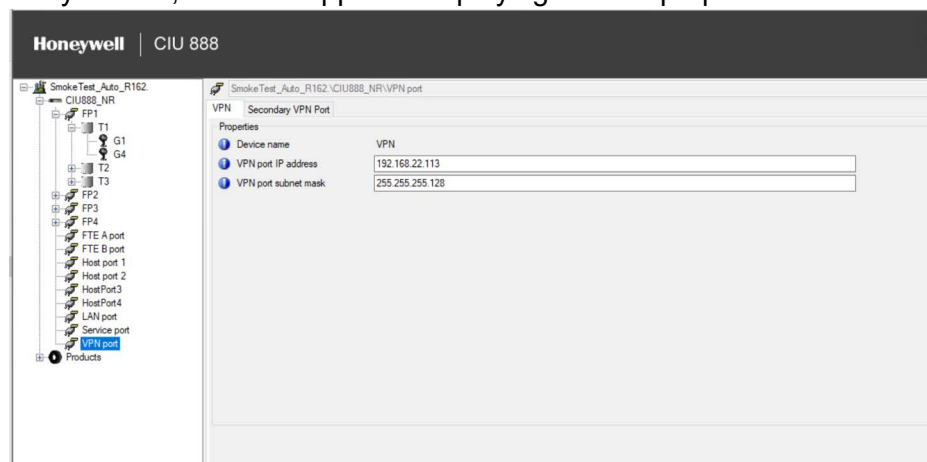
You can view or edit these properties.

Parameters	Configuration options
Device name	This indicates the device name of the VPN port.
VPN port IP Address	IP address of the corresponding VPN port in the CIU. *Format: 192.168.x.x, 10.x.x.x, 172.16.x.x to 172.31.x.x* Default Value: 192.168.5.1 **Note**: Following IP series are invalid 192.168.1.x, 192.168.10.x
VPN Subnet Mask	Subnet mask of the corresponding VPN port in the CIU. In case of redundant CIUs, this also indicates the Subnet mask of the corresponding VPN port in the partner CIU. *Format: e.f.g.h* *Default Value: 255.255.255.0*

3. Click the **Secondary VPN Port** tab to view the Property.

You can view or edit this property.

Parameter	Configuration option
VPN port counterpart IP Address	In case of redundant CIUs, this indicates the IP address of the corresponding Ethernet port in the partner CIU. CIU Service tool shall have a provision to get the same from user. *Format: 192.168.x.x, 10.x.x.x, 172.16.x.x to 172.31.x.x* *Default Value: 192.168.5.1* **Note**: Following IP series are invalid 192.168.1.x, 192.168.10.x

3.2.14 Configuring Modbus map for TCP/IP ports

CIU 888 node provides the option to create, edit and delete TCP/IP modbus maps.
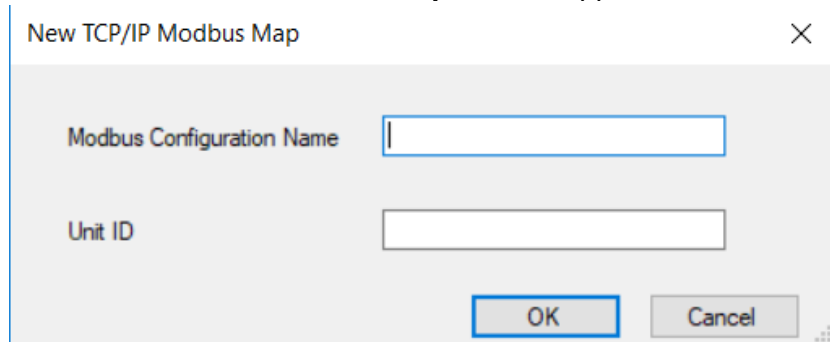
3.2.14.1 Create TCP/IP Modbus Map

1. On the CIU 888 node, right-click and select **Create TCP/IP modbus map** from the menu.
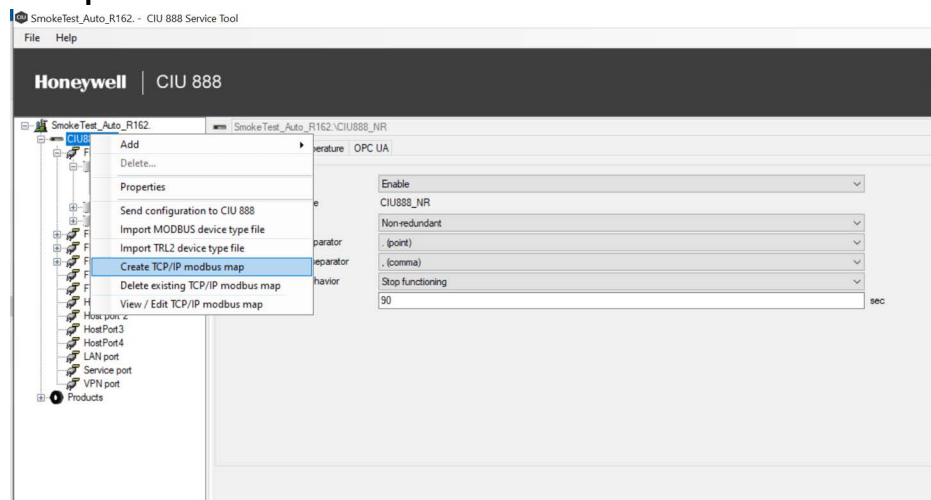
2. The **New TCP/IP Modbus Map** window appears.
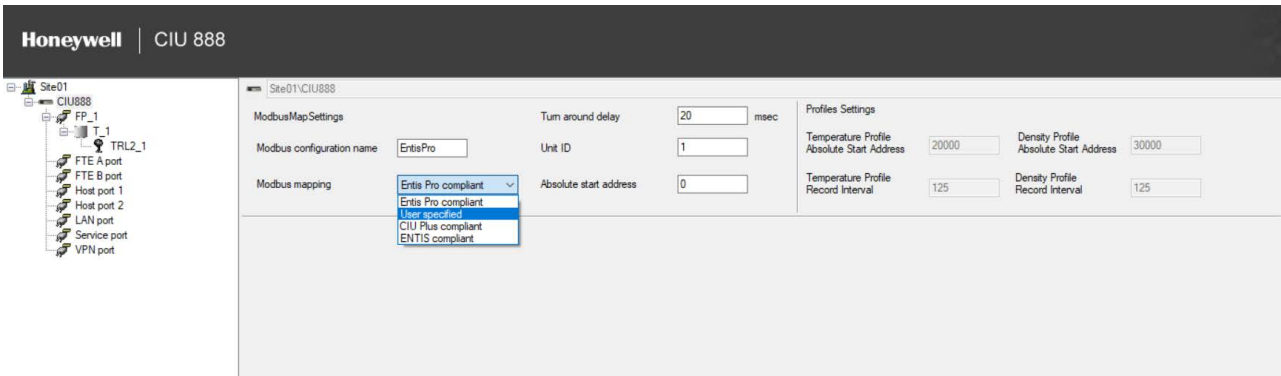
3. The two fields seen in the window and a brief description of each of them are as follows:

    –   **Modbus Configuration Name** - This indicates the Modbus configuration name. This shall be used to identify a Modbus map configuration for a Modbus TCP/IP client.

    –   **Unit ID** - This indicates the Unit Id (Unit Identifier) list for which Modbus TCP/IP server should respond. Modbus requests with any other Unit Id apart from that configured here would be ignored and not responded by the Modbus TCP/IP server. It is value from 1 - 254.

4. Enter appropriate details in each of the fields and click **OK**

    The **ModbusMapSettings** window appears
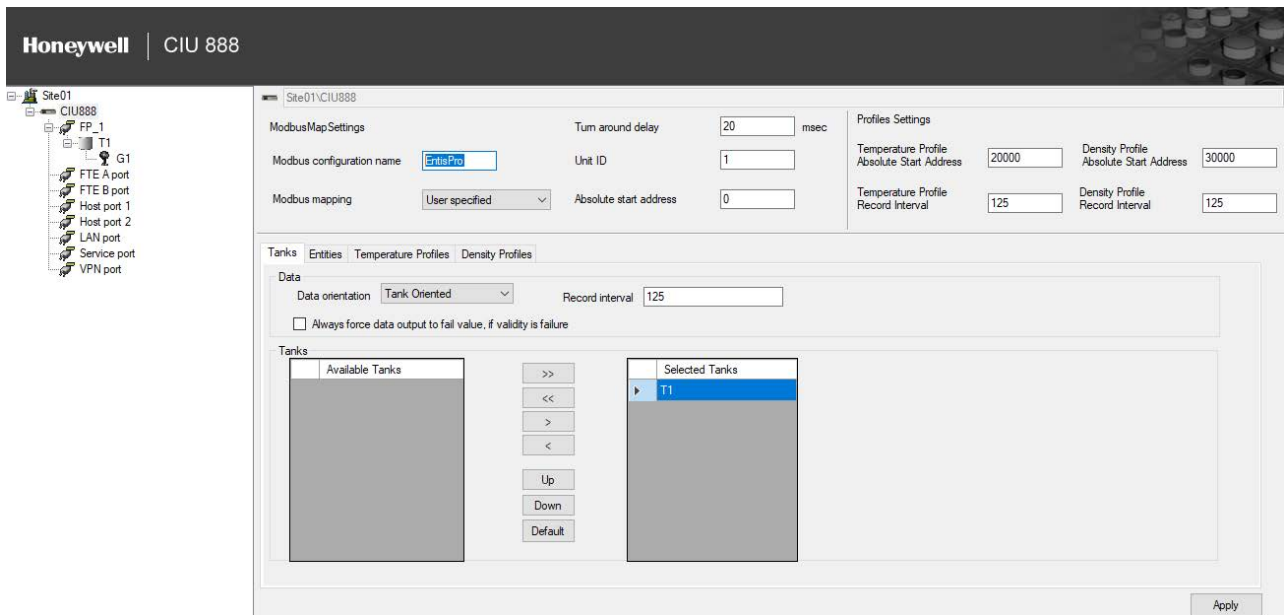
5. The various fields seen in the window and a brief description on each of the them are given in the following table.

Fields	Description
Modbus Configuration Name	This indicates the Modbus configuration name. This shall be used to identify a Modbus map configuration for a Modbus TCP/IP client.
Unit ID	This refers to the unit identifier in case of the Modbus TCP/IP client request. Different Modbus maps should have unique unit identifier configured so that when a Modbus TCP/IP client requests with a Unit Identifier, CIU shall pick up the corresponding Modbus map and present the data accordingly.
Turn around Delay	This refers to the CIU's response to any Modbus requests after the specified turn around delay in milli seconds. Value is from 0 to 65535. Default value is 20.
Modbus mapping	This indicates the Modbus mapping type. Supported types are: • Entis Pro Complaint • User specified • CIU Plus Complaint • ENTIS Compliant For more information on *User specified* modbus maps, refer to section 3.2.12.1 and section 3.2.12.2

Fields	Description
Absolute start address	This indicates the absolute start address of the Modbus tank record. Values are in decimal. **Note**: For Entis Pro and ENTIS Complaint Modbus mapping, if the number of tanks are more than 50 then configure absolute start address as 10000.
Temperature Profile Absolute Start address	This indicates the absolute start address of the temperature profiles record. Values are in decimal. Default value is 20000. Configurable when modbus mapping is User Specified.
Temperature Profile Record Interval	This indicates the record interval of the temperature profiles record. Values are in decimal. Default value is 125. Configurable when modbus mapping is User Specified.
Density Profile Absolute Start address	This indicates the absolute start address of the density profiles record. Values are in decimal. Default value is 30000. Configurable when modbus mapping is User Specified.
Density Profile Record Interval	This indicates the record interval of the density profiles record. Values are in decimal. Default value is 320. Configurable when modbus mapping is User Specified.

6. Enter the details as required and click **Apply.**

NOTE: *Click the* ***Apply*** *button after filling details in* ***Tanks***, ***Entities***, ***Temperature Profiles*** *and* ***Density Profiles*** *tab.*

3.2.14.2 Delete TCP/IP Modbus map

On the CIU 888 node, right-click and select **Delete exisiting TCP/IP modbus map** from the menu.
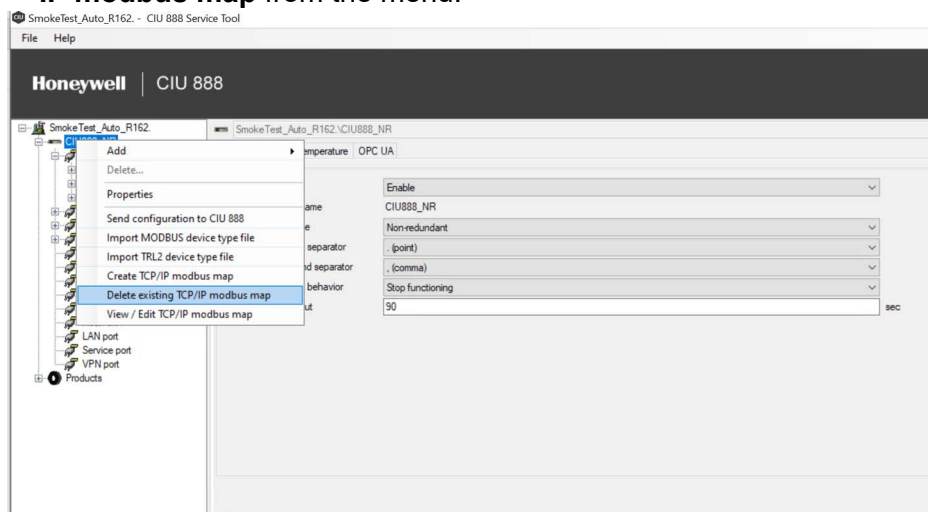
1. The **Delete TCP/IP Modbus Map** window appears.
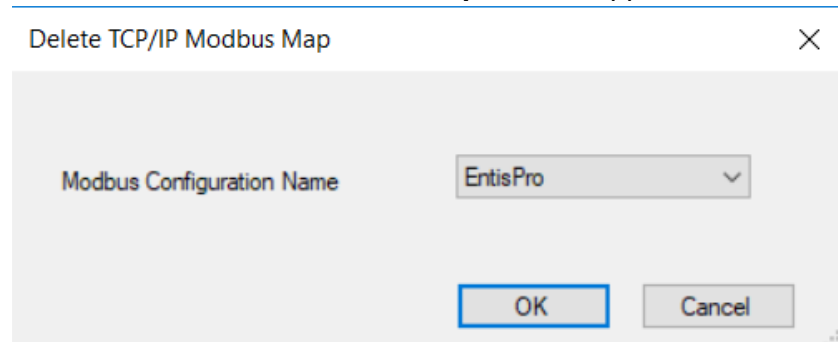
2. Select the name of the Modbus map to be deleted from the drop-down list and click **OK**.

   The Modbus map is deleted.

3.2.14.3 View/Edit Modbus TCP/IP Maps

1. On the CIU 888 node, right-click and select **View / Edit TCP/IP modbus map** from the menu.
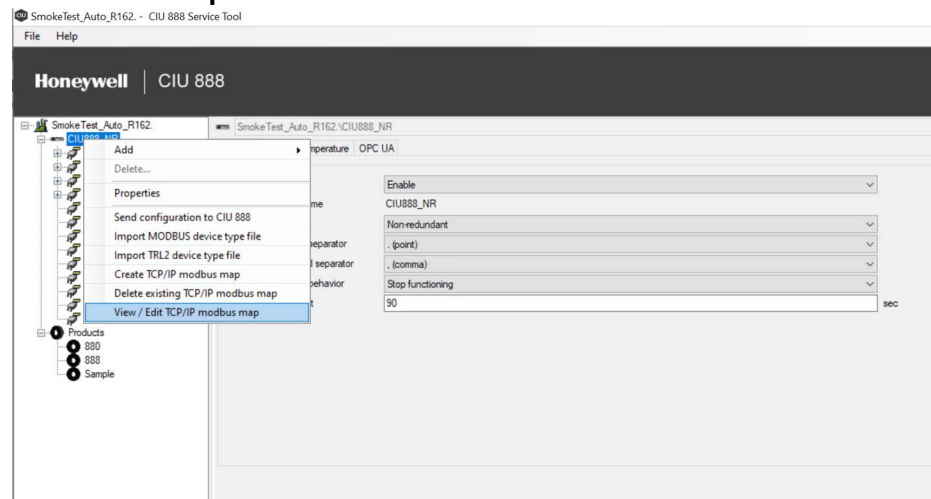
2. The **View/Edit TCP/IP Modbus Map** window appears.
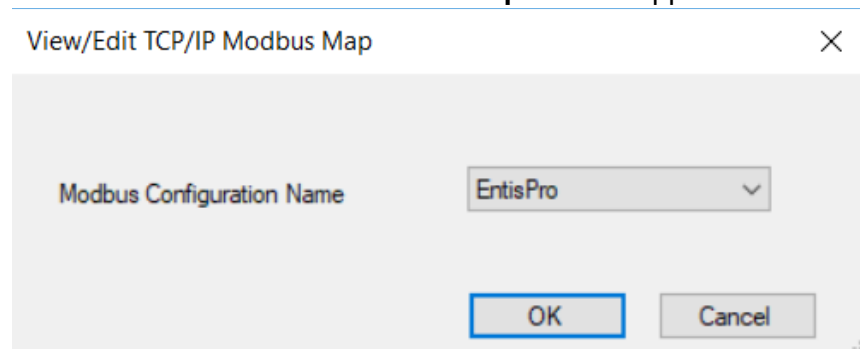
3. Select the name of the modbus map to be viewed from the drop-down list and click **OK.**

   The **ModbusMapSettings** window is displayed for viewing and editing.

CAUTION

Click the apply button to save changes before navigating to other tabs. Failing to do so may lead to wrong values getting displayed.

3.3 Sending Configuration to CIU 888

1. On the CIU 888 node, right-click and choose **Send configuration to CIU 888**.
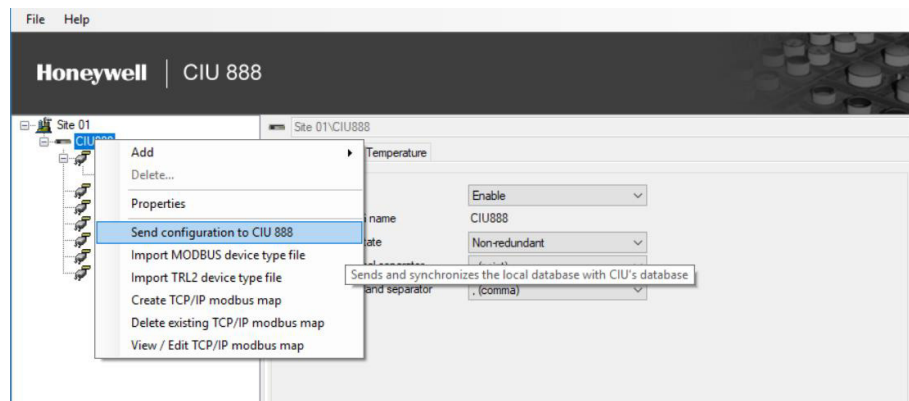
2. The **CIU 888 Connection Details** window appears.
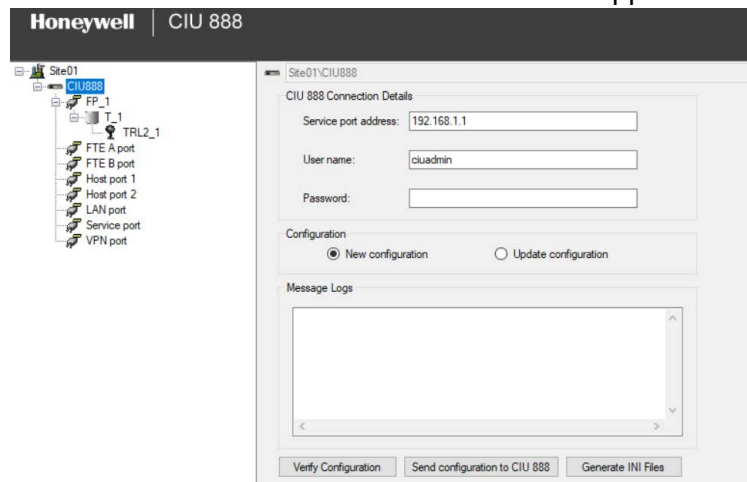
3. In the **Service Port address** box, type the name of the service port address.

4. In the **User name** box, type the User name.

5. In the **Password** box, type the password.

6. In the **Configuration** box, select the New Configuration or update configuration.

7. Click **Send Configuration to CIU 888**.

3.4 Generating INI Files

1. On the CIU 888 node, right-click and choose **Send configuration to CIU 888.**
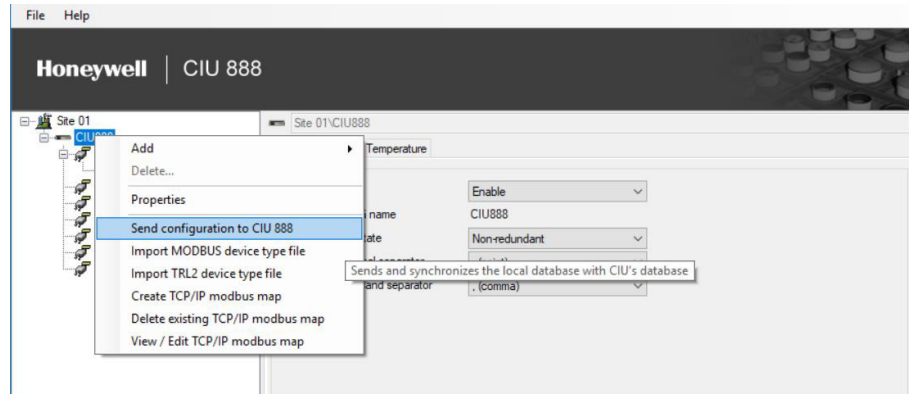
2. The **CIU 888 Connection Details** window appears.
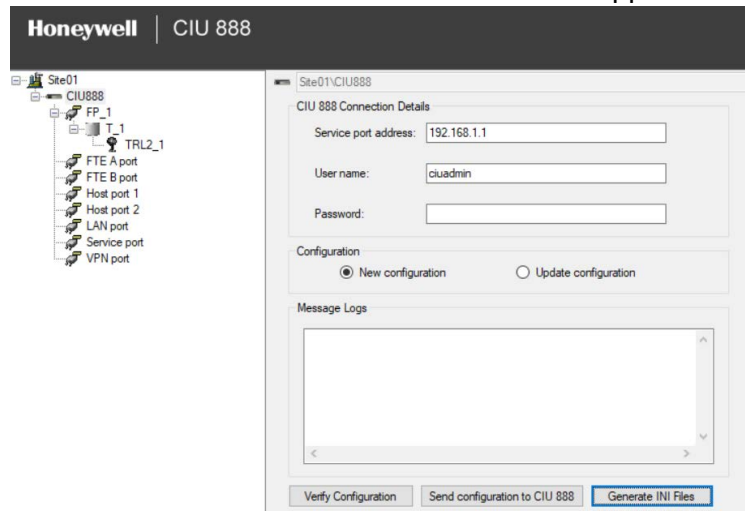
3. In the **Service Port address** box, type the name of the service port address.

4. In the **User name** box, type the User name.

5. In the **Password** box, type the password.

6. Click **Generate INI Files**.

3.5 Verifying Configuration

1. On the CIU 888 node, right-click and choose **Send configuration to CIU 888.**
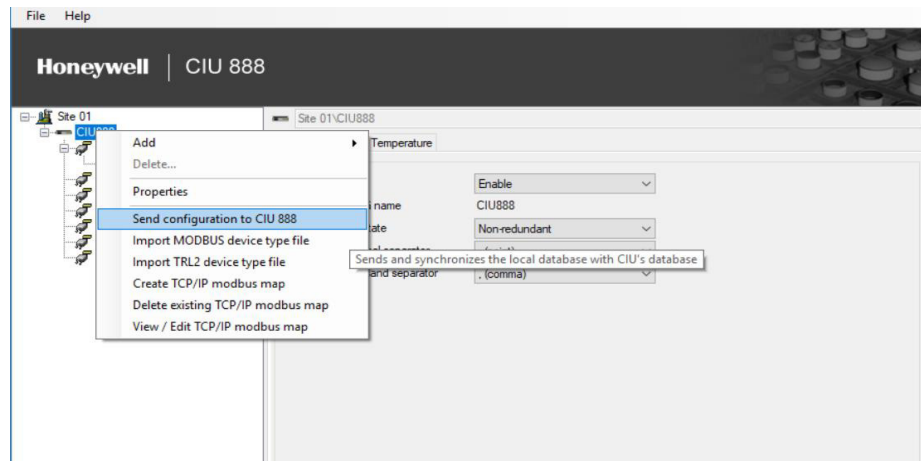
2. The **CIU 888 Connection Details** window appears.
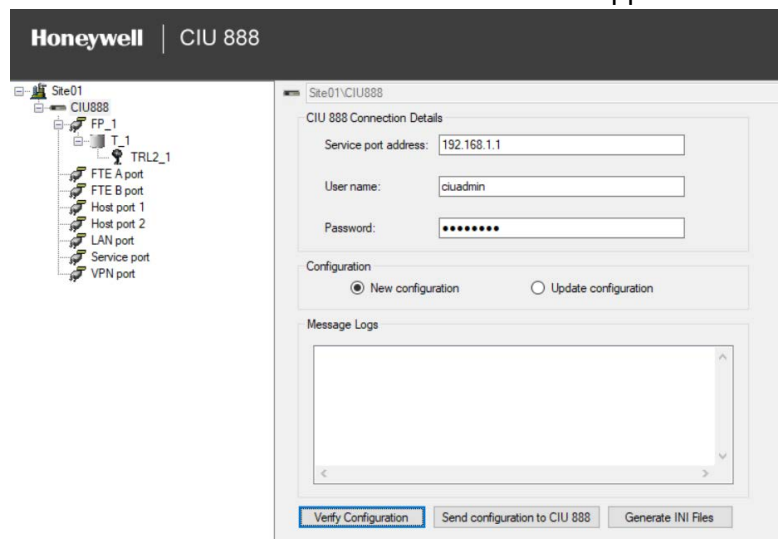
3. In the **Service Port address** box, type the name of the service port address.
4. In the **User name** box, type the user name.
5. In the **Password** box, type the password.
6. Click **Verify Configuration**.

3.6 Importing an existing site configuration

1. From the **CIU 888 Service Tool** window, Choose File > **Open**.
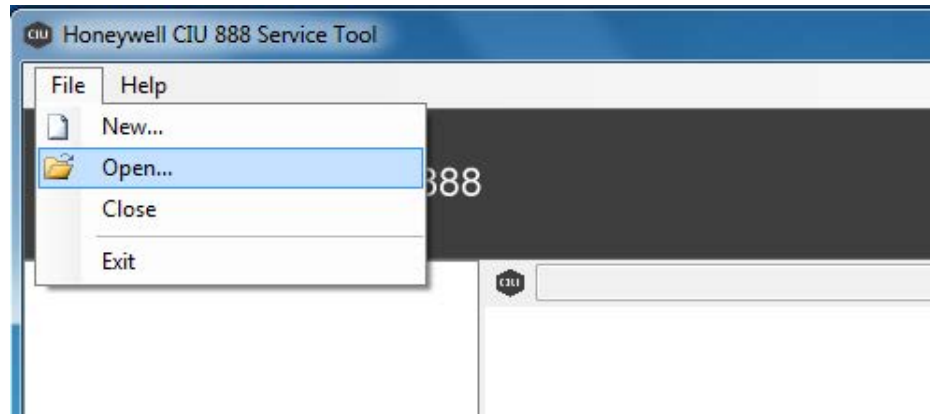
The **SelectSiteForm** window appears.
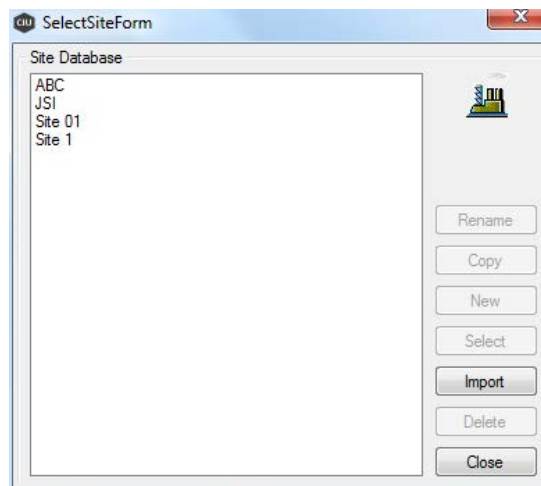
2. Click **Import.**

3.6.1 Recommended actions if importing from prior to R150.1 Databases

■ If CIU Plus compliant modbus maps are configured in TCP/IP, then delete and re-create CIU Plus compliant map.

■ If ENTIS compliant modbus map is configured in TCP/IP, then delete and recreate ENTIS compliant map.

■ If Density profiles are configured as part of TCP/IP User defined modbus maps, then set the density map to default and configure it as required.

■ If importing from R130 then temperature spots configured as part of TRL2 gauge will be removed and it is no more available for selection.

To get Multispot Temperature, temperature profiles has to be configured in TRL2 gauge as follows:

a) Select the TRL2 Gauge.

b) Enable Temperature Profiles checkbox and configure the Scan period, Slave ID, Modbus Address, Device Type and click on

Apply. For more details refer section 3.2.10.4

c) Remove Multi Spot temperatures configured in User Defined modbus maps and configure the Temperature parameters in 'Temperature' tab of User defined modbus map.

The **Open** window appears.

3. Select the site database file and click **Open**.

The files are imported to the current CIU 888 Service tool.

3.7 Opening an existing site configuration

1. From the **CIU 888 Service Tool** window, Choose File > **Open**.
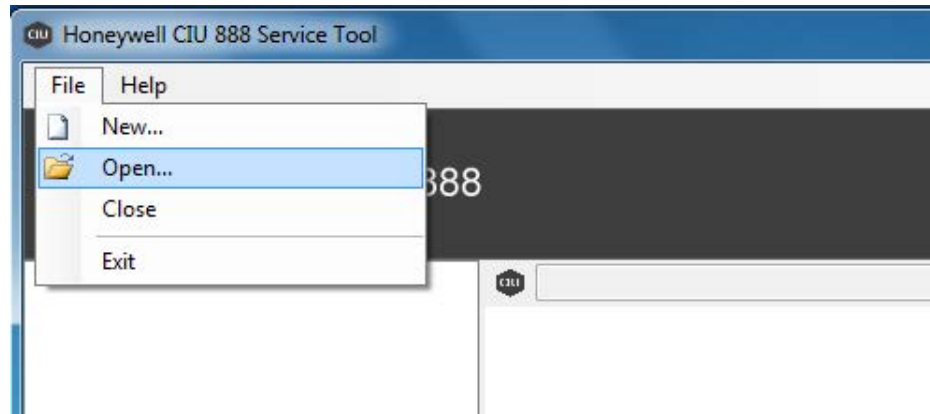
The **SelectSiteForm** window appears.
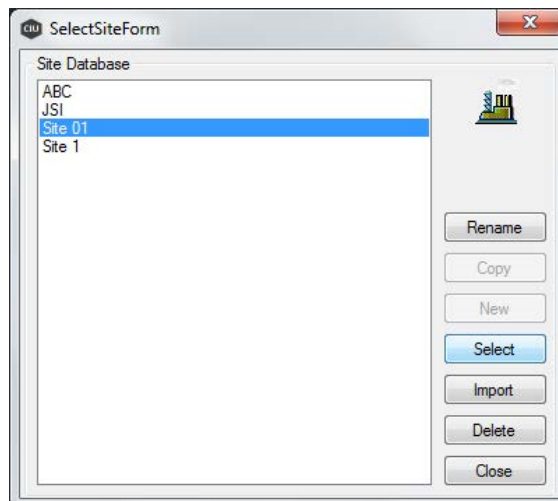
2. Select the required site and Click **Select.**

   You can see the selected site details now.

NOTE: Migrating Service tool database from previous releases to the current release (R210) is possible.

CHAPTER 4 COMMISSIONING OF A STANDALONE SYSTEM SETUP

Perform the following steps to commission a standalone CIU 888 system setup:

1. Log on to the CIU 888 and changing the initial password, see section 4.2.1

2. Verify the CIU 888 license, see section 4.2.2

3. Configure the site using Service Tool, see section 4.3

4. Send the site configuration to the CIU 888, see section 4.4

5. Generate the INI files, see section 4.5

6. Start the Entis Pro system connected to the CIU 888, and loading the INI files in Entis Pro, see section

7. Verify the CIU 888 system setup is working properly, see section 4.10

8. Seal the CIU 888, see section 4.11

4.1 Requirements for commissioning

For the commissioning of a standalone CIU 888 system setup the following requirements must be met:

- The electrical and mechanical installation of the CIU 888 must be completed. Refer to the *Installation Manual CIU 888* (Part No. 4417590) for more information.

- The CIU 888 must be switched on, see section 7.1.1

- Both the W&M lock key switch and the Configuration lock key switch must be in 'unlocked' position, see section 7.2

- A PC/laptop running the CIU 888 Service Tool must be connected to the Service port of the CIU 888 using a Cat. 5 Ethernet cable (patch or crossover). The Service port is located at the front of the CIU 888 (see FIGURE 4-1). See Chapter 3 for more information about the CIU 888 Service Tool.
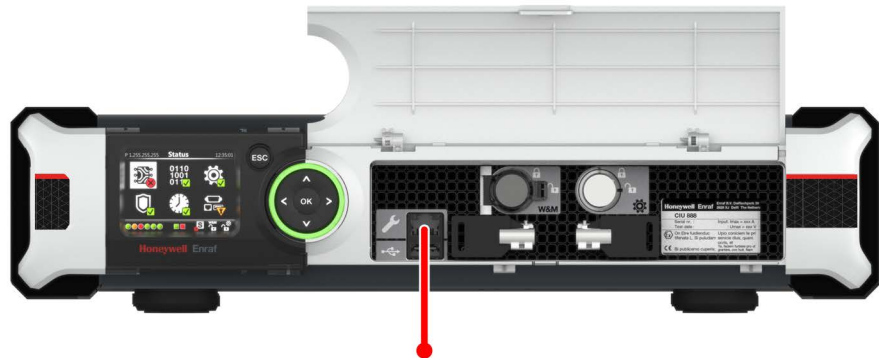
FIGURE 4-1   CIU 888: Service port

4.2 Running the initial setup of the CIU 888

The first step in the procedure for the commissioning of a standalone CIU 888 system setup is running the initial setup.

4.2.1 Logging on to the CIU 888 and changing the initial password

During the initial setup, a user has to log on to the CIU 888 and change the initial password first.

Procedure:

1. On the PC/laptop connected to the CIU 888, launch a browser.
2. Enter the IP address of the CIU 888 in the address bar of the browser. The IP address is: **192.168.1.1**. Press the **Enter** key.
   The *Login* window of the CIU 888 is displayed.
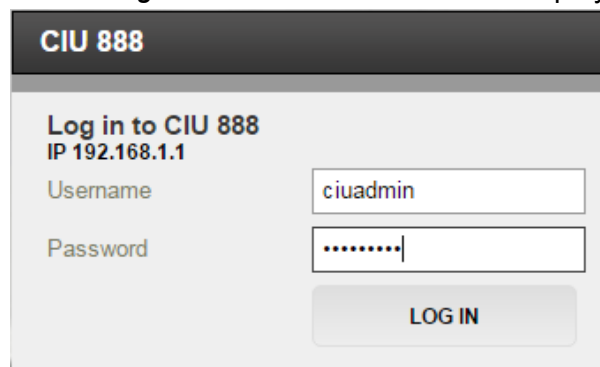
FIGURE 4-2   CIU 888: *Login* window

3. Enter the username and password to log in to the CIU 888. The username is: **ciuadmin**. The initial password is **CIU888@Enraf**. Click **LOG IN**.
   After entering a valid username and password, the CIU 888 prompts to change the password of the ciuadmin account (see FIGURE 4-3).
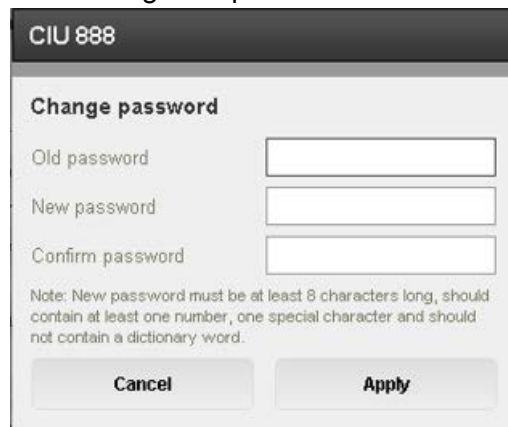
FIGURE 4-3   CIU 888: *Change Password* window

NOTE: Changing the password is only required during the initial setup of the CIU 888.

4. Change the password of the ciuadmin account.
   a) Enter the current password in the *Old Password* text box.
   b) Enter the new password in the *New Password* text box and in the *Confirm Password* text box.

      The password must meet the following criteria:

      - It must not be the same as the previous password

      - It must not contain any dictionary words (for example, password)

      - It must be at least eight characters long

      - It must contain at least one number and one special character

      - It must not contain special characters **!**, **'** and **"**

   c) Click **Apply**.

      The CIU 888 Web interface is displayed. By default, the *DIAGNOSTICS* window is displayed. (see FIGURE 4-4).
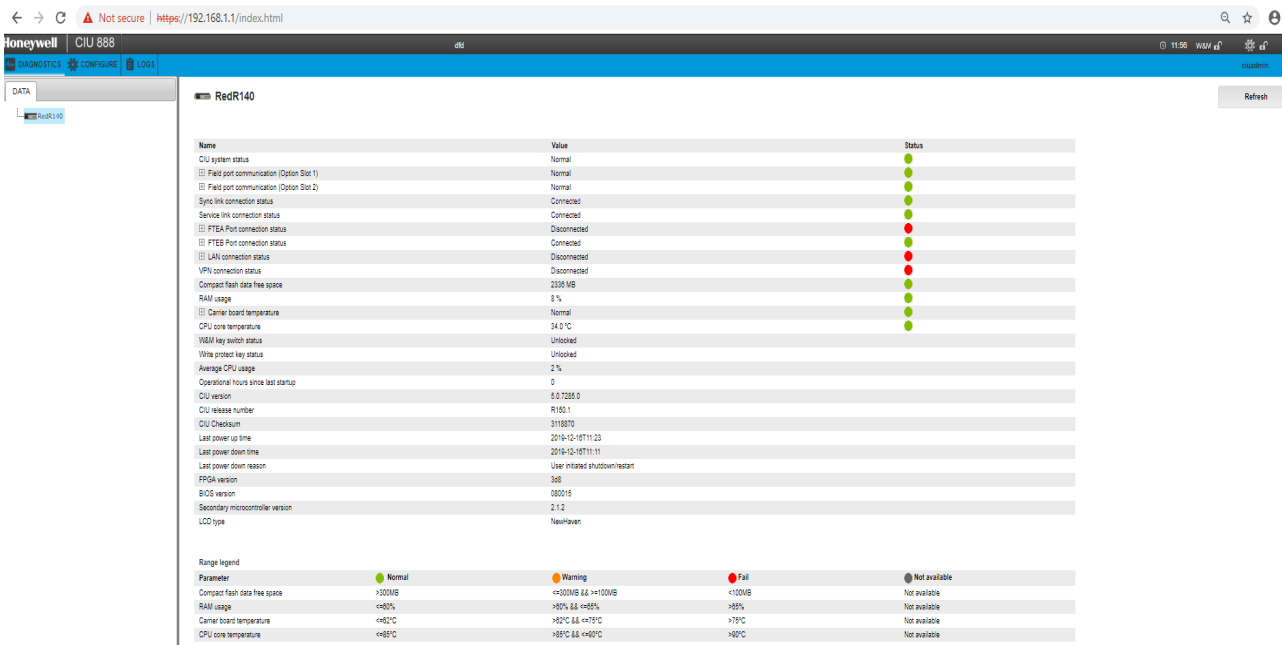
FIGURE 4-4   CIU 888 Web interface: *Diagnostics* window

4.2.2 Verifying the CIU 888 license

NOTE: When the initial password is changed, verify if a license is installed on the CIU 888 and if it supports the functionality ordered.*Refer to the Firmware Upgrade Manual (Part No. 4417596) for more information about the CIU 888 license.*

Perform the following procedure:

1. In the CIU 888 Web interface, click **CONFIGURE** in the section menu bar.
   The *CONFIGURE* window is displayed (see FIGURE 4-5).
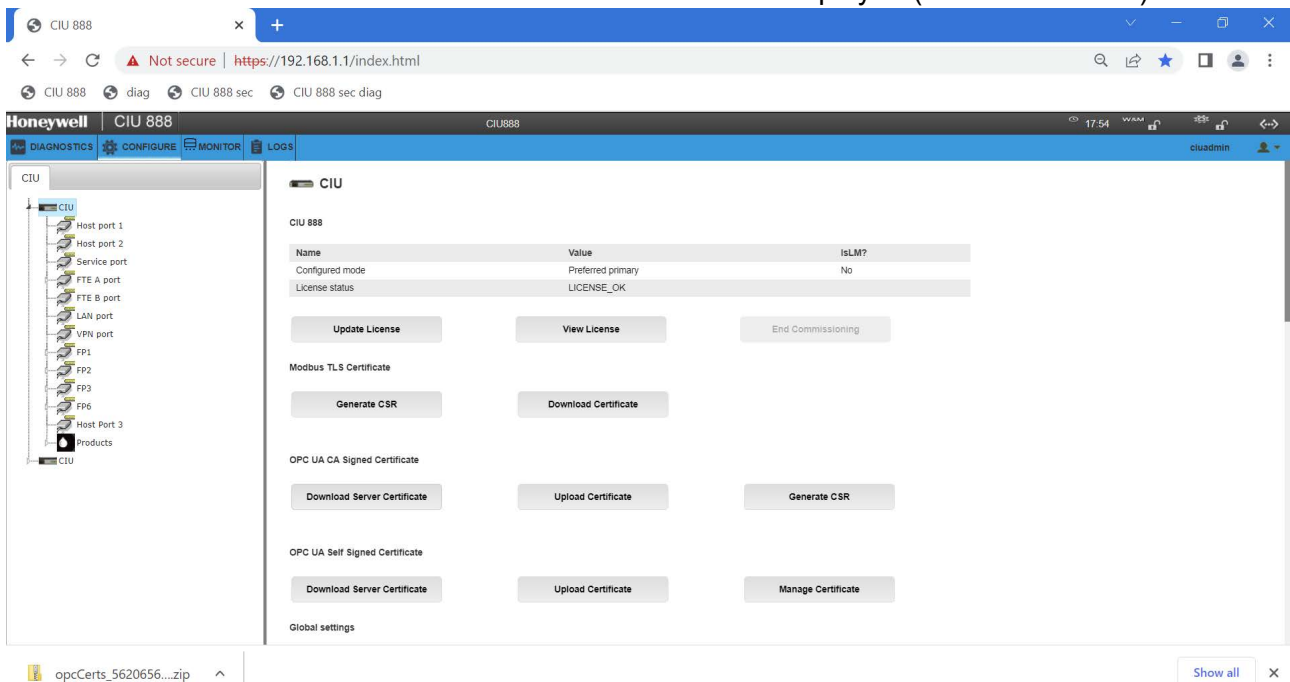
FIGURE 4-5   CIU 888 Web interface: *Configure* window

2. If a license is installed on the CIU 888, 'LICENSE_OK' is displayed in the *License status* field. If no license is installed, the field is empty. In this case, contact Honeywell.

3. Click **View License** to view the details of the license currently installed on the CIU 888.
The *View License* window is displayed (see FIGURE 4-6).

CIU 888

License Information

Customer Name	HTS
License creation date	2022-Jul-28 00:00:00
Site Name	CIU888
Software MSG	XRSF888V1ISSZFTD80ZN
Hardware MSG	USAH888BGZZZZZZZ
Calculations enabled	true
Redundancy enabled	true
Number of Tanks	80
LM enabled	true
Modbus TCP/IP enabled	true
Temperature Profiles enabled	true
Density Profiles enabled	true
OPCUA enabled	true
RIC enabled	true
Additional Calculations enabled	All
License Status	LICENSE_OK

Close

FIGURE 4-6   CIU 888 Web interface: *View License* window

4. Verify if the correct license is installed on the CIU 888. If not, contact Honeywell.

4.3 Setting up the site configuration

After the initial set up of the CIU 888 is completed, set up the site configuration using CIU 888 Service Tool. The site configuration can be set either by:

■ Creating a new site configuration, see section 3.2.

  or

■ Importing an existing CIU 888 site configuration, see section 3.6.

4.3.1 Configuration procedure in CIU 888 Service Tool

Perform the following procedure to configure a site using CIU 888 Service Tool:

1. Preparation
Before starting the creating and configuring the site, a number of details must be known, e.g. site layout, information about field cabling, tag names of site elements (i.e. gauges, tanks and CIUs), tank information (tank strapping tables or tank capacity tables, roof

details, etc.), information on types of stored product, host communication setup (if applicable).

2. Creating the site and defining the global settings
The creation of the site allows CIU 888 Service Tool to store a configuration set. The global settings are required for initiating the site configuration. Once the global settings are defined, CIU 888 Service Tool creates a site database.

3. Creating and configuring the tanks
Tank strapping tables or tank capacity tables can be linked via an external file.

4. Linking of the data inputs and tanks.

The site configuration created with Service Tool is saved in the folder **C:\Users\Public\Documents\Honeywell\CIU 888 Service Tool R210.1**.

This folder also contains the following sub-folders:

- INI
  This folder is reserved for Entis Pro INI files generated with Service Tool.
- LOG
  This folder is reserved for log files.
- STR
  This folder is reserved for strapping table files linked to the tanks in the site configuration.
- CUSTOM_TABLES
  This folder Contains Density/CTL/Concentration tables
- SCR
- TRC

4.4 Sending the site configuration to the CIU 888

When the site configuration is set up, send the site configuration to the CIU 888 using the CIU 888 Service Tool, see section 3.3.

4.5 Generating INI files

When the site configuration is sent to the CIU 888, generate the INI files needed for Entis Pro.

Refer to section 3.4 for detailed information about generating INI files using CIU 888 Service Tool.

4.6 Starting Entis Pro and loading the updated INI files in Entis Pro

When the INI files are generated, start the Entis Pro system connected to the CIU 888 and then load the INI files in Entis Pro. Refer to the *Configuration manual Entis Pro version 2.80x for Windows 10*

(Part No. 4416381) for more information.

4.7 Loading the CIU site database in ENTIS

Load the update CIU site database in ENTIS using ENTIS Configuration tool. In case of multiple CIU888s in a site, load all CIU site databases in ENTIS. Refer to the ENTIS Installation and Configuration guide (ETDOC-X613) for more information.

4.8 OPCUA Certificate Management

OPCUA secure communications require certificate to be exchanged and trusted between CIU888 (OPCUA server) and Inventory systems (OPCUA clients). Certificate exchange will happen when any one sign and sign/encrypt option is selected while configuring in CIU888 Service tool. Default Policy is "Security Policy – Basic256Sha256 – Sign and Encrypt".

None policy: Not a secure communication

Other policy: It is a secure communication with/without encryption. Sign refers to secure communication without encryption. Sign and encrypt refers to secure communication with encryption. Multiple policies can be selected during configuration. When client application connects, CIU presents all configured polices and the client application can choose one for the connection with CIU.(see FIGURE 4-7)
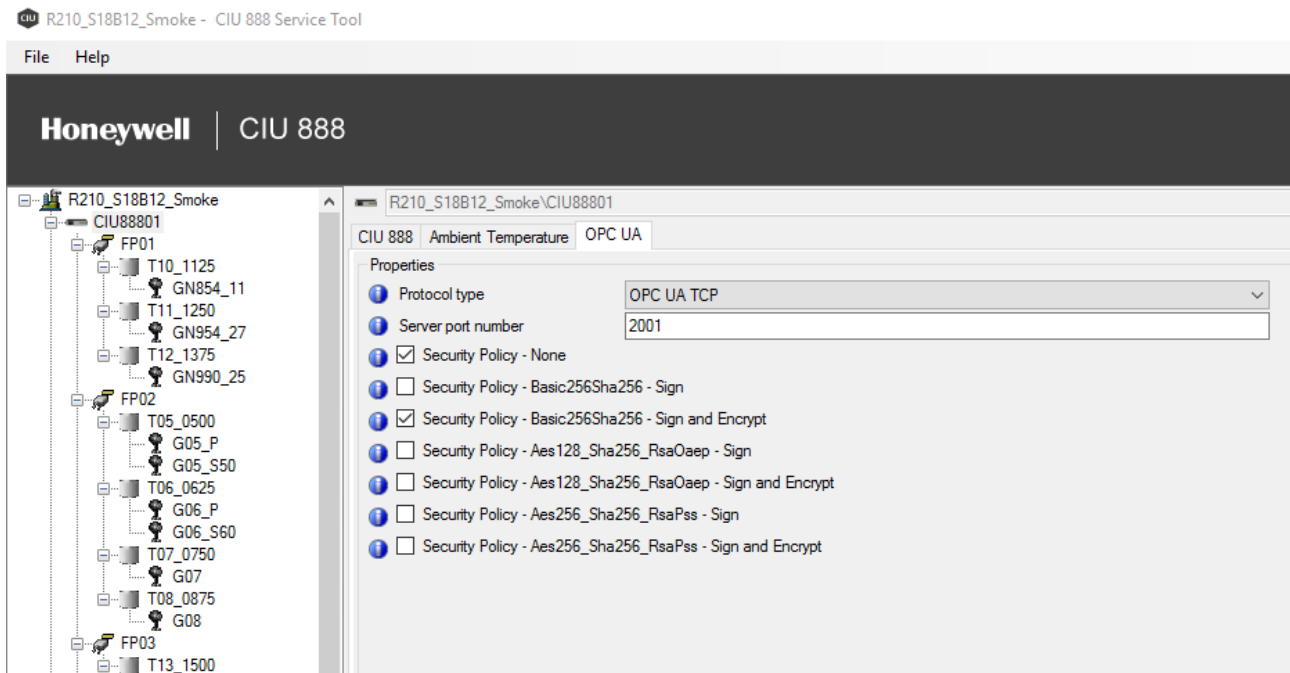
FIGURE 4-7   OPCUA Security policy and mode configuration.

CIU supports security via self-signed certificates and CA-signed certificates. Based on the site requirements either one can be chosen by the user. The certificate management is handled via CIU 888's web interface.

Login to the CIU 888 Web portal and navigate to the CONFIGURE tab. Two sections are available as OPCUA CA Signed Certifcate and OPCUA Self Signed Certificate.(see FIGURE 4-8)
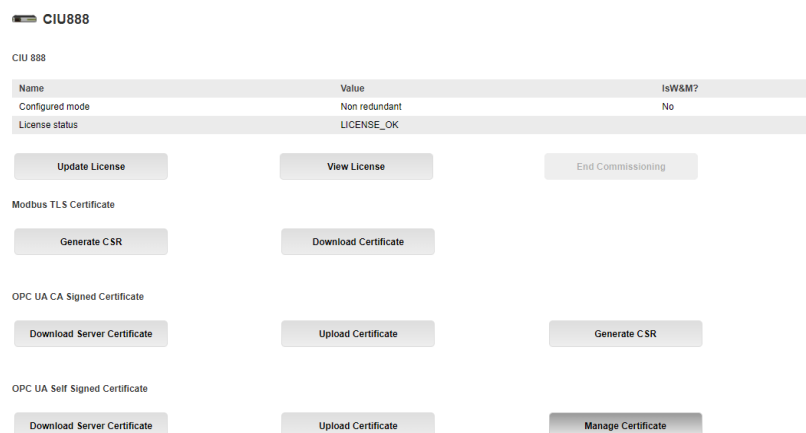
FIGURE 4-8   CIU888 Web Interface Configure tab.

4.8.1 OPCUA Self-Signed Certificate Management

Self-signed certificate security flow involves the user trust the certificates manually.

That is, OPC client certificate needs to be trusted in CIU 888 and CIU 888 server certificate needs to be trusted in OPC client application. When OPCUA server is enabled, CIU creates the self-signed server certificate (if not available) at the start up. The validity of the server certificate is 2 years from the creation date. Generated self-signed certificate would be of the format application_rsa_sha256_UniqueId.der (example:application_rsa_sha256_23B922307EE1EEFF765DEE2E6E 886CD2914C82EF.der).

OPC client certificate management can be done via Manage Certificate option (or) Upload Certificate option.

4.8.1.1 Download Server Certificate:

The user shall use this option to download the CIU 888 server self-signed certificate.

1. Under OPC UA Self Signed Certificate section, click "Download Server Certitificate" option and certificate gets downloaded.
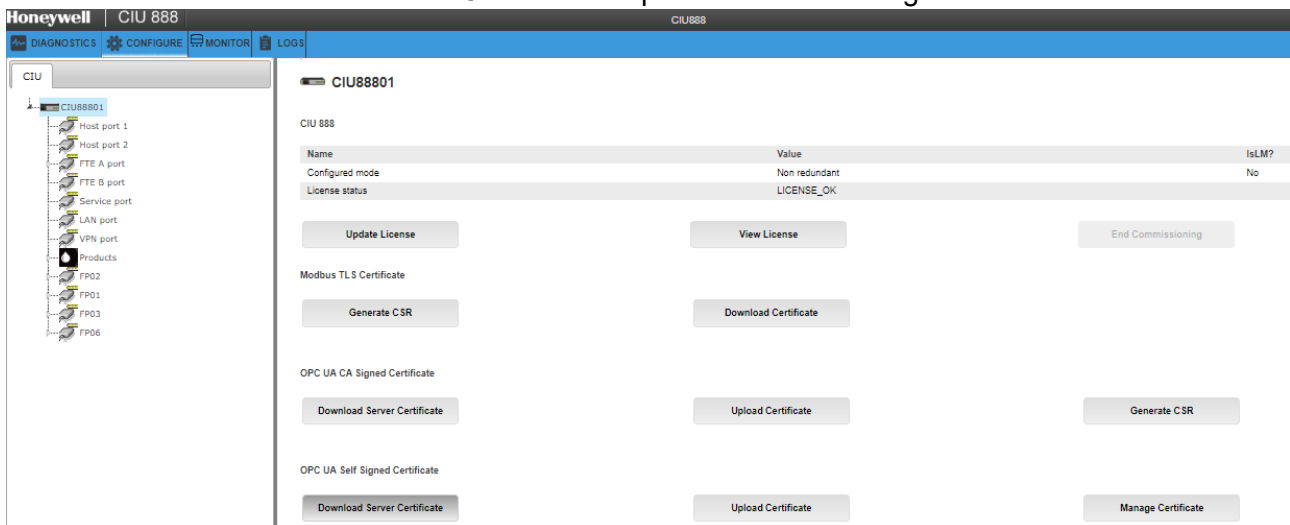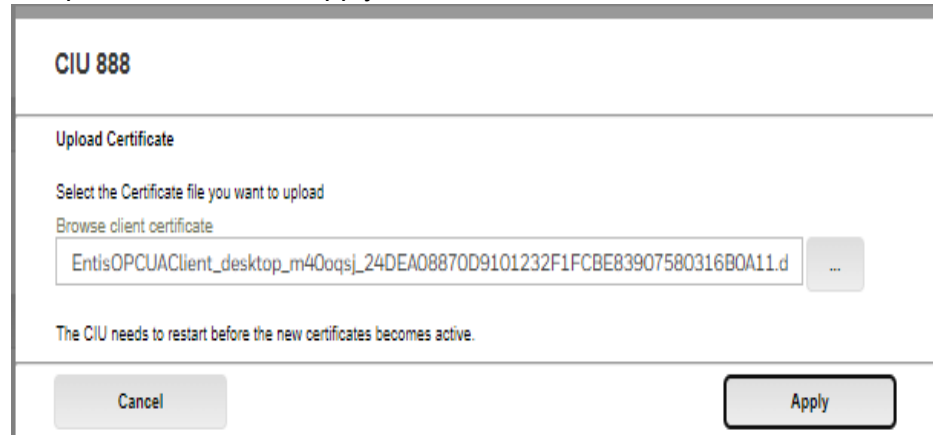
4.8.1.2 Upload Certificate:

The user can upload the client certificate to CIU through this option if it is available. On upload, CIU adds the client certificate to the trusted certificate store.
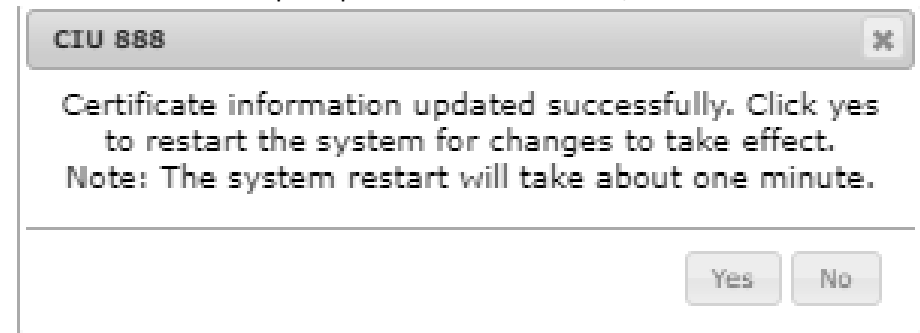
1. Under OPC UA Self Signed Certificate section, click "Upload Certitificate" option and browse to the client certificate to be uploaded and Click Apply

2. The user would be prompted for a restart of CIU, click Yes.

NOTE: Secure communication is established between CIU and the OPC Client application after CIU restart.

4.8.1.3 Manage Certificate:

The user manage the OPC UA client certificates through this option. When an OPC UA client connects to CIU, the client gets the CIU's OPC UA server certificate. If the user trusts the CIU server certificate in the OPC UA client application, then OPC UA client sends its certificate to CIU. By default, the received client certificate to be added to rejected certifcate store in CIU. The user has to manually trust the client certificate to enable CIU communication with the OPC UA client.

1. Under OPC UA Self Signed Certificate section, click "Manage Certitificate" option and a list of rejected client certificates are presented to the user.
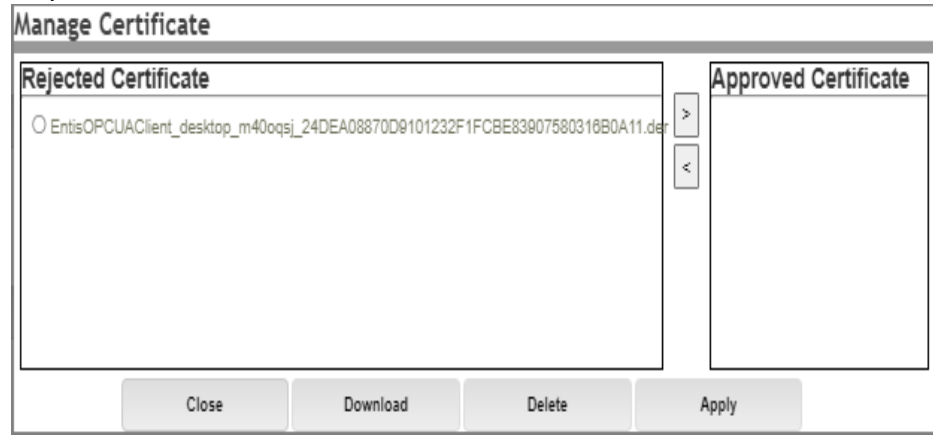
2. Select the desired client certificate from Rejected Certificate section and click > option. This certificate is moved to Approved Certificate section.
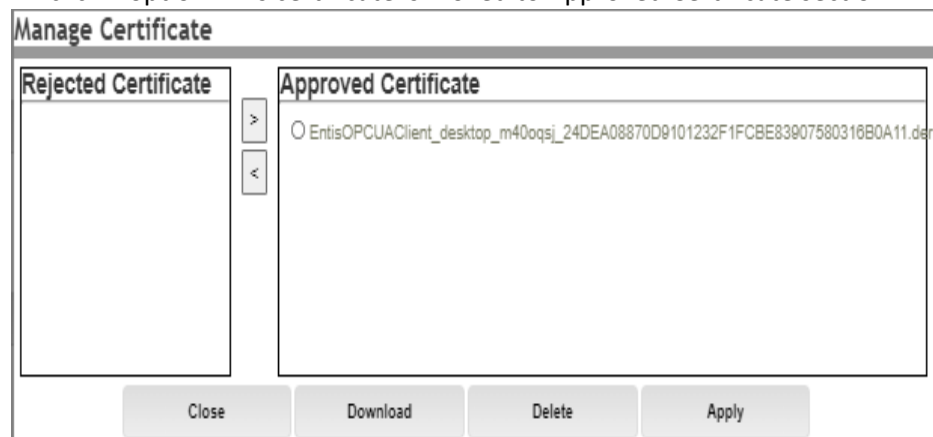
3. Click Apply and the user would be prompted for a restart of CIU, click Yes.
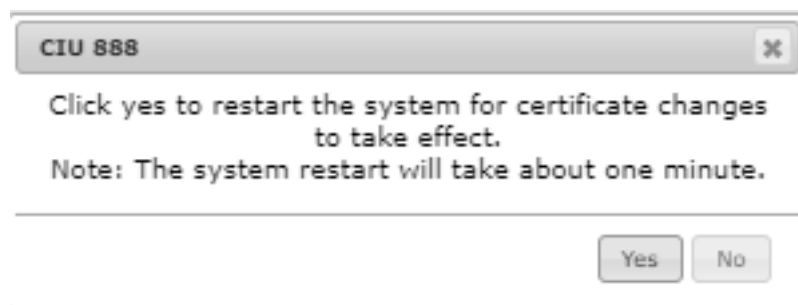
NOTE: *Secure communication is established between CIU and the OPC Client application after CIU restart.*

NOTE: *In case of a redundant system, above steps have to be done separately for CIUA and CIUB. Both certificates are different.*

4.8.2 OPCUA CA-Signed Certificate Management

CA-signed certificate security flow involves the server and the client certificates being signed by a Certificate Authority (CA). The trust is established through the CA certificate that is used to sign the server and client certificates. That is, the CA certificate used to sign the server certificate needs to be added to trusted CA certificate store of the client application and the CA certificate used to sign the client certificate needs to be added to trusted CA certificate store of the server.

The following steps are involved in a CA-signed certificate security flow in CIU 888:

1. Generate CSR (Certificate Signing Request) for CIU
2. Send the generated CSR to Certificate Authority for server certificate signing. Request the following from the CA:
   a) Signed CIU 888 Server certificate (.der)
   b) Root CA certificate (.der)
   c) Certificate Revocation List (CRL) (.crl)
3. Upload the received certificates to CIU.

4.8.2.1 Generate CSR:

Click on "Generate CSR" under OPCUA CA Signed Certificate. Provide necessary information and click apply. CSR will be downloaded to PC. Share this .csr file to CA.(see FIGURE 4-9).

FIGURE 4-9   Generate CSR - OPCUA CA signed certificate management

Name	Description
Common Name	Name of the server.
Organization	Name of the organization
Department	Name of the Department
Locality	Name of the locality
State	Name of the state.
Country	Country code. IN, DE, US. This should be a two letter code.
RSA Key Size	Default: 2048. Supports 2048 and 4096. If 4096 key size is used, initial connection time at the client application needs to be adjusted as it may add some delay of 5-10 secs.

4.8.2.2 Upload Certificates:

Click on upload certificates under OPCUA CA Signed Certificate section.

- **Browse CA Certificate:** Browse the received root CA certificate in .der format.

- **Browse CA CRL:** Browse the received root CA CRL in .crl format

- **Browse Server Certificate:** Browse the the received signed server certificate (in .der format).

When prompted for a restart, click on Yes. Once the CIU restarts, OPCUA client will communicate with the CIU888 securely over OPCUA. (see FIGURE 4-10)
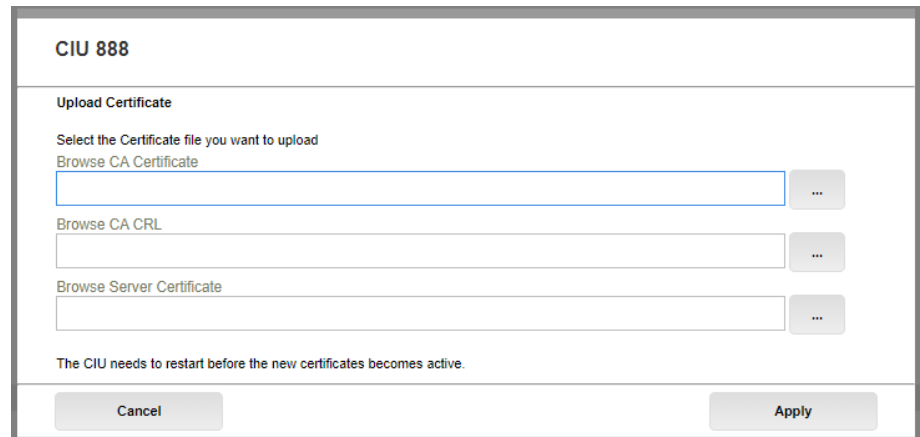
FIGURE 4-10   OPCUA CA Signed certificate.

NOTE: *If different CA is used for Client application to sign: get its CA root certificate and CA CRL of that CA and upload to CIU using "upload Certificate" under OPCUA CA Signed Certificate. Browse CA Certificate and Browse CA CRL only and click apply to upload the certificates. Now both CAs used for Client and Server are uploaded to CIU888.*

NOTE: *In case of a redundant CIU888, workflow steps have to done separately for CIUA and CIUB. Both certificates are different.*

4.8.2.3 Download Server Certificate:

To download the CA signed certificate created from CIU888. This is useful after uploading the signed CIU888 certificate.

4.8.2.4 Workflow for OPCUA client applications (CA Signed):

1. The OPCUA Client application will also have a provision to generate CSR.
2. Send the generated CSR to CA and get three certificates back from CA.
   a) Signed Client application certificate in format as application requires.
   b) Root CA certificate in format as application requires.
   c) Root certificate revocation list (.crl).
3. Upload the received certificates to client application.

NOTE: *If different CA is used for CIU888 to sign: get its CA root certificate and CA CRL of that CA and add to respective directory of client application certificate management. Now Both CA root certificate and CA root CRL will be present.*

Following are the directory structure of UA expert.

Eg:C:\Users\<username>\AppData\Roaming\unifiedautomation\uaexpe rt\PKI\issuers\certs

Eg:C:\Users\<username>\AppData\Roaming\unifiedautomation\uaexpe rt\PKI\issuers\crl

4.9 Self Signed Certificate Management with ENTIS

ENTIS automatically generates a self-signed certificate to communicate with the CIU 888. To successfully establish secure communication with the CIU 888, the ENTIS self-signed certificate and the CIU 888 server certificate need to be trusted by each other. This can be done with the following steps:

1. Trusting server certificate, move the certificate from

C:\ProgramData\Honeywell\Entis\Communication\OPCUA\Certificates\ EntisOPCUAClient\pki\rejected\certs

to

C:\ProgramData\Honeywell\Entis\Communication\OPCUA\Certificates\ EntisOPCUAClient\pki\trusted\certs

2. Trusting client certificate.
   a) Login to the CIU 888 Web portal and navigate to the **CONFIGURE** tab.(see FIGURE 4-11)
   b) Click on **Manage Certificates** under the OPC UA Self Signed Certificates header. The ENTIS self-signed certificate can be seen in the **Rejected Certificate** section.

FIGURE 4-11   CIU888 Web Interface: Configure tab
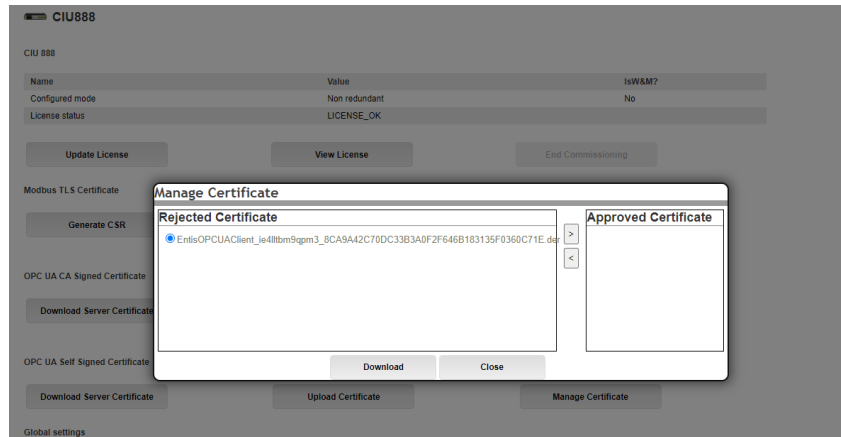
FIGURE 4-12   Mange certificate: OPCUA CA Signed certificate.

c) Select the certificate and move it to the **Approved Certificate**
section.(see FIGURE 4-13)
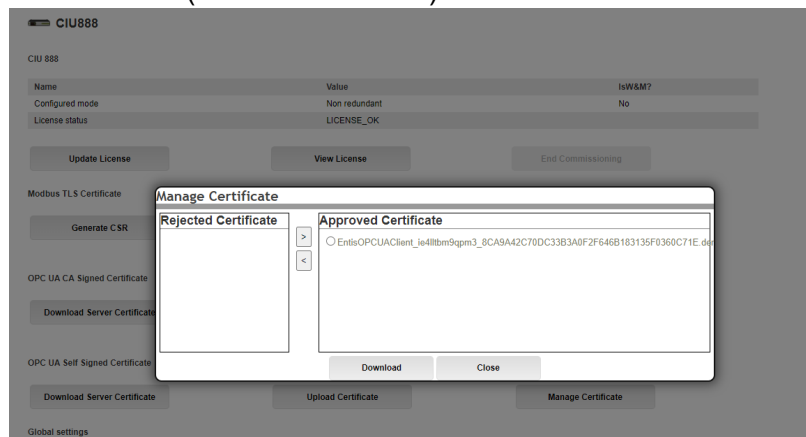
FIGURE 4-13   Mange certificate: OPCUA CA Signed certificate.

d) Click on Close and when prompted for a restart, click on
Yes.Once the CIU restarts, ENTIS will communicate with the CIU
securely over OPC.

NOTE: *The ENTIS client certificate is valid for a period of 1 year after which a new*
certificate will be generated. The new certificate must be approved in a similar
way.

NOTE: *If steps a, b, and c are redundant, they must be performed on both CIUA and*
CIUB.

4.10 Verifying the working of the system setup

The last step in the commissioning procedure is verifying if the CIU 888
system setup is working properly.

To verify the working of the system setup, the CIU 888 must be connected to:

■ PC/laptop running the CIU 888 Service Tool via Service port located at the front using a Cat. 5 Ethernet cable

■ PC/laptop running the Modbus Host (e.g. Entis Pro) via one of the configured serial host ports using RS-232/RS-485 cable (see FIGURE 4-14)

FIGURE 4-14   CIU 888: Serial host ports

■ PC/laptop running the Modbus TCP/IP Host and / or OPC UA TCP Host via one of the configured ethernet host ports using network cable (see FIGURE 4-15)
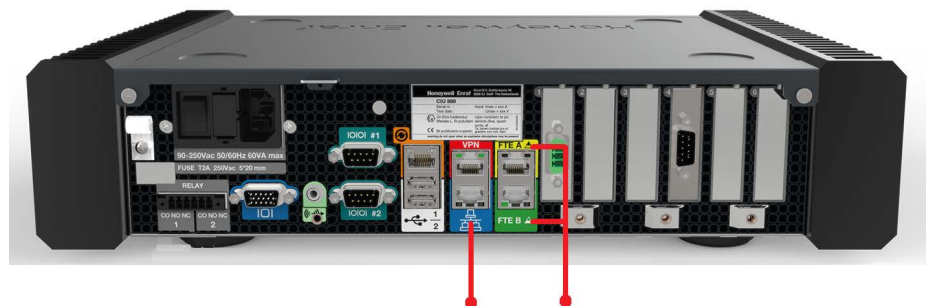
FIGURE 4-15   CIU 888: FTE A, FTE B and LAN ports

Perform the following procedure:

1. Launch the CIU 888 Web interface. See section 3.1.4 for more information.
2. Verify the CIU 888 configuration options in the Web interface.
3. Logout of the Web interface.
4. Verify the CIU 888 functioning by checking the received values on the Modbus Host and / or OPC UA TCP Host.

4.11 Sealing the CIU 888

If the CIU 888 sealing option is licensed, the next step is to have it sealed by a representative of the LM authorities or by a LM accredited user. Refer to the *CIU 888 Sealing Guide* (Part No. 4417595) for more information.

NOTE: *If the CIU 888 does not feature the option to be sealed, the W&M lock key switch and the configuration lock key switch can either be locked or left unlocked.*

CHAPTER 5   COMMISSIONING OF A REDUNDANT SYSTEM SETUP

Redundancy is a common approach to improve the reliability and availability of a system. In a redundant CIU 888 system setup, one CIU 888 (usually the primary CIU 888) has the active role and its counterpart (usually the secondary CIU 888) has the passive role. During normal operation, the CIU 888 that has the active role scans the connected gauges for data and provides the measured and calculated data to host systems.

If both CIU 888s in a redundant system setup are fully synchronized and the connected host initiates a switchover, the CIU 888 that has the active role assumes the passive role. The CIU 888 that has the passive role assumes the active role and continues to perform the tasks that are performed by the CIU 888 that previously had the active role.

Switchover command issued by Entis Pro via Modbus serial is one such example.

NOTE: *Refer to the Protocol Manual - Modbus and OPC UA Host (Part No. 4417588) for more information about setting up of Modbus host for redundancy.*

NOTE: *The active CIU 888 can either be the primary CIU 888 or the secondary CIU 888.*

The redundancy status of the CIU 888 (active or passive) is presented through the following (host) systems:

- Entis Pro (via Modbus RTU)
- ENTIS (via OPC UA TCP)
- Other Modbus RTU host systems
- Other Modbus TCP/IP host systems
- Other OPC UA TCP host systems

Perform the following procedure to commission a redundant CIU 888 system setup:

1. Log on to the CIU 888 and changing the initial password, see section 5.2
2. Verify the CIU 888 license, see section 5.2
3. Configure the site using Service Tool, see section 5.3
4. Send the site configuration to the primary CIU 888, see section 5.4
5. Commission the secondary CIU 888, see section 5.5
6. Generate the INI files, see section 5.6 and Start the Entis Pro system connected to the CIU 888, and load the INI files in Entis Pro, see section 5.8
7. Verify the working of the system setup, see section
8. Seal the CIU 888s, see section 5.13

5.1 Requirements for commissioning

For commissioning of a redundant CIU 888 system setup, the following requirements must be met:

■ The mechanical and electrical installation of both the primary CIU 888 and the secondary CIU 888 must be completed. Refer to the *CIU 888 Installation Manual* (Part No. 4417590) for more information.

■ Both the primary CIU 888 and the secondary CIU 888 must be switched on. See section 7.1.1 for more information.

■ The W&M lock key switch and the Configuration lock key switch of both the primary CIU 888 and the secondary CIU 888 must be in 'unlocked' position. See section 7.2 for more information.

■ The primary CIU 888 and the secondary CIU 888 must be linked through their Sync Link ports using a Cat. 5 Ethernet cable (patch or crossover). The Sync Link port is located at the back of the CIU 888 (see FIGURE 5-1).

FIGURE 5-1   CIU 888: Sync Link port

■ A PC/laptop running the CIU 888 Configuration System must be connected to the Service port of the primary CIU 888 using a Cat. 5 Ethernet cable (patch or crossover). The Service port is located at

the front of the CIU 888 (see FIGURE 5-2). See CHAPTER 3 for more information about the CIU 888 Configuration System.
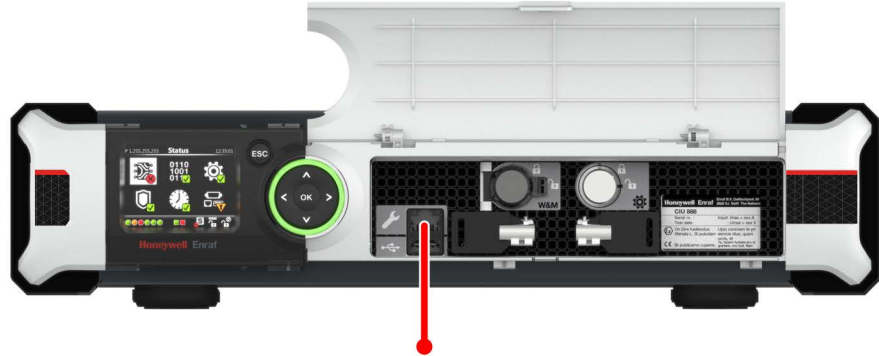
FIGURE 5-2   CIU 888: Service port

■ During commissioning of the CIU 888s, the Entis Pro system(s) connected to the CIU 888s must be shut down.

5.2 Running the initial setup of the primary CIU 888

The first step in the procedure for the commissioning of a redundant CIU 888 system setup is performing the initial setup procedure of the primary CIU 888. See section 4.2 for more information.

5.3 Setting up the site configuration

When the initial setup of the primary CIU 888 is completed, then set up the site configuration using CIU 888 Service Tool. The site configuration can be set up either by:

■ Creating a new site configuration, see section 3.2.

   or

■ Importing an existing CIU 888 site configuration, see section 3.6.

5.4 Sending the site configuration to the primary CIU 888

When the site configuration is set up, send the site configuration to the primary CIU 888 using the CIU 888 Service Tool. See section 3.3 for more information.

5.5 Commissioning of the secondary CIU 888

When the primary CIU 888 is commissioned, then configure its counterpart as preferred secondary CIU 888.

Perform the following procedure:

1. On the display of the secondary CIU 888, highlight the **Configuration** icon in the Status Dashboard using the navigation keys. Next, press the **OK** button.
   The *Configuration menu* screen is displayed (see FIGURE 5-3).

FIGURE 5-3	CIU 888 display: *Configuration menu* screen

2. Highlight the required **Redundancy** option using the navigation keys. Click the **OK** button.
   The *Redundancy* screen is displayed (see FIGURE 5-4).
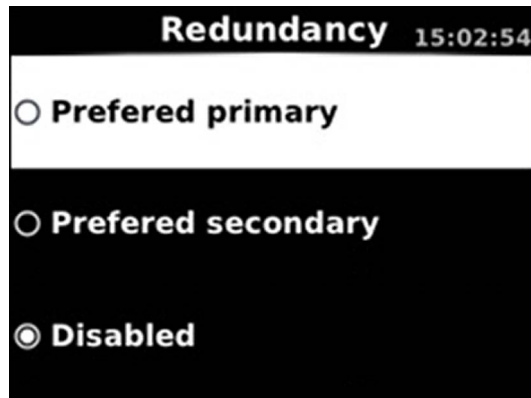
FIGURE 5-4	CIU 888 display: *Redundancy* screen

3. Highlight the **Preferred secondary** option using the navigation keys and then press the **OK** key.
   The *Confirm Changes* screen is displayed.

FIGURE 5-5   CIU 888 display: *Confirm Changes* screen

4. Highlight the **OK** option using the display keys. Click **OK** key.
   The secondary CIU 888 is reset to the factory settings and reboots twice. Because the Entis Pro system(s) connected to the CIU 888s is shutdown, redundancy switchover is disabled during reboot.

5. Connect the PC/Laptop to the secondary CIU 888. Log on to the secondary CIU 888 and change the initial password, refer to section 4.2.1.

6. Verify the CIU 888 license, refer to section 4.2.2.

   When commissioning of both the primary CIU 888 and secondary CIU 888 is completed, the role of each CIU 888 in the redundant system setup is indicated in the Status Dashboard (see FIGURE 5-6).

FIGURE 5-6   Status Dashboard of primary CIU 888 (left) and secondary CIU 888 (right)

5.6 Generating INI files

When the site configuration is sent to primary CIU 888, then generate the INI files required for Entis Pro.

Refer to the section 3.4 for detailed information about generating INI files using CIU 888 Service Tool.

5.7 Loading the CIU site database in ENTIS

Load the update CIU site database in ENTIS using ENTIS Configuration tool. In case of multiple CIU888s in a site, load all CIU site databases in ENTIS. Refer to the ENTIS Installation and Configuration guide (ETDOC-X613) for more information.

5.8 Starting Entis Pro and loading the INI files in Entis Pro

When the INI files are updated, then start the Entis Pro system(s) connected to the CIU 888s and then load the INI files in Entis Pro. Refer to the *Configuration manual Entis Pro version 2.80x for Windows 10* (Part No. 4416381) for more information.

5.9 OPCUA Certificate Management.

Refer section 4.8 for details.

5.10 Self Signed Certificate Management with ENTIS.

Refer section 4.9 for details.

5.11 Procedure for communication between ENTIS and CIU 888

ENTIS automatically generates a self-signed certificate to communicate with the CIU 888. To successfully establish secure communication with the CIU 888, the ENTIS self-signed certificate and the CIU 888 server certificate need to be trusted by each other. This can be done with the following steps:

1. Trusting server certificate, move the certificate from

C:\ProgramFiles(x86)\Honeywell\Entis\Communication\OPCUA\Certificates\EntisOPCUAClient\pki\rejected\certs

to

C:\ProgramFiles (x86)\Honeywell\Entis\Communication\OPCUA\Certificates\EntisOPCUAClient\pki\trusted\certs

2. Trusting client certificate.

a) Login to the CIU 888 Web portal and navigate to the **CONFIGURE** tab.

b) Click on **Manage Certificates** under the OPC UA Self Signed Certificates header. The ENTIS self-signed certificate can be seen in the **Rejected Certificate** section.
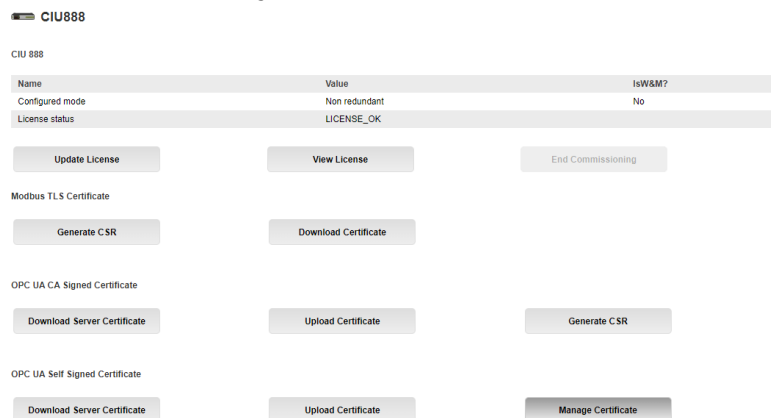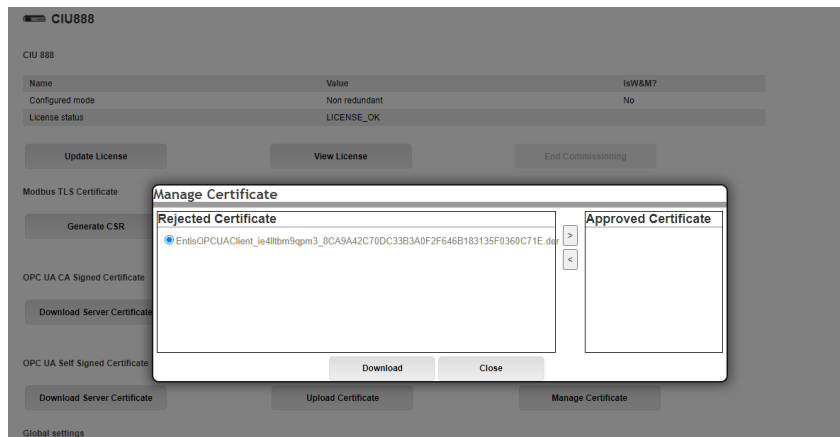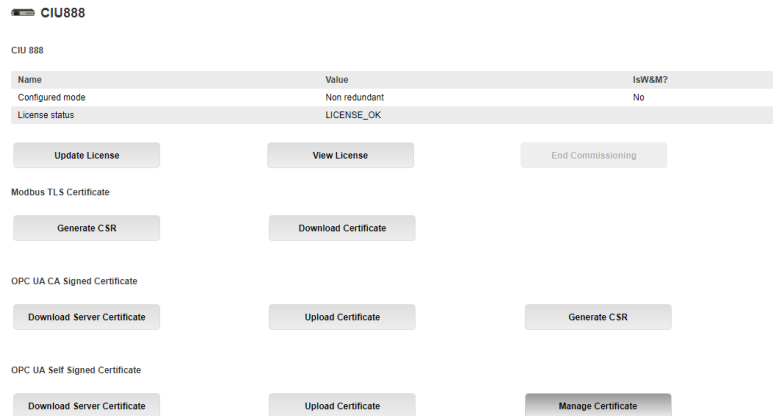

c) Select the certificate and move it to the **Approved Certificate** section.
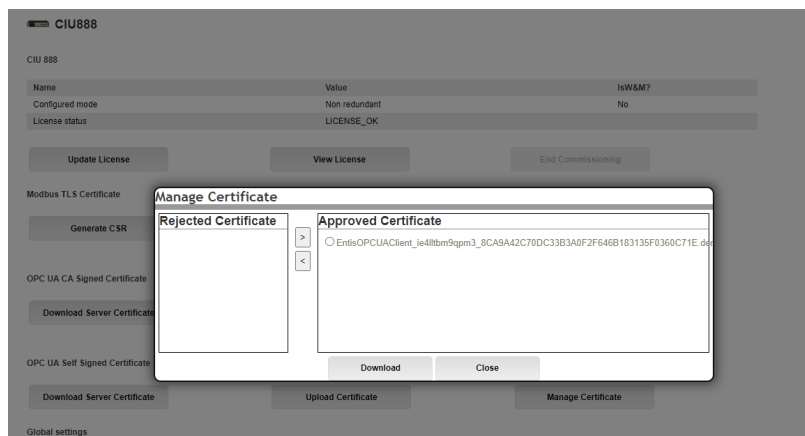
d) Click on Close and when prompted for a restart, click on Yes.Once the CIU restarts, ENTIS will communicate with the CIU securely over OPC.

NOTE: The ENTIS client certificate is valid for a period of 1 year after which a new certificate will be generated. The new certificate must be approved in a similar way.

5.12 Verifying the working of the system setup

The final step in the commissioning procedure is verifying if the redundant CIU 888 system setup is working properly. See section 4.10 for more information.

5.13 Sealing the CIU 888s

If the CIU 888s sealing option is licensed, the next step is to have them sealed by a representative of the LM authorities or by a LM accredited user. Refer to the CIU 888 Sealing Guide (Part No. 4417595) for more information.

NOTE: If the CIU 888s do not feature the option to be sealed, the W&M lock key switches and configuration lock key switches can either be locked or left unlocked.

CHAPTER 6 UPDATING CIU 888 SITE CONFIGURATION

If there are changes in the CIU 888 system setup, these changes must be implemented in the site configuration. Subsequently, the updated site configuration must be sent to the CIU 888 for the changes to become effective.

Changes in the CIU 888 system setup can be the result of the following. For example:

■ Connection of additional tank gauging instruments to the CIU 888

■ Connection of additional host systems to the CIU 888

■ Installation of a new CIU 888 license resulting in the expansion of the features and functionalities of the CIU 888 (e.g. redundancy, support of a larger number of tanks)

Perform the following steps to update the CIU 888 site configuration:

1. Implement the required changes in the site configuration, see section 6.3

2. Send the updated site configuration to the CIU 888, see section 6.4

3. Generate the INI files required for Entis Pro, see section 6.5

4. Start the Entis Pro system connected to the CIU 888, and load the INI files in Entis Pro, see section 6.6

5. Verify the working of the system setup, see section 6.7

6. Seal the CIU 888, see section 6.8

6.1 Requirements for updating the non redundant CIU 888 site configuration

The following requirements must be met in order to update the CIU 888 site configuration:

■ The CIU 888 must be switched on. See section 7.1.1 for more information.

■ For LM relevant parameters update, W&M lock key switch and Configuration lock key switch of the CIU 888 must be in 'unlocked' position. See section 7.2 for more information.

■ For non LM parameters update, Configuration lock key switch of the CIU 888 must be in 'unlocked' position. See section 7.2 for more information.

■ A PC/laptop running the CIU 888 Configuration System must be connected to the Service port or VPN port of the CIU 888 using a Cat. 5 Ethernet cable (patch or crossover). The Service port is

located at the front of the CIU 888 (see FIGURE 6-1). See Chapter 3 for more information about the CIU 888 Configuration System.
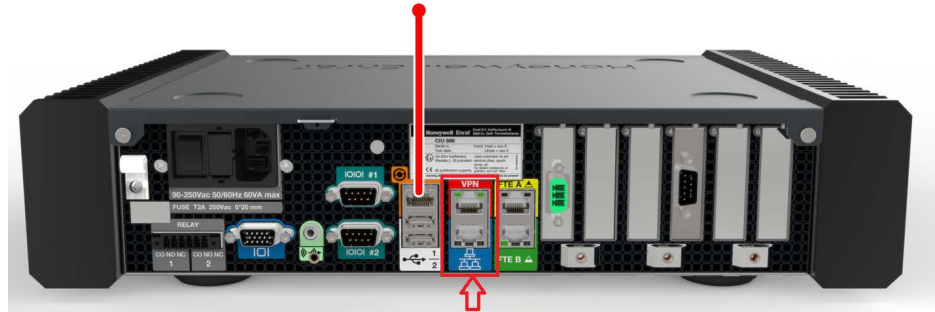
FIGURE 6-1   CIU 888: Service port

6.2 Requirements for updating the redundant CIU 888 site configuration

The following requirements must be met in order to update the CIU 888 site configuration:

■ The primary CIU 888 and the secondary CIU 888 must be in sync.

■ For LM parameters update, W&M lock key switch and Configuration lock key switch of Primary CIU 888 and Secondary CIU 888 must be in 'unlocked' position. See section 7.2 for more information.

■ For non LM parameters update, Configuration lock key switch of Primary CIU 888 and Secondary CIU 888 must be in 'unlocked' position. See section 7.2 for more information.

■ A PC/laptop running the CIU 888 Configuration System must be connected to the Service port of the CIU 888 using a Cat. 5 Ethernet cable (patch or crossover). The Service p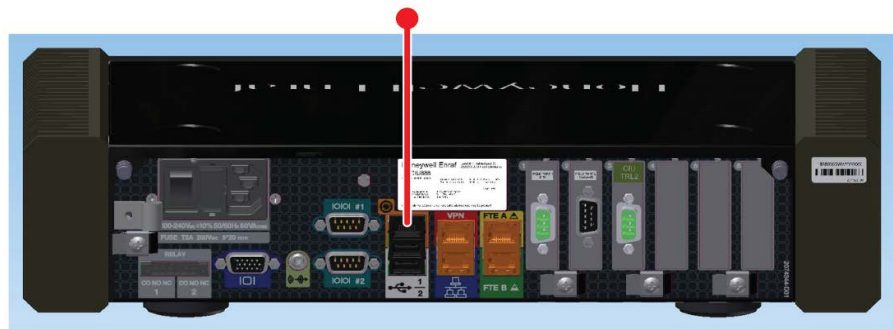ort is located at the front of the CIU 888 (see FIGURE 6-1). See Chapter 3 for more information about the CIU 888 Configuration System.

6.3 Implementing the required changes in the site configuration

Perform the following procedure to implement the required changes in the site configuration:

1. Launch CIU 888 Service Tool (refer to section 3.2.2).

2. Load the applicable CIU 888 site configuration (refer to section 3.7).

3. Navigate through the CIU site nodes and do the required changes. If any new site nodes are required, create and configure them (refer to section 3.2.5, section 3.2.6, section 3.2.7, section 3.2.9, and section 3.2.11).

6.4 Sending the site configuration to the CIU 888

When the site configuration is set up, send the site configuration to the CIU 888 using the CIU 888 Service Tool, see section 3.3.

NOTE: *In case of updating redundant CIU 888, the configuration should be sent to Primary CIU 888.*

6.5 Generating the INI files

When the site configuration is sent to CIU 888, the next step is to generate the INI files needed for Entis Pro. Refer to section 3.4 for detailed information about generating INI files using Service Tool.

6.6 Starting Entis Pro and reloading INI files in Entis Pro

When the INI files have been generated, then start the Entis Pro system connected to the CIU 888 and then load the INI files in Entis Pro. Refer to the *Configuration manual Entis Pro version 2.80x for Windows 10* (Part No. 4416381) for more information.

6.6.1 Using Entis as a host

To use Entis as a host, refer to the Entis Manuals in Honeywell Entis HUB accessible from *https://process.honeywell.com/us/en/products/ terminals/enraf-tank-gauging/entis-tank-inventory-system*

6.7 Verifying the working of the CIU 888 system setup

The final step in the procedure for updating the CIU 888 system setup is verifying if the system setup is working properly. See section 4.10 for more information.

6.8 Sealing the CIU 888

If the CIU 888 features the option to be sealed, the next step is to have it sealed by a representative of the LM authorities or by a LM accredited user. Refer to the *CIU 888 Sealing Guide* (Part No. 4417595) for more information.

NOTE: *If the CIU 888 does not feature the option to be sealed, the W&M lock key switch can either be locked or left unlocked.*

6.9 Special Operating Procedure to perform configuration updates on redundant CIU

CIU 888 has a private sync link between the Primary CIU and Secondary CIU through which the data gets synchronized. During configuration updates, the configuration is updated to Primary (Active) CIU and the configuration updates gets synchronized to Secondary (Passive) CIU through the private sync link. This is the recommended procedure for most of the customers as CIU 888 takes care of the configuration synchronization automatically and ensures both Primary CIU and Secondary CIU has the same configuration.

For certain customers, the need is slightly different. These customers want to perform the configuration updates to one CIU (Secondary CIU) in the redundant pair, test the configuration changes and if the configuration changes are working fine then update the configuration changes to the partner CIU. The following operating procedure needs to be followed to achieve this behavior. "CIU A" refers to the Active CIU and "CIU B" refers to the Passive CIU.

6.9.1 Updating configuration for Restart parameters

This section covers the configuration update procedure that involves restart of CIU 888.

1. Login to CIU A webpage and disable configuration synchronization. Proceed to the next step on seeing "configuration sync is disabled successfully" message.
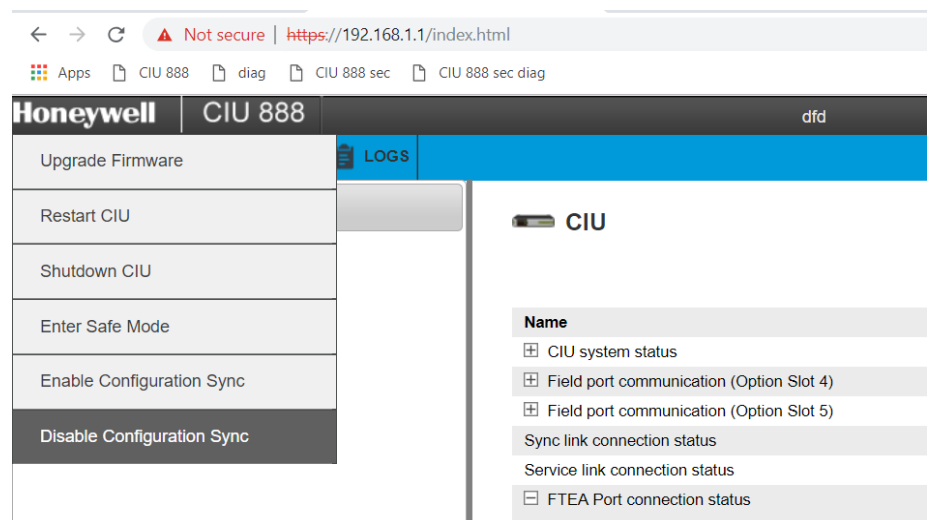
2. Make configuration changes in service tool/Ensite Pro tool.
3. Update configuration to CIU B by connecting via service/VPN port.

NOTE: *CIU B will restart and will take up Passive role with 1-99 in hot stand by window.*

NOTE: Generate INI files from CIU B by connecting via service/VPN port.

If Entis Pro is the host then reload INI files. If Entis is used as host then reload the site DB in Entis.

NOTE: a) Entis pro automatically issues switch over if CIU B had taken value 1-99 in hot standby window on step 3. After switch over, CIU A will take value as 1-99 and role as Passive and CIU B will take value 100 and role as Active.
b) If both the CIUs (A and B) have value as 100, then user has to make CIU B as Active by issuing a switch over command.

4. If configuration change is working as intended, skip to step 7.
5. Configuration change is not working as intended.
   If the Host is Entis Pro then connect to CIU A via service/VPN port and generate and reload INI files.
   If the Host is ENTIS then reload the site DB in Entis.

NOTE: a) Entis pro automatically issues switch over if CIU A had taken value 1-99 in hot standby window on step 5. Now CIU A will become active and take value as 100 and CIU B will become passive and take value as 1-99.
b) If both the CIUs (A and B) have value as 100, then user has to make CIU A as Active by issuing a switch over command.

6. Make configuration changes in Service Tool/Ensite Pro revert the configuration. Go to step 3.
7. Configuration update works as intended. Login to Active CIU (CIU B) web interface and enable configuration sync. This will restart the partner CIU A

NOTE: CIU A will restart and take up Passive role with Hot standby value 100.

8. Issue a switch over in Entis Pro. CIU A takes up Active role and CIU B will take up Passive role.

6.9.2 Updating configuration for Non-Restart parameters

This section covers the configuration update procedure that does not involve restart of CIU 888.

1. Login to CIU A webpage and disable configuration synchronization. Proceed to the next step on seeing "configuration sync is disabled successfully" message.
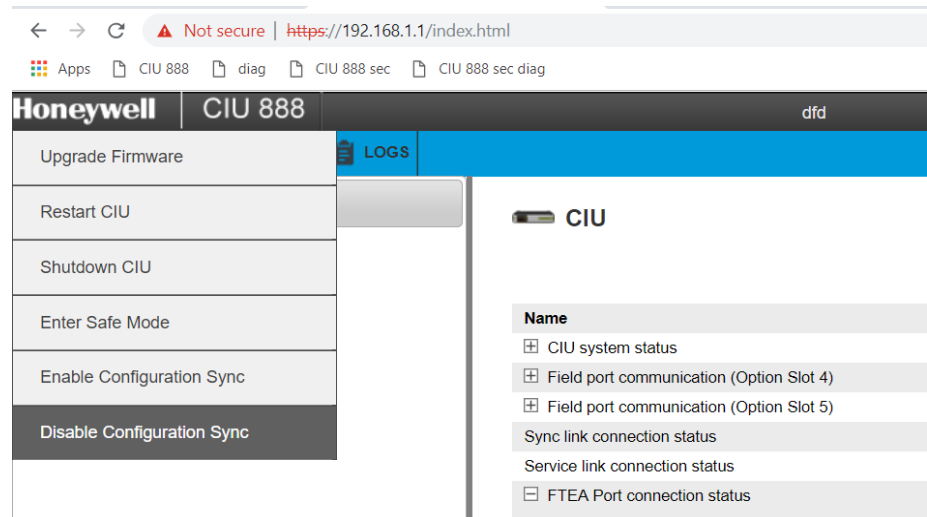
2. Make configuration changes in service tool/Ensite Pro tool.
3. Update configuration to CIU B by connecting via service/VPN port.

NOTE: CIU B remains Passive with value 100 or 1-99 in hot stand by window.

NOTE: Generate INI files from passive CIU B by connecting via service/VPN port.

If Entis Pro is the host then reload INI files. If Entis is used as host then reload the site DB in Entis.

NOTE: a) Entis pro automatically issues switch over if CIU B had taken value 1-99 in hot standby window on step 3. After switch over, CIU A will take value as 1-99 and role as Passive and CIU B will take value 100 and role as Active.
b) If both the CIUs (A and B) have value as 100, then user has to make CIU B as Active by issuing a switch over command.

4. If configuration change is working as intended, skip to step 7.
5. Configuration change is not working as intended.
   If the Host is Entis Pro then connect to CIU A via service/VPN port and generate and reload INI files.
   If the Host is ENTIS then reload the site DB in Entis.

NOTE: a) Entis pro automatically issues switch over if CIU A had taken value 1-99 in hot standby window on step 5. Now CIU A will become active and take value as 100 and CIU B will become passive and take value as 1-99
b) If both the CIUs (A and B) have value as 100, then user has to make CIU A as Active by issuing a switch over command.

6. Make configuration changes in Service Tool/Ensite Pro revert the configuration. Go to step 3.

7. Configuration update works as intended. Login to Active CIU (CIU B) web interface and enable configuration sync. This will restart the partner CIU A

NOTE: CIU A will restart and take up Passive role with Hot standby value 100

8. Issue a switch over in Entis Pro. CIU A takes up Active role and CIU B will take up Passive role.

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CHAPTER 7 GENERAL CIU 888 FUNCTIONS

7.1 (Re)starting and shutting down the CIU 888

7.1.1 Starting the CIU 888

When the CIU 888 is connected to the mains, you can start the CIU 888 using the on/off switch at the back of the device (see FIGURE 7-1).

FIGURE 7-1   CIU 888: on/off switch

During startup, the *CIU 888 Loading...* splash screen is shown on the CIU 888 display (see FIGURE 7-2).
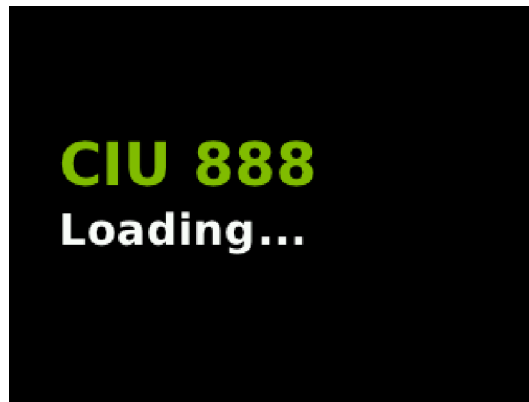
FIGURE 7-2   CIU 888 display: *CIU 888 Loading...* splash screen

NOTE: *If the CIU 888 is built into a storage cabinet, the on/off switch should be in the 'ON' position as it is no longer accessible. In this case, you can start the CIU 888 by switching on the mains.*

7.1.2 Restarting the CIU 888

You can restart the CIU 888 via the CIU 888 Web interface. To restart the CIU 888, select **Restart CIU** from the *CIU 888* menu (see FIGURE 7-3).
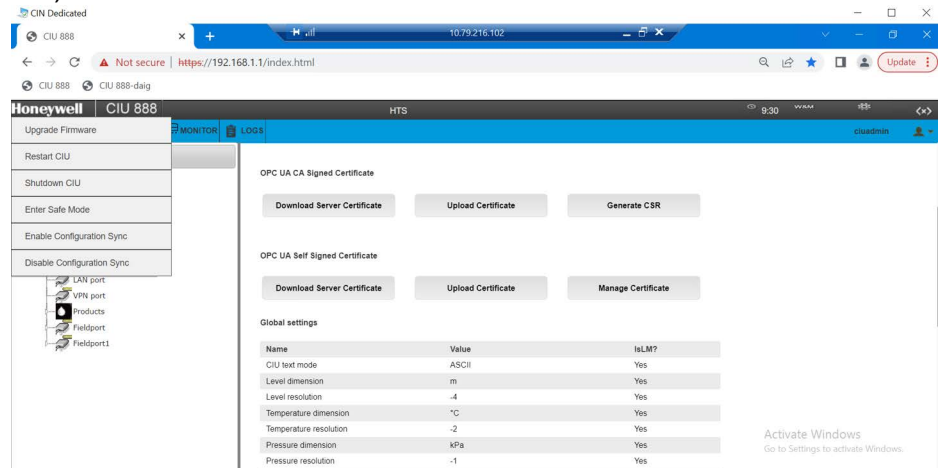
FIGURE 7-3   CIU 888 Web interface: *Restart CIU* option in *CIU 888* menu

During restart, the *CIU 888 Restarting...* splash screen is shown on the CIU 888 display (see FIGURE 7-4).

FIGURE 7-4   CIU 888 display: *CIU 888 Restarting...* splash screen

7.1.3 Shutting down the CIU 888

Shutting down the CIU 888 is necessary if, maintenance must be performed on the CIU 888 or if the CIU 888 must be replaced. You can shut down the CIU 888 via the CIU 888 Web interface. To shut down the CIU 888, select **Shutdown CIU** from the *CIU 888* menu (see FIGURE 7-5).
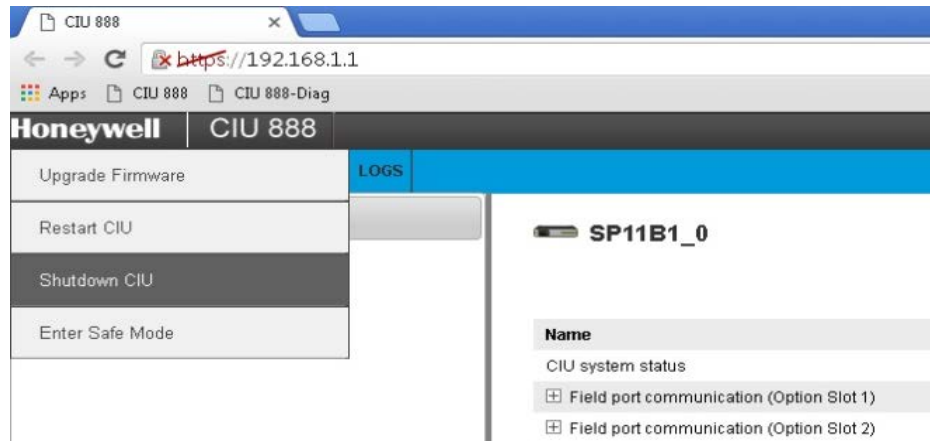
FIGURE 7-5   CIU 888 Web interface: *Shutdown CIU* option in *CIU 888* menu

NOTE: To switch the CIU 888 back, use the on/off switch at the back of the device, see section 7.1.1. Because the on/off switch is still in the 'ON' position, the on/off switch must be switched to the 'OFF' position first. Subsequently, the CIU 888 can be started by switching the on/off switch to the 'ON' position.

7.2 W&M lock key switch and Configuration lock key switch

The CIU 888 features two key switches located at the front of the device:

- W&M lock key switch, see section 7.2.1.
- Configuration lock key switch, see section 7.2.2.

7.2.1 W&M lock key switch

The W&M lock key switch is used for locking and unlocking the LM relevant configuration settings of the CIU 888. The key switch is located at the front of the CIU 888, and is fitted with a cover (see FIGURE 7-6).

FIGURE 7-6   CIU 888: W&M lock key switch

7.2.1.1 Unlocking the W&M relevant configuration settings

Perform the following steps to unlock the LM relevant configuration settings of the CIU 888:

1. If the cover of the W&M lock key switch is sealed, remove the hardware seal (wire) in order to get access to the key switch.
2. Take the key for locking/unlocking the W&M relevant configuration settings and insert it in the key switch. Then, turn the key counter-clockwise.

On the CIU 888 display, the status of the W&M lock key switch changes from [icon] ('locked') to [icon] ('unlocked') (see FIGURE 7-7).

FIGURE 7-7   CIU 888 display: W&M relevant configuration settings are unlocked

3. Remove the key from the key switch and store it.

7.2.1.2 Locking the LM relevant configuration settings

Perform the following steps to lock the W&M relevant configuration settings of the CIU 888:

1. Take the key for locking/unlocking the W&M relevant configuration settings.
2. Insert the key in the W&M lock key switch. Then, turn the key clockwise.
   On the CIU 888 display, the status of the W&M lock key switch changes from [icon] ('unlocked') to [icon] ('locked') (see FIGURE 7-8).

FIGURE 7-8   CIU 888 display: W&M relevant configuration settings are locked

3. Remove the key from the key switch and store it.

7.2.2 Configuration lock key switch

The Configuration lock key switch is used for locking and unlocking the configuration settings (non-LM relevant and LM relevant) of the CIU 888. The key switch is located at the front of the CIU 888 (see FIGURE 7-9).

FIGURE 7-9   CIU 888: Configuration lock key switch

7.2.2.1 Unlocking the configuration settings

Perform the following steps to unlock the configuration settings of the CIU 888:

1. Take the key for locking/unlocking the configuration settings.
2. Insert the key in the Configuration lock key switch, and then turn the key counterclockwise.
   On the Status Dashboard, the status of the Configuration lock key switch changes from ('locked') to ('unlocked') (see FIGURE 7-10).

FIGURE 7-10   Status Dashboard: configuration settings are unlocked

3. Remove the key from the key switch and store it.

7.2.2.2 Locking the configuration settings

Perform the following steps to lock the configuration settings of the CIU 888:

1. Take the key for locking/unlocking the configuration settings.

2. Insert the key in the Configuration lock key switch, and then turn the key clockwise.
   On the Status Dashboard, the status of the Configuration lock key switch changes from ![unlocked icon] ('unlocked') to ![locked icon] ('locked') (see FIGURE 7-11).

FIGURE 7-11   Status Dashboard: configuration settings are locked

3. Remove the key from the key switch and store it.

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APPENDIX A DATA HANDLING

A.1 Engineering units

System engineering units are required for proper rounding of the internal engineering units. The system engineering units are selected during the configuration of the CIU 888, and also in a later stadium when the settings of the CIU 888 are configured (partly or fully) and the CIU 888 is operational. The CIU 888 Web interface presents the configuration settings in the selected system engineering units.

The CIU 888 supports the same set of engineering units as supported by the Service Tool.

A.2 Data presentation

A.2.1 Decimal and thousand separators

A.2.1.1 Decimal separator

The CIU 888 displays its floating point numeric data with a decimal separator which is either a dot (default) or a comma. Other characters are not allowed. A number cannot start nor end with a decimal separator. For example, '0.2' is correct, but '.2' is not correct.

NOTE: The decimal separator parameter is under the W&M seal.

A.2.1.2 Thousand separator

The CIU 888 displays its numeric data with a thousand separator which is either a dot, a comma (default) or no separator (space). Other characters are not allowed. The thousand separator is applied before and after the decimal separator to group three digits. A number cannot start nor end with a thousand separator.

NOTE: The thousand separator parameter falls under the W&M seal.

A.2.1.3 Configuring the decimal separator and thousand separator

The decimal separator and thousand separator are both initialized during setup of the site configuration in Service Tool, and are taken from the settings configured for the PC/laptop running Service Tool.

To configure the decimal separator and thousand separator:

1. On the PC/laptop running Service Tool, go to ⊞ (**Start**) > **Control Panel**.
   The *Control Panel* is displayed (see FIGURE A-1).
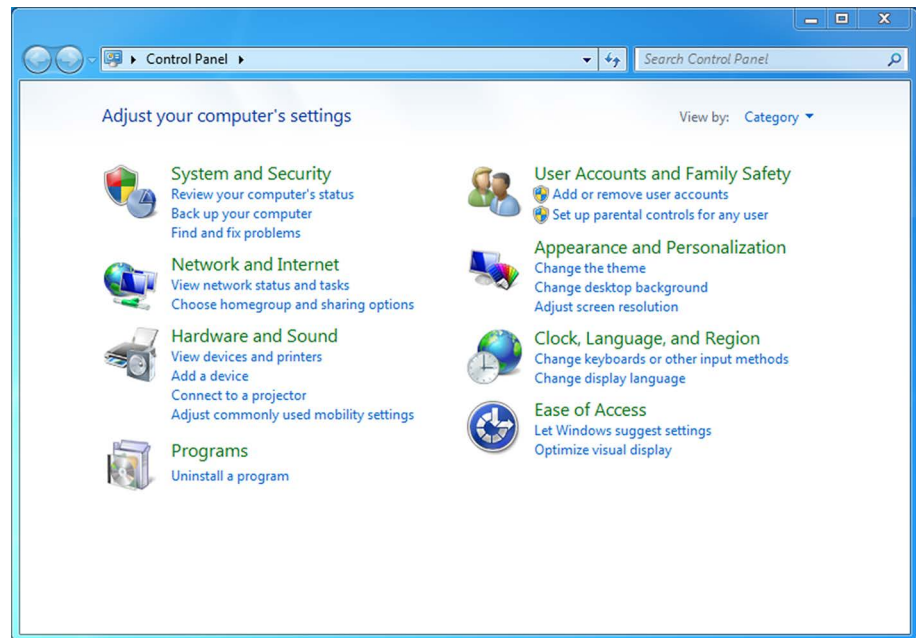
FIGURE A-1   Control Panel

2. Click **Clock, Language, and Region**.
   The *Clock, Language, and Region* window is displayed (see FIGURE A-2).
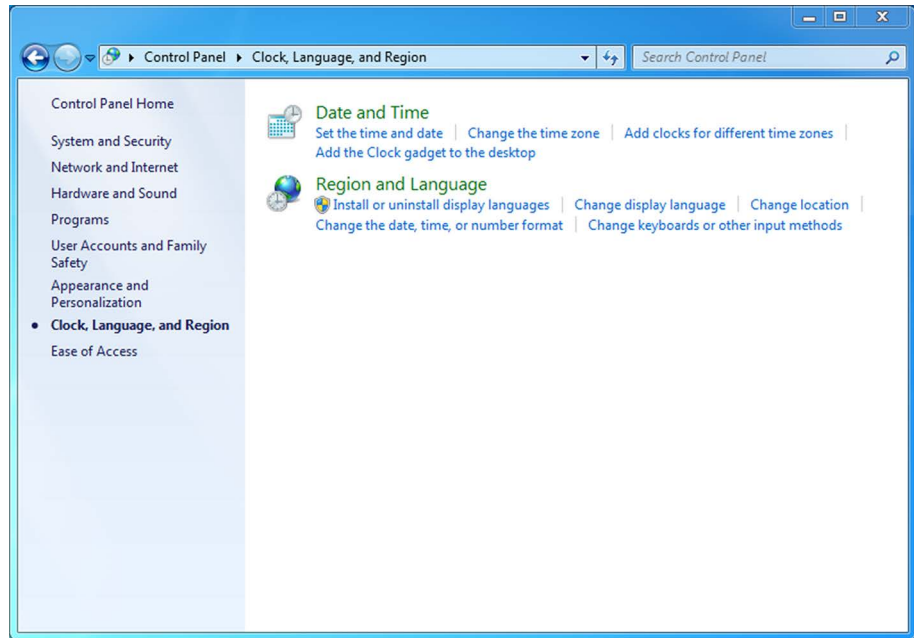
FIGURE A-2   *Control Panel: Clock, Language, and Region window*

3. Click **Region and Language**.
   The *Region and Language* window is displayed. By default, the *Formats* tab is displayed (see FIGURE A-3).
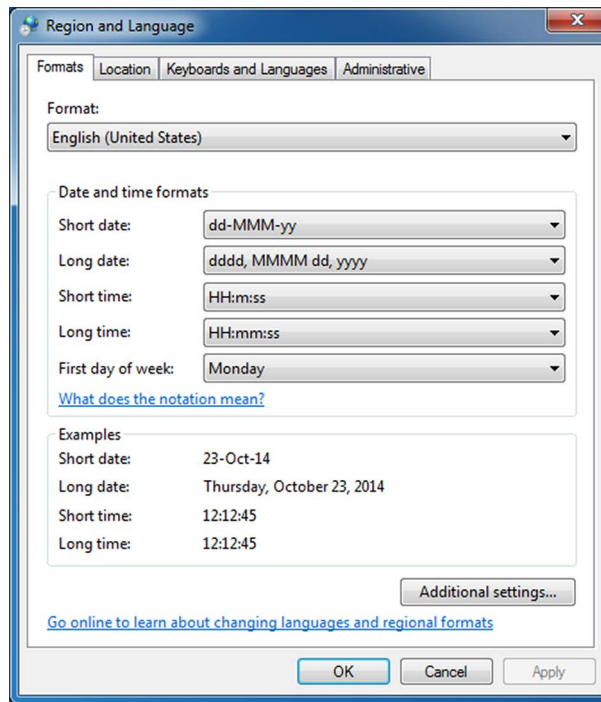
FIGURE A-3   *Region and Language* window

4. Click **Additional settings...**.
    The *Customize Format* window is displayed (see FIGURE A-4).
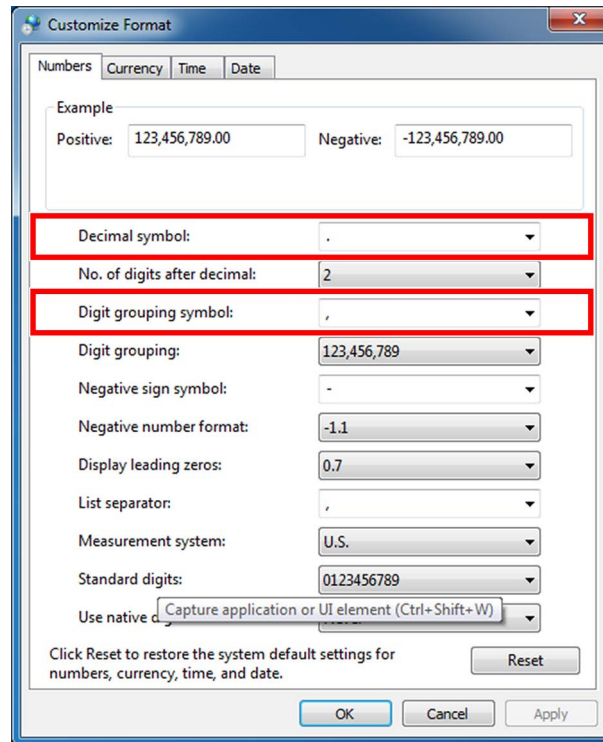
FIGURE A-4   *Customize Format* window

5. From the list box next to 'Decimal symbol:' select the symbol to be used as decimal separator.
6. From the list box next to 'Digit grouping symbol:' select the symbol to be used as thousand separator.
7. Click **OK** to save the settings and to close the window.

A.2.2 Time stamped data

Measured and calculated data is accompanied with a time stamp with the same resolution as the time stamp configured in the CIU 880.

See section A.2.3 for more information about time resolutions.

A.2.3 Date and time presentation

A.2.3.1 Date

Dates are always presented in ISO format, i.e. YYYY-MM-DD, where:

■ YYYY = the year (all digits)
■ MM = the month (01 (January) to 12 (December))
■ DD = the day (01 to 31)

For example, '3rd October 2013' is presented as 2013-10-03.

A.2.3.2 Time

Times are presented in one of the following formats:

■ Times in minutes resolution are presented as hh:mm

■ Times in seconds resolution are presented as hh:mm:ss

■ Times in milliseconds resolution are presented as hh:mm:ss.ttt

where:

■ hh = zero-padded hour between 00 and 24

■ mm = zero-padded minute between 00 and 59

■ ss = zero-padded second between 00 and 60

■ ttt = zero-padded between 000 and 999

NOTE: *The AM/PM part of time should not be at the start. So time format AM 03:55 is not allowed. Only the standard windows time formats are supported.*

A.3 List of entities not needing restart after a change

TABLE A-1   List of CIU 888 entities that do not require a restart after changing

Entity Name	Entity Number
VolumeCorrections	24
ProductTRef	26
ProductDref	30
ProductDrefStatus	31
SedAndWater	32
ProductTC	33
ProductTCStatus	34
LiqVolRatio	35
ProductLevel	40
ProductLevelStatus	41
WaterLevel	42
WaterLevelStatus	43
ProductTemp	44
ProductTempStatus	45
VapRoomTemp	46
VapRoomTempStatus	47
VapRoomPressure	48

Entity Name	Entity Number
VapRoomPressureStatus	49
Dobs	50
DobsStatus	51
WaterVol	56
WaterVolStatus	57
MolarWeight	79
TankTRef	90
ThermalexpCoeffTankshell	91
TankAirDensity	92
AmbientTemperature	103
AmbientTemperatureStatus	104
InsulationFactor	109
LowestTemperatureElement	110
Tobs	118
TobsStatus	119
CTL (VCF)	124
CTLStatus	125
TCF	126
TCFStatus	127
DCF	128
DCFStatus	129
TankTypeStatus	133
ShellCapacityStatus	134
LowTOVStatus	135
HighTOVStatus	136
GSVCalcTypeStatus	138
ProductCodeStatus	139
VolumeCorrectionsStatus	140
ProductTRefStatus	142
SedAndWaterStatus	143
LiqVolRatioStatus	144
MolarWeightStatus	145
TankTRefStatus	155
TankTCStatus	156
AirDensityStatus	157
InsulationFactorStatus	158

Entity Name	Entity Number
WaterDipOffset	2070
NegativeLevelsEnabled	2073
Moving TripValue	2100
MovingIntervalTime	2101
StandardAmbientAirPressure	3026
TankPressureOrientation	3028
GaugeAlarmHandling	3045
IPConfigurationCRC	3508
IPDipswitchStatus	3511
TankZoneControl	4003
TankZoneStart	4004
TankZoneEnd	4005
TankZoneCorrection	4006
FloMul	5042
FloIntervalTime	5043
GaugeDetail	6500
GSVCalcType	8122
ProductCode	8123
AlphaType	2155
SampleDensityStatus	9133
SampleTemperatureStatus	9135
ProductConfigurationCRC	9160

APPENDIX B SCANNING

The main task of the CIU 888 is scanning the connected tank gauging instruments continuously for the measured values of the connected devices.

B.4 Scanning Philosophy

CIU 888 incorporates time-based scanning for better scanning performance. CIU 888 maintains a scan items pool per field port / sequenced field ports that has the list of scan items to be scanned. Each scan item is allocated a minimum scan period and a maximum scan period. Minimum scan period is the minimum expected time interval at which the scan item must be scheduled in milliseconds and maximum scan period is maximum time interval within which the scan item must be scheduled in milliseconds.

Based on the scan periods and current scanning pattern of the scan items, CIU 888's scanning algorithm picks up the most useful item among all the scan items configured for a field port and sends it to the field. In case of sequenced field ports (channel sequencing), CIU 888's scanning algorithm picks up the most useful item among all the scan items configured for the field ports that are sequenced.

Following are the various scan items processed by CIU 888.

B.5 Configured Foreground scan items

The CIU 888 scans measurable data inputs (for example, product level) that are configured in the foreground scan more often than data inputs configured in the background scan.

In tank gauging, the most important data to retrieve from gauging instruments on a tank is the level. The core competency of the scanner is to update each value on a regular basis. If tank calculation is part of the solution, a change of each new level value triggers the calculations module to recalculate the tank record.

B.6 Configured Background scan items

Measured data inputs that do not change frequently, for example the average temperature of a tank, do not need to be scanned with the same scan rate as the values that are scanned in the foreground scan.

The CIU 888 scans all measurable data inputs that are configured in the foreground with a higher priority ((i.e) less minimum and maximum scan period) than the measurable data inputs that are configured in the background scan.

B.7 Command scan items

When gauge commands are issued from the Host system, gauge command scan items are added to the scan items pool. Gauge commands scan items are scheduled with a higher priority ((i.e) less minimum and maximum scan period) than configured foreground and background items.

B.8 Service Messages

When service messages are issued from Service tools like Engauge, Winsetup service messages are added to the scan items pool. Service messages are scheduled with a higher priority ((i.e) less minimum and maximum scan period) than configured foreground and background items.

Adaptive scanning based on field device communication failures:

8. Field device retries are made smarter and spread rather than configured consecutive retries.

9. If the communication errors are received for the configured number of retries for a field device, the priority of all the scan items for that field device will be reduced and retries are skipped until a valid response is received for that field device.

10. On receiving a valid response from the field, the priority of the field device is moved to the appropriate level and retry mechanism is restored.

B.9 Priority Agent

CIU 888 also incorporates a Priority Agent which monitors the product movement and product level close to Tank High limit and relatively prioritizes the scan items by modifying the minimum and maximum scan periods of the scan items so that critical parameters are scanned at a faster rate compared to the less critical parameters. Priority agent can be enabled / disabled with a configuration option.

Priority Agent is disabled - CIU 888 scans the field using a static time based scanning algorithm for foreground and background scan items. No priority changes happen based on Product movement and Tank High Monitoring Limit.

Priority Agent is enabled - CIU 888 scans the field using a dynamic time scanning algorithm based on the Product movement and Tank High monitoring limit. Scan item's priority changes happen based on Product movement and Tank High Monitoring Limit. That is, a relative prioritization is done between static tanks (tanks with no product movement), dynamic tanks (tanks with product movement), dynamic tanks in which product level is beyond the configured Tank high monitoring limit.

The following table provides various priority levels incorporated in CIU 888.

Priority	Scenario
Very High	Product level when it is close to Tank high limit (beyond the configured Tank high monitoring limit) and product movement is detected.
High	Service messages received over Service Ethernet port Command scan messages.
Above Normal	Product level when detected to be moving in a specific direction. Product level when it is close to Tank high limit and no product movement is detected Product level when it is close to Tank high limit, and device communication errors occur irrespective of product movement being detected / not.
Normal	Foreground parameters (for example, Level) of static tanks i.e. no product movement is detected. Product level of tanks where it was moving when device communication errors occur, Service / emulation messages received over serial host ports.
Below Normal	Background parameters (for example, Temperature, Density) Foreground parameters (for example, Level) of static tanks when device communication errors occur.
Low	Background parameters of tanks when device communication errors occur.

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APPENDIX C   REDUNDANCY

C.10   Sync Link and database synchronization

Redundancy between a pair of CIU 888s is realized by synchronizing the databases of the CIU 888s. Real-time and continuous synchronization ensures that all recently measured data is available to both CIU 888s and is required to minimize switch-over time.

To achieve real-time and continuous synchronization, a dedicated Ethernet connection between the pair of CIU 888s must be established, called the Sync Link. The Sync Link connection is also used to determine the actual role of each CIU 888 (active or passive). To establish the Sync Link connection, the CIU 888s have to be connected by means of a Cat. 5. Ethernet cable.

In a redundant CIU 888 system setup, the following data stores are kept synchronized:

■ Real-time data

■ Active gauge commands, including status

■ Configuration data

■ Operational data (manual overwrites and gauge commands)

■ Clock

NOTE: A failure in the Sync Link connection will disable a synchronization.

The Sync Link port is located at the back of the CIU 888 (see FIGURE C-5).

FIGURE C-5   CIU 888: Sync Link port

C.11 Supported redundant CIU 888 topologies of deployment

The following redundant CIU 888 topologies of deployment are supported:

■ RS-232 host port redundancy with redundant CIU 888s and host port redundancy on demand of host system (see C.11.1)

■ RS-232 host port redundancy with redundant CIU 888s and data synchronization by host system (see C.11.2)

■ Modbus TCP host port redundancy with redundant CIU 888s and data synchronization between host systems

■ OPC UA TCP host port redundancy with redundant CIUs

C.11.1 RS-232 host port redundancy with redundant CIU 888s and host port redundancy on demand of host system

In this configuration, both CIU 888s in the redundant configuration are connected to the same host system, for example, Entis Pro (see FIGURE C-6). The CIU 888s are connected to the host system via one of their fixed host ports. Each host port has its own unique RTU address and is configured for communication through Modbus RTU on serial.
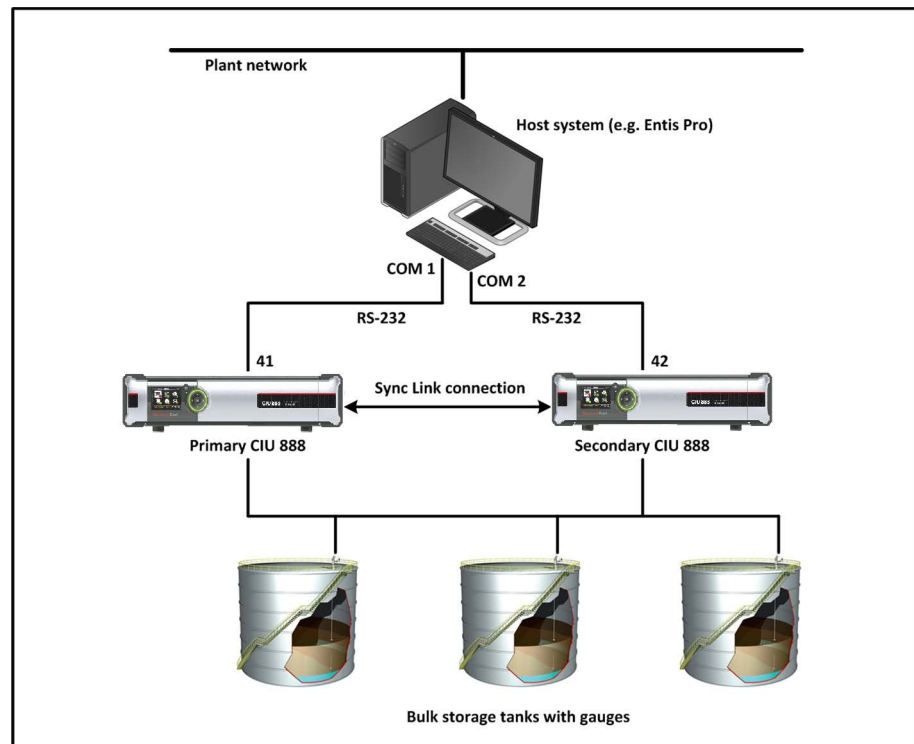
FIGURE C-6   RS-232 Host port redundancy with redundant CIU 888s and host port redundancy on demand of host system

This configuration is compliant with Entis Pro or any other modbus host system. By issuing the appropriate Modbus command, Entis Pro can demand to switch over to the secondary CIU 888 if the primary CIU 888 is not responding anymore and move to Com2/Port 42 to acquire tank data. The secondary CIU 888 becomes the active CIU and its host port becomes R/W.

NOTE: *Refer to the chapter 'CIU Plus Links' in the Configuration Manual Entis Pro 2.80x for Windows (Part No. 4416381) for more information about connecting the CIU 888 to the Entis Pro system.*

C.11.2 RS-232 host port redundancy with redundant CIU 888s and data synchronization between host systems

In this configuration, each CIU 888 in the redundant configuration is connected to a separate host system, for example, Entis Pro (see FIGURE C-7). The CIU 888s are connected to the host system via one of their fixed Host ports. Each host port has its own unique RTU address and is configured for communication through Modbus RTU on serial. By connecting each CIU 888 to a separate instance of Entis Pro, an extra safety is created in the event of failure of one of the two host systems.
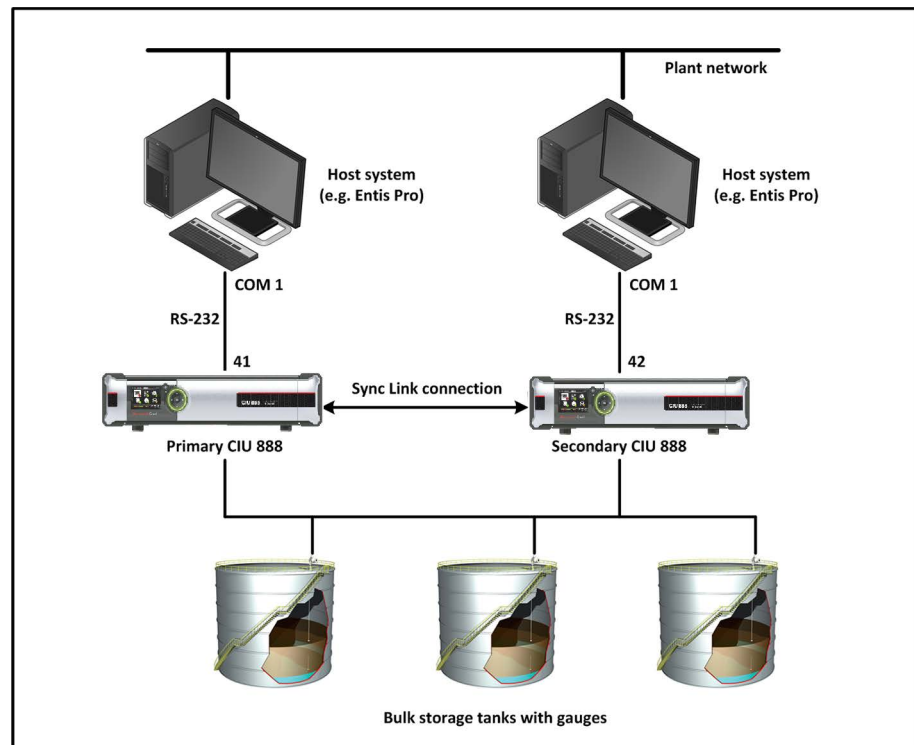
FIGURE C-7   RS-232 host port redundancy with redundant pair of CIU 888s and data synchronization between host systems

This configuration is compliant with Entis Pro or any other modbus host system. By issuing the appropriate Modbus command, Entis Pro can demand to switch over to the secondary CIU 888 if the primary CIU 888 is not responding anymore and move to Com2/Port 42 to acquire tank data. The secondary CIU 888 becomes the active CIU and its host port becomes R/W.

NOTE: *Refer to the chapter 'CIU Plus Links' in the Configuration Manual Entis Pro 2.80x for Windows (Part No. 4416381) for more information about connecting the CIU 888 to the Entis Pro system.*

C.11.3 Modbus TCP host port redundancy with redundant CIU 888s and data synchronization between host systems

In this configuration, both CIU 888s in the redundant configuration are connected to the Honeywell Experion PKS ((see FIGURE C-8)) and to other Modbus TCP/IP hosts. The CIU 888s are connected to Experion FTE Networks via FTE A & FTE B ports. CIU 888s acts as non-FTE nodes on FTE network. Each ethernet port has its own unique IP address and is configured in Modbus TCP/IP hosts for communication. Also, LAN ports can be connected to LAN network which can further be accessed by other Modbus TCP/IP client host systems.

At CIU 888 level, Modbus maps are created with Unique Unit ID which can be configured in Modbus TCP/IP Client host systems. This way, each configured map can be accessed in any Modbus TCP/IP ports.
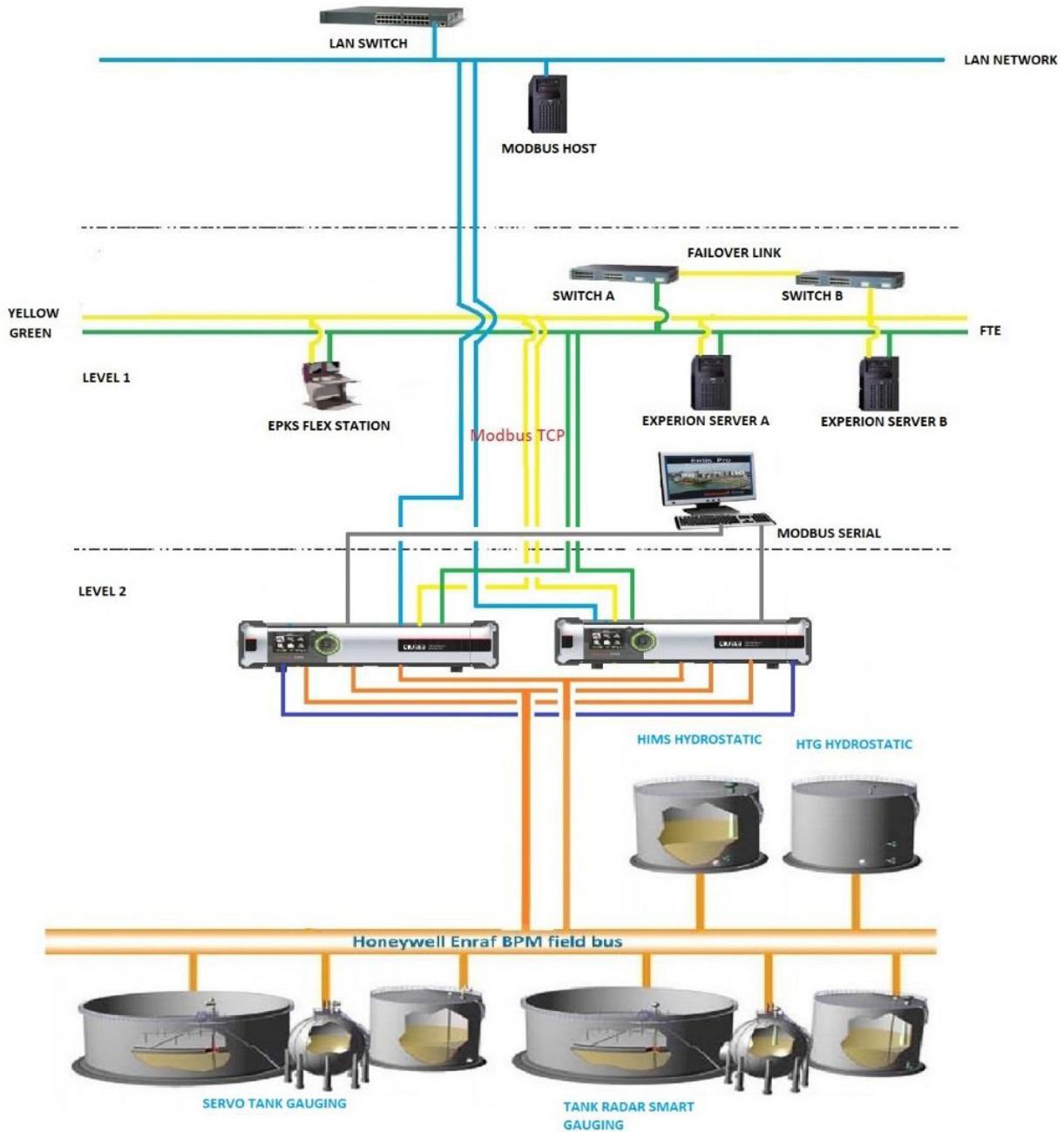
FIGURE C-8   Modbus TCP host port redundancy with redundant CIU 888s and data synchronization between host systems

C.11.4 OPC UA TCP host port redundancy with redundant CIU 888s and data synchronization between host systems

In this configuration, both CIU 888s in the redundant configuration are connected to the Honeywell Experion PKS ((see FIGURE C-8)) and to other Modbus TCP/IP hosts. The CIU 888s are connected to Experion FTE Networks via FTE A & FTE B ports. CIU 888s acts as non-FTE nodes on FTE network. Each ethernet port has its own unique IP address and is configured in Modbus TCP/IP hosts for communication. Also, LAN ports can be connected to LAN network which can further be accessed by other Modbus TCP/IP client host systems.
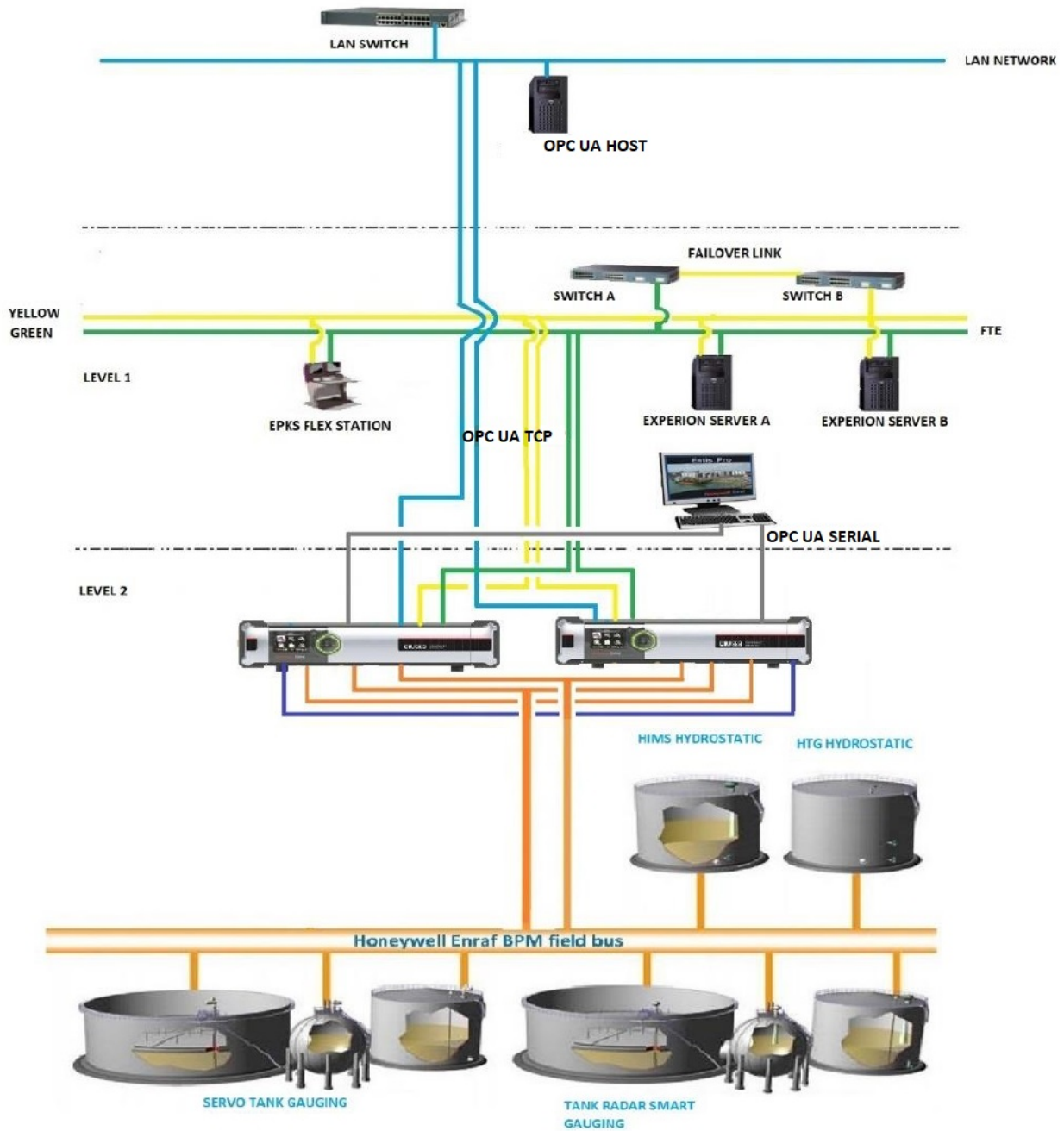
FIGURE C-9   OPC UA TCP host port redundancy with redundant CIU 888s and data synchronization
                     between host systems

C.12 Redundant CIU 888-Experion PKS Integration

Redundant CIU 888 and Experion PKS Integration requires necessary configuration changes in CIU 888 using Service tool and in Experion PKS using Quick Builder.

C.12.1 Configuring CIU 888

Perform the below steps for the required CIU 888 configuration using CIU 888 Service tool:

1. On **CIU 888** node, click **FTE A** port.

2. By default, the **FTE** tab appears displaying the **Properties** details.

3. Enter appropriate details in the **IP address** and **Modbus port number** fields.

4. Select the **Tranparency Mode** and **IP switch over decision maker** check boxes and click **Apply.**
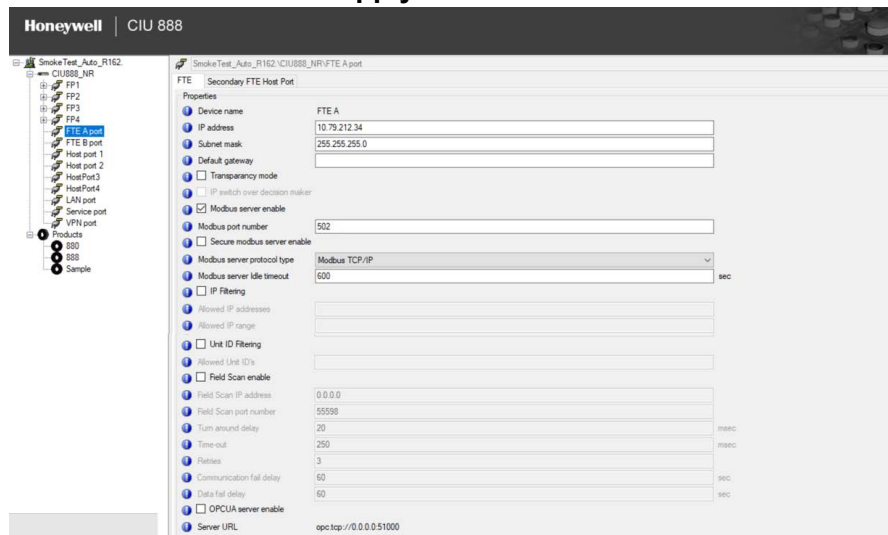
5. Click **Secondary FTE Host Port** tab to view the **Properties** details.
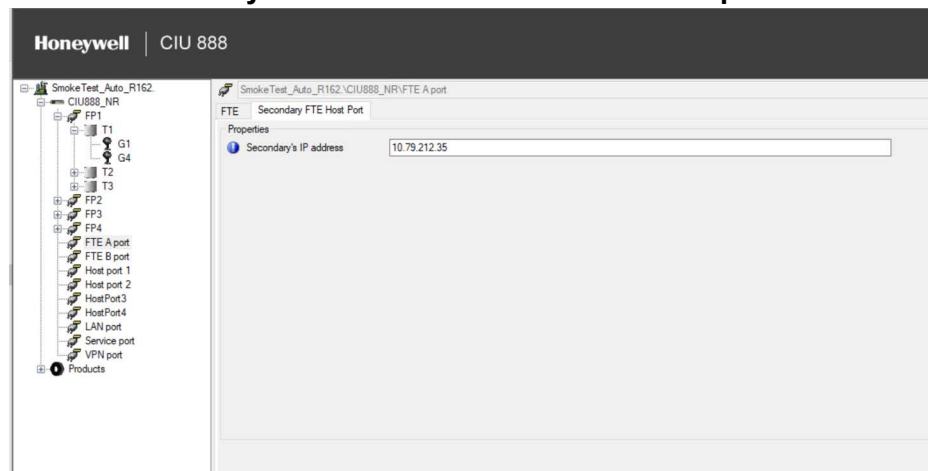
6. Enter an appropriate IP address in the **Secondary's IP address** field. (For example, if configured Primary CIU 888's IP address is

given as 10.79.212.182 then the configured Secondary's IP address can be given as 10.79.212.184)

7. Click **Apply.**

8. On **CIU 888** node, click **FTE B** port.

9. By default, the **FTE** tab appears displaying the **Properties** details.

10. Enter appropriate details in the **IP address** and **Modbus port number** fields.

11. Select the **Tranparency Mode** and **IP switch over decision maker** check boxes and click **Apply.**
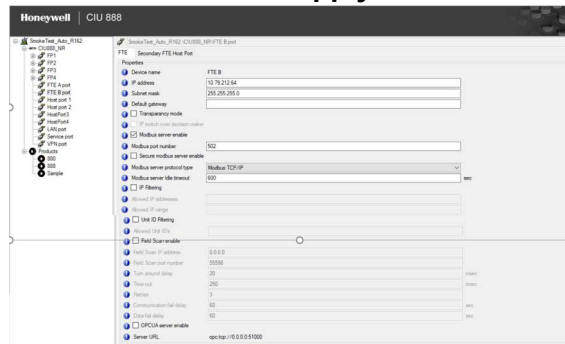
12. Click **Secondary FTE Host Port** tab to view the **Properties** details

13. Enter an appropriate IP address in the **Secondary's IP address** field. (For example, if the configured Primary CIU 888's IP address is given as 10.79.212.183 then the configured Secondary's IP address can be given as 10.79.212.185).
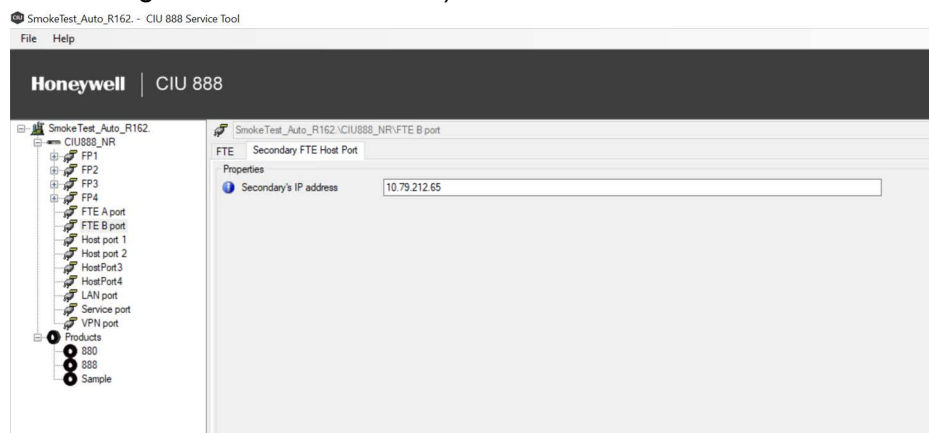
CIU 888 is now configured for Experion PKS integration.

NOTE: When Redundant CIU 888 is integrated with Experion PKS, the IP address of the FTE A & FTE B should be configured in the same subnet.

C.12.1.1   Configuring Modbus maps

Configure Modbus maps in CIU 888 for Experion PKS based on the site requirement.   Refer to Configuration manual section 3.2.14 for more information on Modbus maps configuration procedures.

C.12.2 Configuring Experion PKS

Perform the below steps for the required Experion PKS configuration using Quick builder in Configuration Studio.

1. On the **CIU 888A** node, click **Channels**.

2. Under the **Main** tab, enter details in the **Name** and **Description** fields.
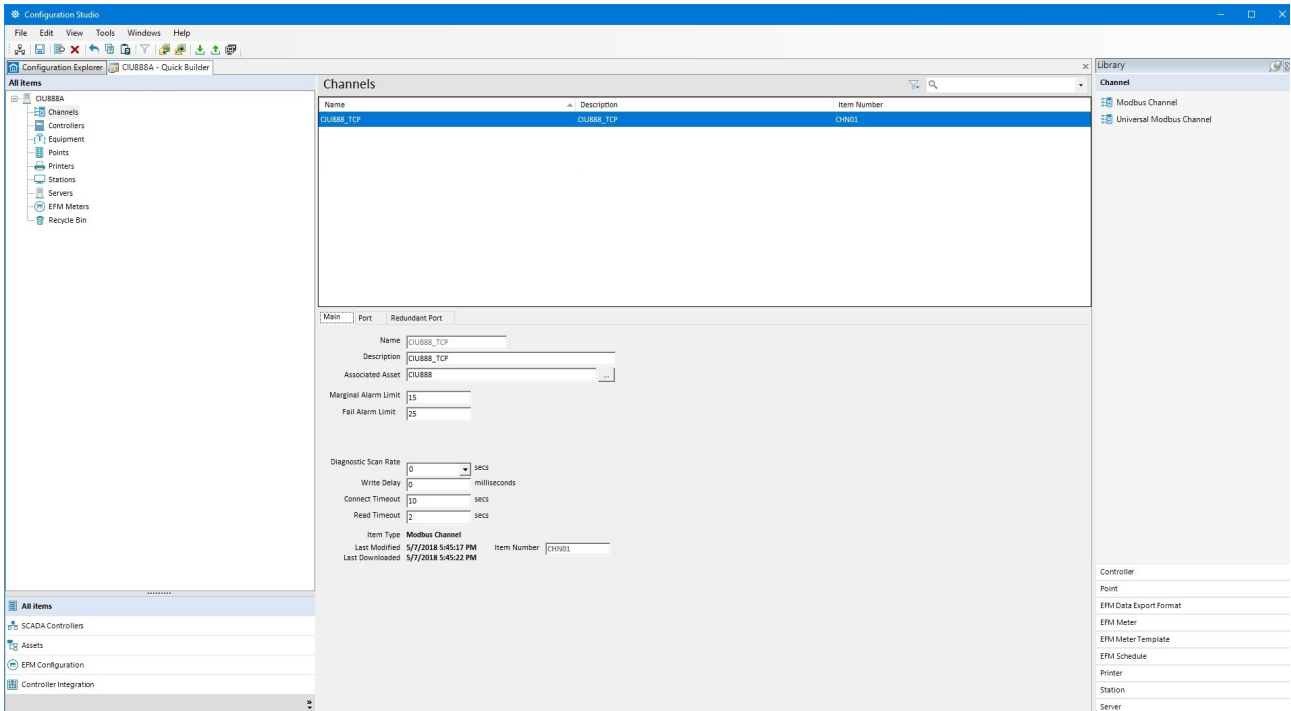
3. Under the **Port** tab, choose **LANVendor** from the **Port Type** drop-down list and **Modbus TCP** from the **Network Type** drop-down list.
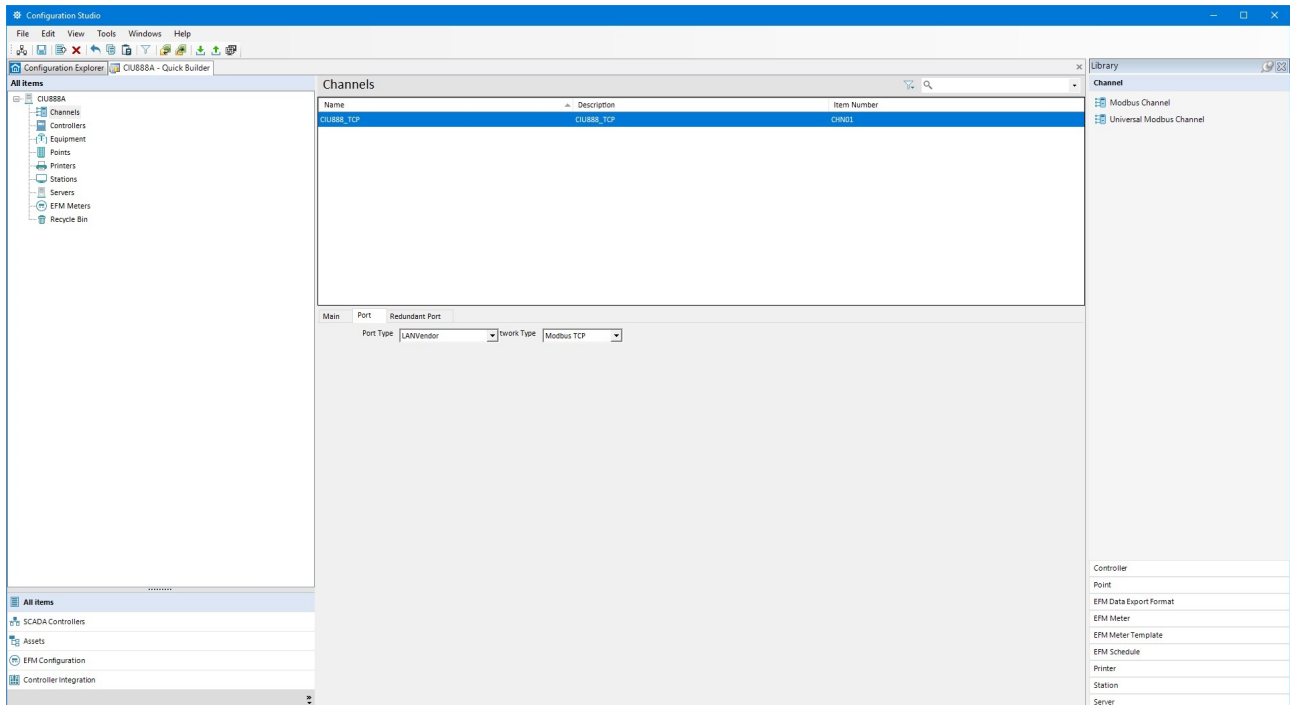
4. Under the **Redundant Port** tab, choose **RedundantLANVendor** from the **Port Type** drop-down list and **Modbus TCP** from the **Network Type** drop-down list.
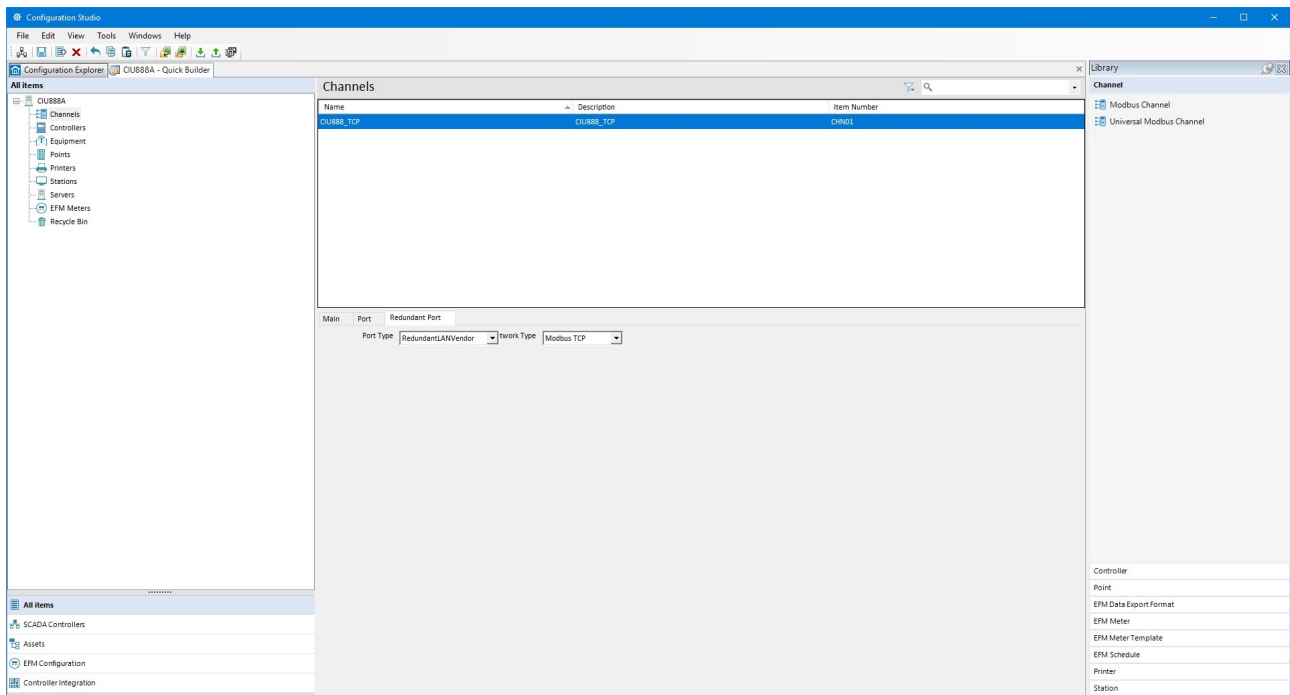
C.12.2.1 Configuring Modbus Controllers

Create Modbus Controller for different type of data inputs and outputs based on the site requirement.

For example, for Holding Registers which are required for calculated and measured parameters, a Modbus Controller "ANALOG" is created as below and associated with configured Modbus Channel which is CIU 888_TCP. The IP Address 1 and IP Address 2 are configured with Primary CIU 888's FTE A and FTE B IP address.

For example, if Primary CIU 888's FTE A IP address is 10.79.212.182 and FTE B IP address is 10.79.212.183, then configure IP Address 1 as 10.79.212.182 & IP Address 2 as 10.79.212.183. Also, configure the port numbers as per the CIU 888 FTE A/FTE B configurations.

PLC Station ID should be configured based on the Unit ID selected for Modbus map created in CIU 888 for Experion PKS integration. For example, if the Modbus map for Experion PKS is created with Unit ID as 1, then PLC Station ID should be configured as 1.

ANALOG modbus controller for holding registers is shown in the figure below.
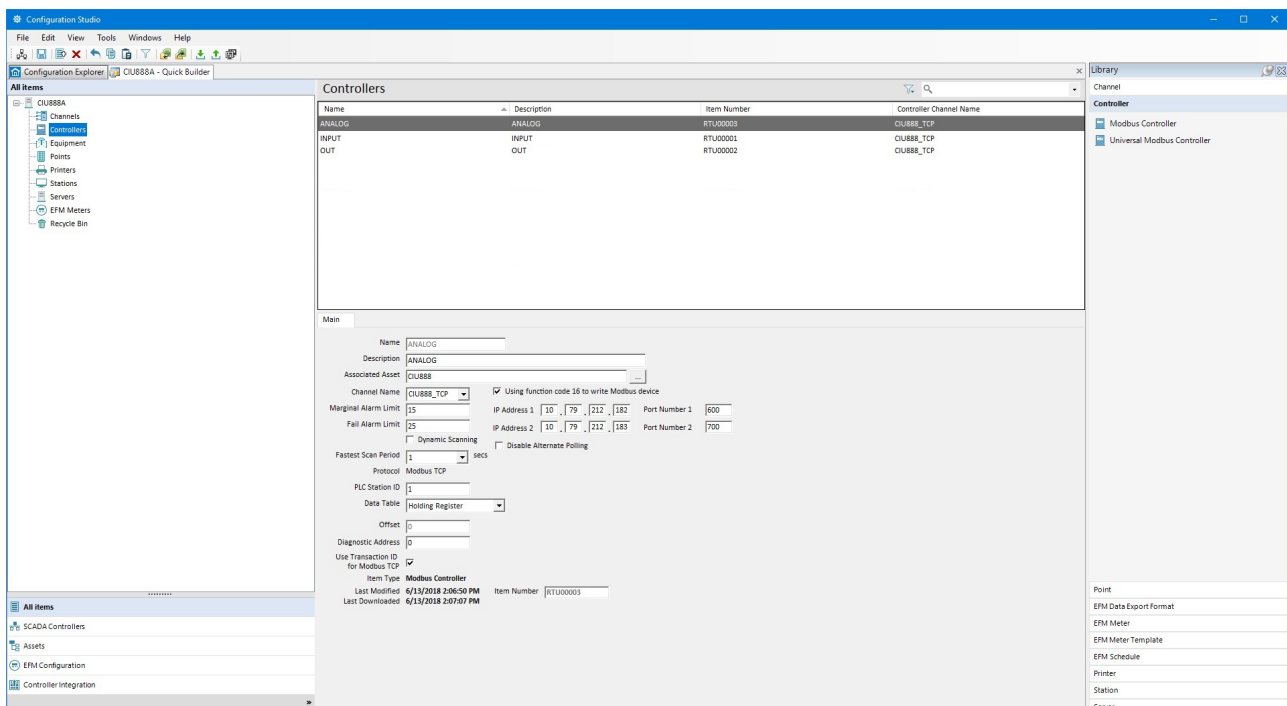
Similarly, for Digital Inputs (or Read Discrete Inputs) "INPUT" controller is created and for Digital Outputs (Write Coils) "OUT" controller is created and downloaded to server.

Digital Input Controller for Read Discrete Inputs is as shown in the figure below.
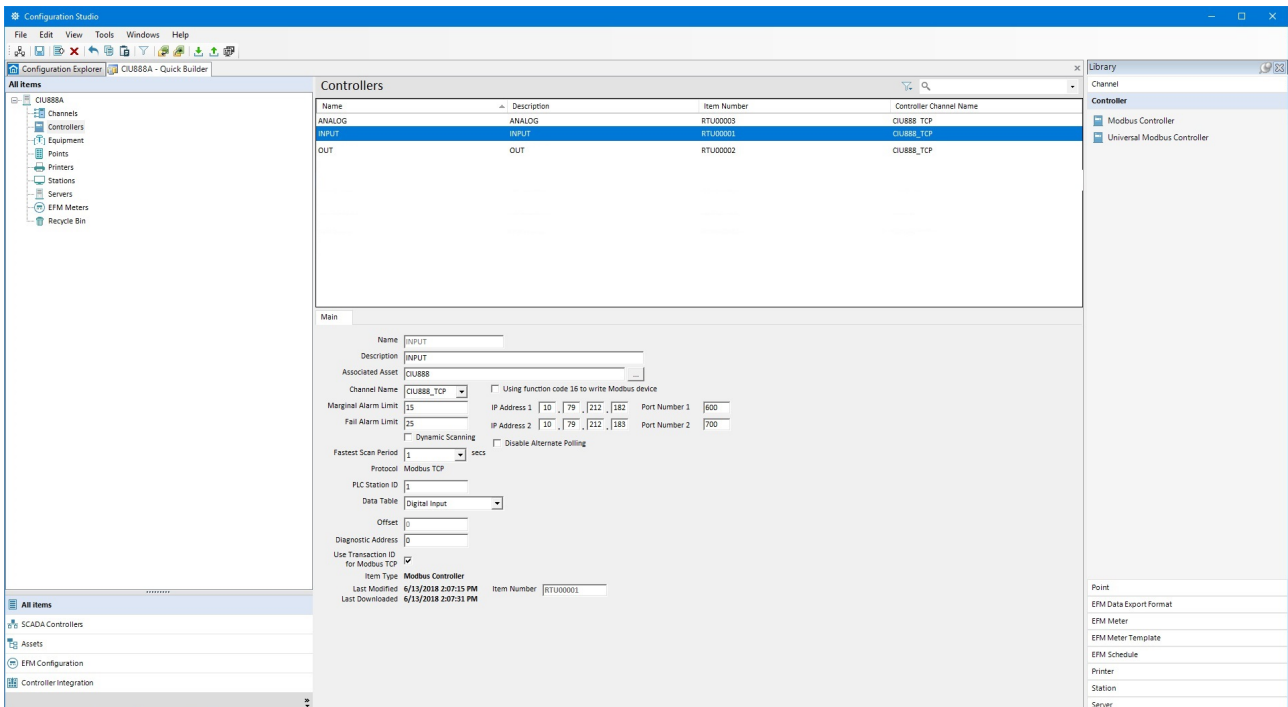
Digital Output Controller for Write Coils is as shown in the figure below.
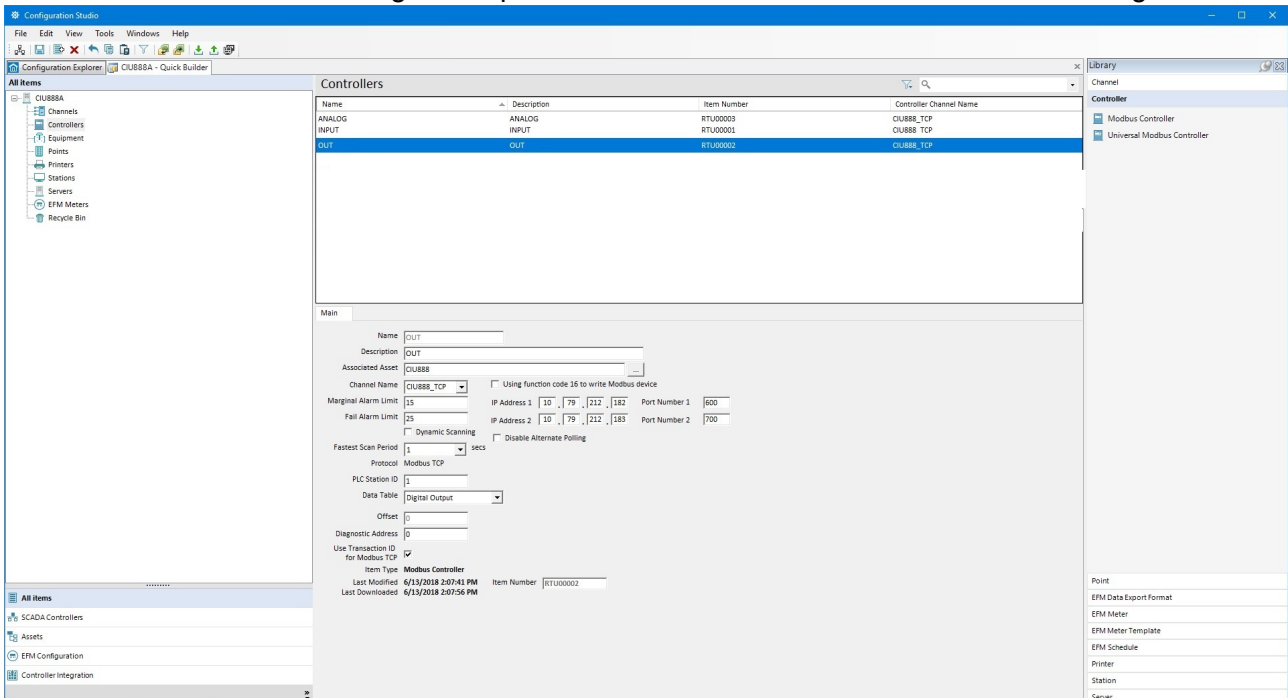
C.12.3 Configure Modbus Points

Based on the Datatypes and Function codes, different points can be created which can be associated to the Modbus Controllers configured earlier.

C.12.3.1 Point configuration for Host initiated switchover

CIU 888's redundancy is controlled by host initiated switchovers. Hence, the following configuration needs to be done in Experion PKS to initiate switchovers.

C.12.3.2 Configure Digital Output Points (Switchover Command)

For the Switchover command, a Status point SWITCHOVERCOMMAND needs to be created in Quick Builder and associate to OUTPUT controller created in step 2.2.3.
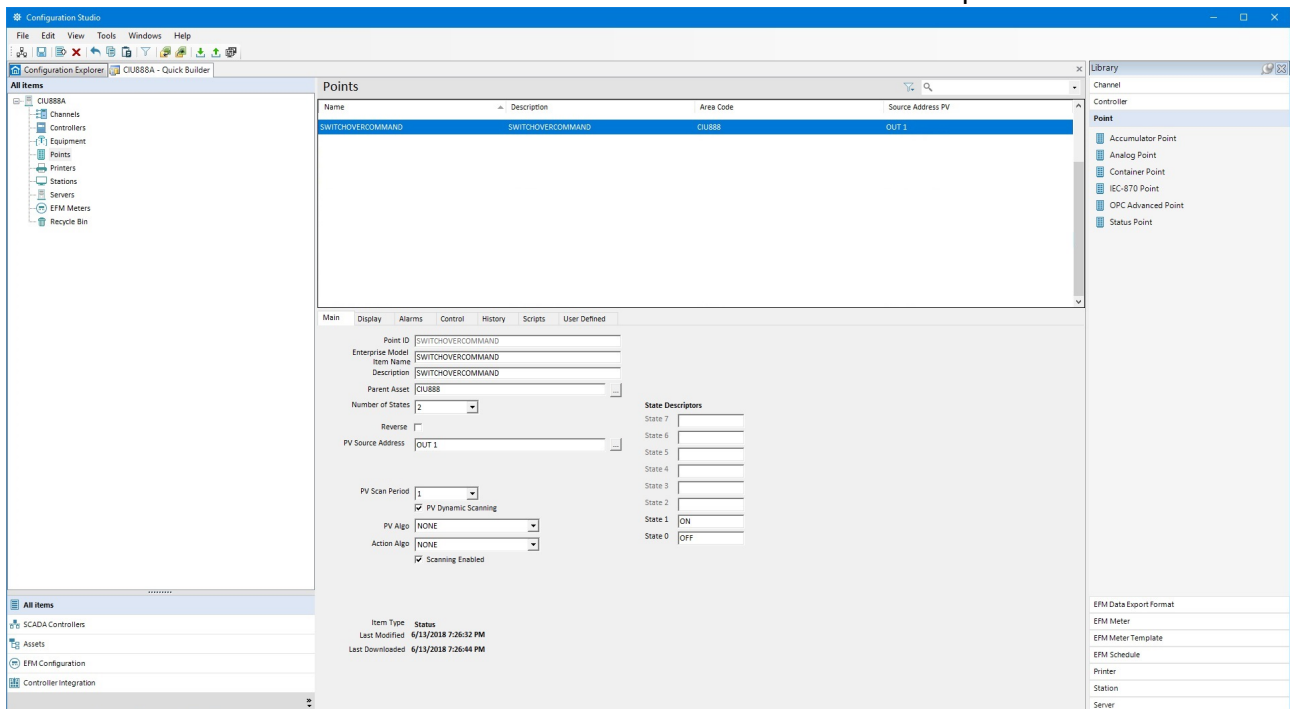
The PV Source address is given as OUTPUT 1(where OUTPUT is Controller and 1 indicates the Modbus address of Coil Output to initiate

as switchover command in CIU 888). Then configure Source and Destination Address as OUTPUT 1 and download the point to server.
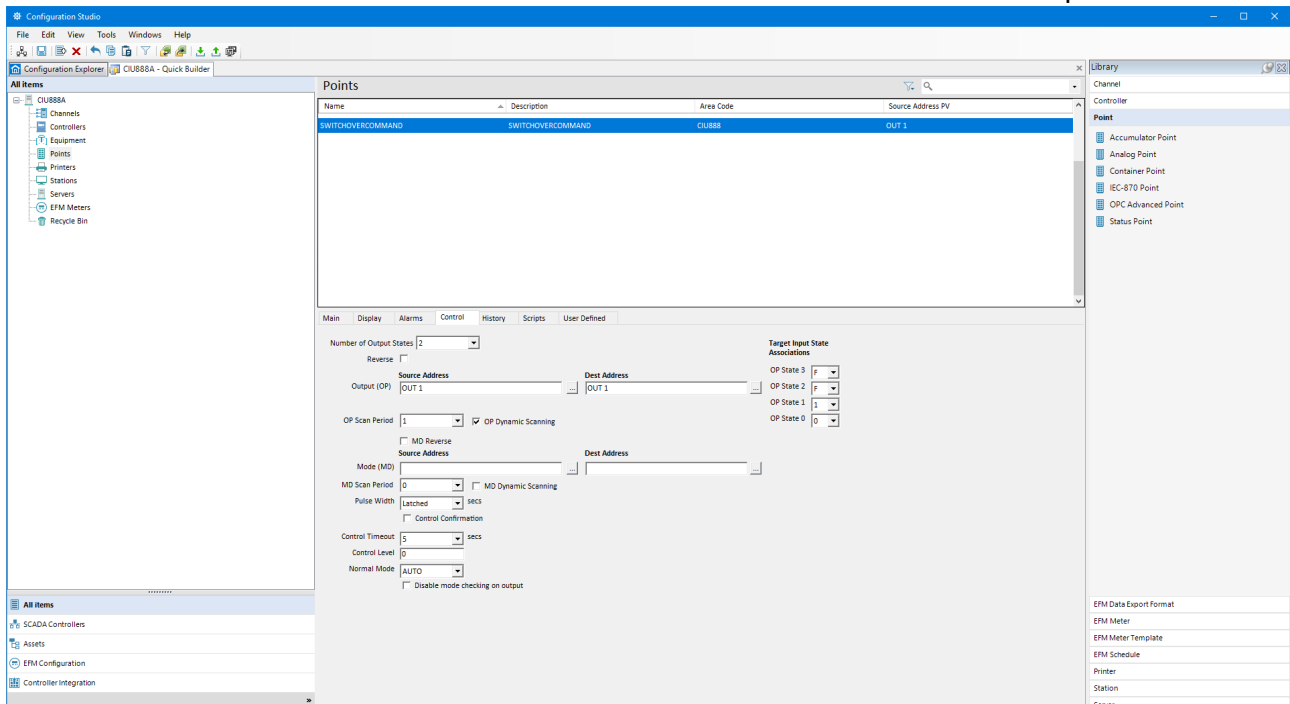
C.12.3.3   Configure Digital Input(Hotstandby Status)

HOTSTANDBYSTATUS is a Digital Input created for getting the Hotstandby Status of CIU 888. This is associated to the INPUT controller and the PV Source Address is given as INPUT 1 (where INPUT indicates the Controller & 1 indicates the Modbus address of the Hotstandby status of CIU 888).

Configure Number of States as 2 and configure state Descriptors as State 1="ON" and State 0="OFF". This will be used in Server scripting for executing automatic switchover from Experion PKS.
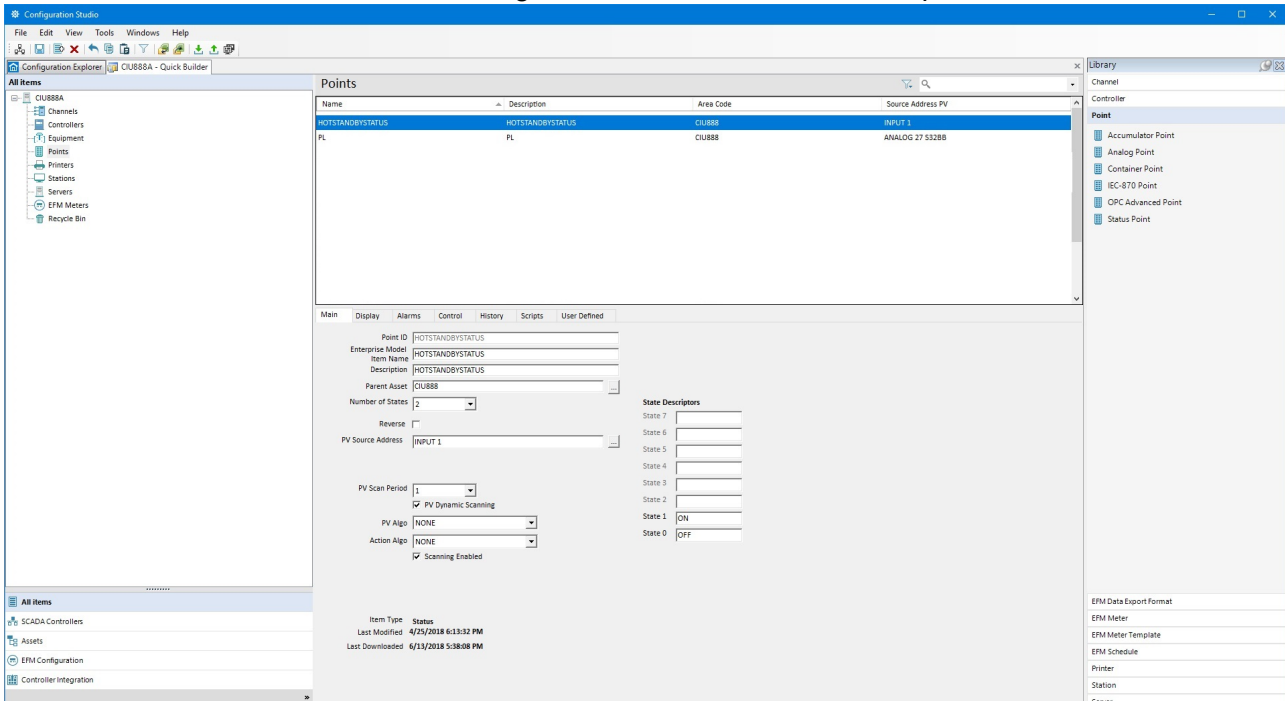
In the Scripts Tab under HOTSTANDBYSTATUS status point, click on Create New or Edit existing server scripts.

"Configure Event as OnChange.

"Configure Script Engine as Automatically Allocate

"Configure Parameter as PV.

"Copy the below script to the script editor.

if ucase(ParamValue("HOTSTANDBYSTATUS.PV"))= ucase("ON") then

ParamValue("SWITCHOVERCOMMAND.OP")= ucase("ON")

end if

NOTE: *This script will check the Hotstandby Status periodically (HOTSTANDBYSTATUS.PV) and whenever it changes to ON (which indicates CIU 888 as PASSIVE), a switchover command*

(SWITCHOVERCOMMAND.OP=ON) is issued to CIU 888 so that the CIU 888 becomes ACTIVE.
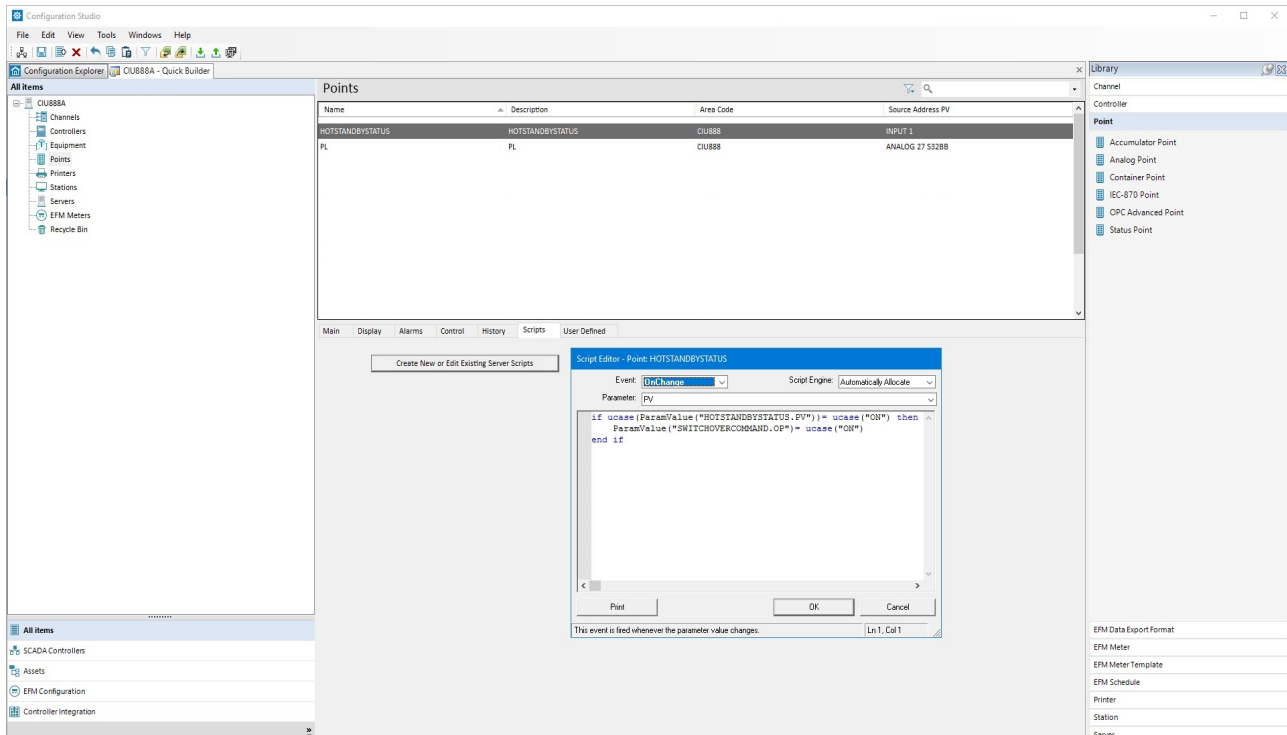
For the Write Coil for giving Switchover command to CIU 888 to make ACTIVE in-case of PASSIVE state, a SWITCHOVERCOMMAND.OP is created which is associated to OUTPUT controller. The PV Source Address is given as OUTPUT 1 which needs to configured in control tab of the point for write.

C.12.4 Configure Points for CIU 888 parameters:

Configure the required points for CIU 888 parameters in Experion PKS.

For example, for Product Level (PL) which is a holding register, under points in Quick Builder > Add Item>Item Type- Analog point is created with name "PL". This is associated to the ANALOG controller and the address format is selected based on EPKS standard format (eg: for 32 signed integer the address format is S32BB, so the PV Source Address

is configured as ANALOG 27 S32BB. In this example Product Level is available at Modbus address 26 in CIU 888).
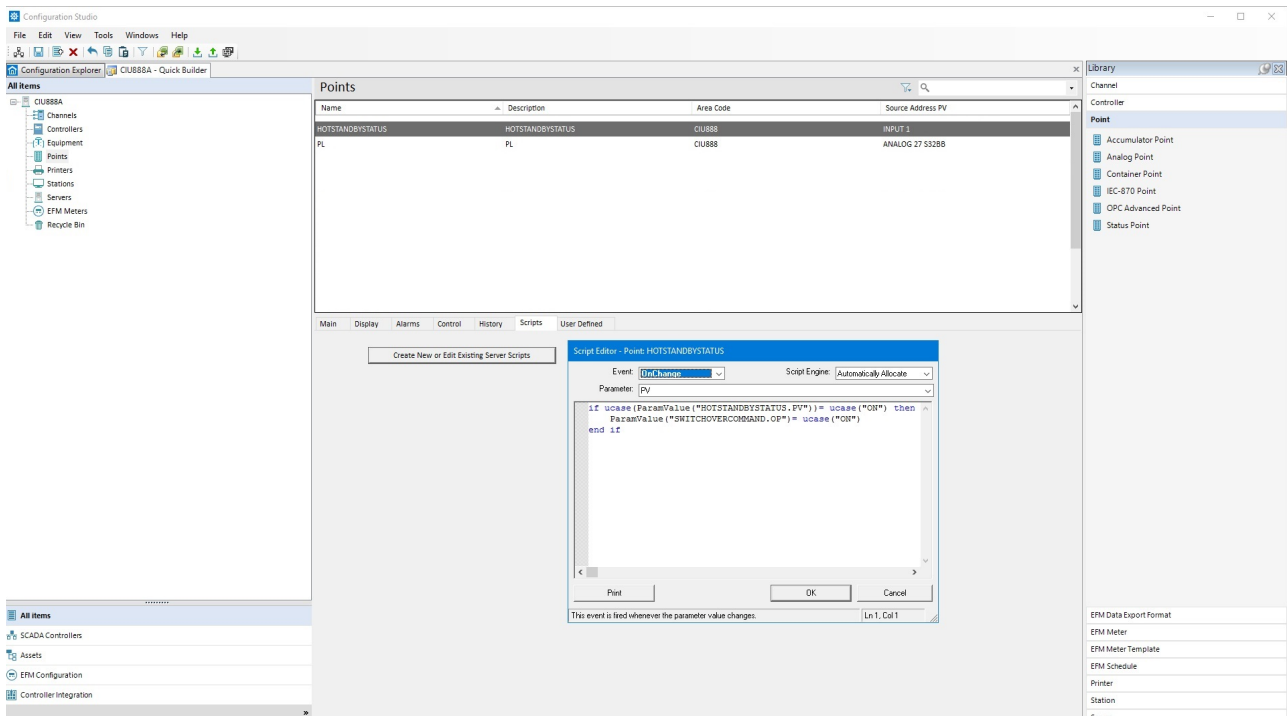
NOTES: 1. *For more information on datatype conversion in Experion PKS, refer to Knowledge Builder of Experion PKS.*

2. *After configuration of all required points, enable configured Modbus channel and Modbus controllers in Experion PKS station.*

3. *Ensure that the created Server Script engine is in Running state in Experion PKS station.*

APPENDIX D TANK CAPACITY TABLE

Refer to the below table for the Tank Capacity Table format.

Strap File Example				Description
[TANK_ID]				[Tank Identification]
Name	=	TNK-03		ASCII string: the name of the tank
Date	=	15-Feb-15		ASCII string: the date this file is generated
Time	=	12:34:00 PM		ASCII string: the time this file is generated
Level	=	2		1 = m xxx.xxxx 2 = mm xxxxxx.x 3 = ft xxx.xxxx 4 = in xxxx.xxx 5 = in/16 xxxxxx.x
Volume	=	51		50 = l xxxxxxxxx 51 = m3 xxxxxx.xxx 52 = USgal xxxxxxx.x 53 = bbls xxxxxxx.xx
Ullage	=	0		0 = innage 1 = ullage
Straps	=	6		Number of straps
[STRAPS]				[Strap data (level vs. volume)]
1	=	-233.0		first (and lowest) strap
2	=	100.0		
3	=	1006.3		
4	=	2001.7	10732.000	
5	=	10032.0	52721.000	
6	=	20531.4	98321.000	last (and highest) strap
[KSISTRAPS]				KSISTRAPS section is optional. It is required only if RIC is configured.In case of water strap table KSISTRAPS section is not required.
1	=	0.168	-	
2	=	0.333	-	
3	=	0.950	-	
4	=	1.843	-	
5	=	2.277	27.3562	
6	=	4.064	27.3999	
[EOF]				[End Of File]

This format is same for Tank TCT and Water TCT

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APPENDIX E DENSITY TABLE FORMAT

Refer to the below table for the Density Table format.

Density File Example				Description
[PRODUCT_ID]				
Name	=	Petrol		ASCII string: the name of the Liquid
Date	=	01-06-92		ASCII string: the date this file is generated
Time	=	11:05:16		ASCII string: the time this file is generated
Temperature	=	20		
Density	=	60		
DensityPoints	=	174		
[DENSITY_POINTS]				
1	=	4,4	1054,2449	
2	=	5,0	1053,9333	
3	=	5,6	1053,6098	
4	=	6,1	1053,2863	
5	=	6,7	1052,9747	
6	=	7,2	1052,6512	
7	=	7,8	1052,3277	
8	=	8,3	1052,0161	
.	.	.	.	
.	.	.	.	
.	.	.	.	
.	.	.	.	
.	.	.	.	
50	=	31,7	1038,5956	
[EOF]				[End Of File]

NOTE: This table supports up to 1000 density points.

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APPENDIX F CTL TABLE FORMAT

Refer to the below table for the CTL Table format.

CTL Table Example				Description
[PRODUCT_ID]				
Name	=	Petrol		ASCII string: the name of the Liquid
Date	=	01-06-92		ASCII string: the date this file is generated
Time	=	11:05:16		ASCII string: the time this file is generated
Temperature	=	20		
CTL	=	6		
CTLPoints	=	50		
[CTL_POINTS]				
1	=	15.556	2.0000	
2	=	16.111	0.9998	
3	=	16.667	0.9995	
4	=	17.222	0.9992	
5	=	17.778	0.9989	
6	=	18.333	0.9987	
7	=	18.889	0.9984	
8	=	19.444	0.9982	
.	.	.	.	
.	.	.	.	
.	.	.	.	
.	.	.	.	
.	.	.	.	
50	=	42.778	0.9873	
[EOF]				[End Of File]

NOTE: This table supports up to 1000 CTL points.

APPENDIX G   CONCENTRATION TABLE FORMAT

Refer to the below table for the Concentration Table format.

Concentration Table Example										Description
[PRODUCT_ID]										
Name	=	Petrol								ASCII string: the name of the Liquid
Date	=	01-06-92								ASCII string: the date this file is generated
Time	=	11:05:16								ASCII string: the time this file is generated
Temperature	=	20								
Concentration	=	140								
Density	=	60								
TemperatureCount	=	12								
ConcentrationCount	=	7								
[DENSITY_POINTS]										
ColVals	=		4,0	4,1	4,2	4,3	4,4	4,5	4,6	-
1	=	25,0	NaN	NaN	1055,67	1055,57	1055,47	1055,37	1055,27	-
2	=	25,5	NaN	NaN	1055,17	1055,07	1054,97	1054,87	1054,77	-
3	=	26,0	NaN	NaN	1054.67	1054.57	1054.57	1054,47	1054,37	-
4	=	26,5	NaN	NaN	1054,27	1054,17	1054,07	1053,97	1053,87	-
5	=	27,0	NaN	NaN	1053,77	1053,67	1053,57	1053,47	1053,37	-
6	=	27,5	NaN	NaN	1053,27	1053,17	1053,07	1052,97	1052,87	-
7	=	28,0	NaN	NaN	1052,77	1052,67	1052,57	1052,47	1052,37	-
8	=	28,5	NaN	NaN	1052,27	1051,17	1051,07	1050,97	1050,87	-
9	=	32,5	1050,77	1050,67	1050,57	1050,47	1050,37	1050,27	1050,17	-
10	=	36,5	1050,07	1049,97	1049,87	1049,77	1049,67	1049,57	1049,47	-
11	=	38,5	1049,37	1049,27	1049,17	1049,07	1048,97	1048,87	1048,77	-
12	=	40,5	1048,67	1048,57	1048,47	1048,37	1048,27	1048,17	1048,07	-
[EOF]	-	-	-	-	-	-	-	-	-	[End Of File]

NOTE: *This is in format of a table. Temperature are recorded in rows and concentration in columns. Density is updated for corresponding temperature and concentration. NaN is used to indicate not applicable.*

NOTE: *This table supports up to 1000 temperature points and 200 concentration points*

APPENDIX H **CREATION OF NEW MODBUS FIELD DEVICE / TRL/2 FIELD DEVICE CONFIGURATION FILE**

Based on the Modbus field device / TRL/2 field device manufacturer's datasheet, the user shall create the Modbus field device / TRL/2 field device configuration file according to the attached Modbus field device configuration template.

Refer to the following sections for more information on the Modbus field device / TRL/2 field device configuration template.

H.13 Device Type

The following table provides more information on the Device Type.

XML Tag	Description	Possible Values
<DeviceInformation> <DeviceType>	This is the Modbus field device type. The user shall provide the device type name like SLG700, E+H ProServo etc.	Any string
<IsGPUFlexconnValid>	This is specific to TRL/2 device and not applicable for Modbus device. The user can provide "TRUE" for Honeywell TRL/2 devices and "FALSE" for third party devices.	TRUE/FALSE

H.14 Device engineering units

The following table provides information on the various engineering units supported by the Modbus field device.

XML Tag	Description	Possible Values
<DeviceInformation> <DeviceUnits> <Unit> <Type>	This specifies the Device unit type.	LEVEL TEMPERATURE DENSITY PRESSURE

XML Tag	Description	Possible Values
\<DeviceInformation\> \<DeviceUnits\> \<Unit\> \<UnitDetail\> \<UnitName\>	This specifies the device engineering unit. Refer to section H.19 for the supported units.	For LEVEL : m, cm, mm, ft, yard, in, in/16, fis, fii/256, in/256, 1/10 mm (TRL/2) For TEMPERATURE : °C, °F, K, Tenth Fahrenheit (TRL/2), Tenth Celsius (TRL/2) For DENSITY : kg/m³, °API, lb/ft³, RD60, lb/ US gal, kg/l, gr/ml For PRESSURE : kgf/ cm², Pa, kPa, psi, atm, bar, psi_r100, psi_r1000, mBarG (TRL/2), mBarA (TRL/ 2), 1/100 psiG (TRL/ 2), 1/100 psiA (TRL/2)
\<DeviceInformation\> \<DeviceUnits\> \<Unit\> \<UnitDetail\> \<Resolution\>	This specifies the device engineering unit's resolution.	-127 to 128

H.15 Valid Register Ranges

The following table indicates the valid consecutive Modbus register address ranges in the device.

XML Tag	Description	Possible Values
\<ValidRegisterRanges\> \<Range\> \<StartRegisterAddress\>	This indicates the Modbus Start address	300001 to 365535 400001 to 465535
\<ValidRegisterRanges\> \<Range\> \<EndRegisterAddress\>	This indicates the Modbus End address	300001 to 365535 400001 to 465535

H.16 Modbus Map

The following table indicates the Modbus register map of the device that can be scanned by CIU.

XML Tag	Description	Possible Values
\<DeviceInformation\> \<ModbusMap\> \<Name\>	This indicates the name of the parameter in the Modbus field device which needs to be scanned by CIU.	Any String

XML Tag	Description	Possible Values
\<DeviceInformation\> \<ModbusMap\> \<ModbusRegisterAddress\>	This indicates the relative Modbus address of a parameter in the Modbus field device. Absolute Modbus address of Parameter = Device Modbus Start Address + Modbus Register Address This is the 6 digit Modbus Register address of the device parameter. The first digit indicates the Modbus function code (3 for Input registers and 4 for Holding registers). Second to Sixth digits indicates the Modbus register address defined by the device manufacturer. 0 to 65535 registers can be addressed. For example to address holding register 0 in device, 400001 would be set here.	300001 to 365535 400001 to 465535
\<DeviceInformation\> \<ModbusMap\> \<NoofModbusRegisters\>	This indicates the number of Modbus registers defined for the selected parameter.	1 to 125
\<DeviceInformation\> \<ModbusMap\> \<ModbusDataType\>	The data can be exposed in different data types by different Modbus field devices. This parameter indicates the Modbus data type in which data is exposed by the field device so that CIU can interpret the data accordingly and convert it to its internal data format. Refer to section H.18 for the list of supported Modbus data types.	Not a number Fixed number ASCII string Unicode string 8-bit unsigned integer 8-bit signed integer 16-bit unsigned integer 16-bit signed integer 16-bit decimal float 12-bit signed integer 32-bit signed integer 32-bit float (regular) 32-bit uint/f1 32-bit uint/f10 32-bit uint/f100 32-bit uint/f1000 32-bit uint/f10000

XML Tag	Description	Possible Values
<DeviceInformation> <ModbusMap> <ByteOrder>	This indicates the byte (8-bit) order within a 16-bit word in which data is exposed by the field device. There can be 2 formats in which data can be exposed (i) LSB first (ii) MSB first. Based on this configuration CIU interprets the data and converts it to its internal data format. *Note:* This refers the endianess of the received data at byte level. LSB first refer to Little Endian and MSB first refers to Big Endian.	LSB_First MSB_First
<DeviceInformation> <ModbusMap> <WordOrder>	This indicates the word (16-bit) order within a 32-bit long word in which data is exposed by the field device. There can be 2 formats in which data can be exposed (i) LSW first (ii) MSW first. Based on this configuration CIU interprets the data and converts it to its internal data format. *Note:* This indicates the endianess of the received data at word level. LSW first refer to Little Endian and MSW first refers to Big Endian.	LSW_First MSW_First
<DeviceInformation> <ModbusMap> <Scaling>	Some Modbus field device scales the data it exposes to the Modbus host. Hence this parameter indicates the scaling factor used in the exposed data from the field device so that CIU can de-scale the retrieved value. If Scaling and offset are not applicable then this tag can be left empty	Any float value

XML Tag	Description	Possible Values
\<DeviceInformation\> \<ModbusMap\> \<Offset\>	Some Modbus field device adds an offset to the data it exposes to the Modbus host. Hence this parameter indicates the offset factor used in the exposed data from the field device so that CIU can subtract the offset from the retrieved value. If Scaling and offset are not applicable then this tag can be left empty	Any 32-bit signed value
\<DeviceInformation\> \<ModbusMap\> \<ScanPriority\>	This indicates the default scanning priority for a device parameter. This can be configured as Foreground / Background. While scanning the field device, if multiple field device parameters are retrieved in one Modbus request, then highest priority within the scanned field device parameters is set for that request. For example, if Product Level (Foreground priority), Product Temperature (Background priority), Product Density (Background priority) are retrieved from the field device with a single Modbus request, then the Modbus request would be scheduled to the field with Foreground priority. This can be overridden through Modbus Data Input configuration in CIU 888 service tool.	FOREGROUND BACKGROUND
\<DeviceInformation\> \<ModbusMap\> \<DeviceUnitType\>	This indicates the device unit type of the parameter configured in the Modbus field device. If value for this tag is set as "ANY" then CIU 888 service tool shall display all the device supported units in its User Interface for this parameter in Modbus Data Input configuration.	LEVEL TEMPERATURE DENSITY PRESSURE ANY

XML Tag	Description	Possible Values
\<DeviceInformation\> \<ModbusMap\> \<DeviceUnitName\>	This indicates the default device unit of the parameter configured in the device. Supported Values are based on DeviceUnits section.	For LEVEL : m, cm, mm, ft, yard, in, in/16, fis, fii/256, in/256, 1/10 mm (TRL/2) For TEMPERATURE : °C, °F, K Tenth Fahrenheit (TRL/2), Tenth Celsius (TRL/2) For DENSITY : kg/m³, °API, lb/ft³, RD60, lb/ US gal, kg/l, gr/ml For PRESSURE : kgf/cm², Pa, kPa, psi, atm, bar, psi_r100, psi_r1000, mBarG (TRL/2), mBarA (TRL/2), 1/100 psiG (TRL/2), 1/100 psiA (TRL/2) For ANY : The tag shall be empty

XML Tag	Description	Possible Values
<DeviceInformation> <ModbusMap> <FailedValue>	This indicates Modbus field device parameter failure value. That is, when parameter value retrieved from Modbus field device is equal to this value, it indicates the device parameter value is in failure. For example, if 0xFFFFFFFF represents Product level measurement failure for a Modbus field device, then when CIU receives that value it interprets that the Product level measurement has failed and sets the Product Level status accordingly. When status register is present in the device (Status tag information present), status and validity of the device parameter would be determined by CIU based on Status tag in the status section and this tag shall be empty.	Any HEX string as per the Modbus field device manufacturer.

<DeviceInformation>
 <ModbusMap>
  <Status>
   <Name>
	This is the device status parameter name as defined in the Manufacturer's product data sheet.	Any string

<DeviceInformation>
 <ModbusMap>
  <Status>
   <ModbusRegisterAddress>
	This indicates the Modbus register address of the status parameter associated with device parameter that needs to be scanned by CIU 888.
	
	This is the 6 digit Modbus Register address of the device parameter. The first digit indicates the Modbus function code (3 for Input registers and 4 for Holding registers). Second to Sixth digits indicates the Modbus register address defined by the device manufacturer. 0 to 65535 registers can be addressed. For example to address holding register 0 in device, 400001 would be set here.
		300001 to 365535
		400001 to 465535

XML Tag	Description	Possible Values
<DeviceInformation> <ModbusMap> <Status> < NoofModbusRegisters >	This indicates the number of Modbus registers defined for the Modbus field device status parameter that needs to be scanned by CIU 888.	As per Modbus field device Modbus datasheet
<DeviceInformation> <ModbusMap> <Status> <ModbusDataType>	This indicates the Modbus datatype for the Modbus field device status parameter that needs to be scanned by CIU 888.	Not a number Fixed number 8-bit unsigned integer 8-bit signed integer 16-bit unsigned integer 16-bit signed integer 12-bit signed integer 32-bit signed integer
<DeviceInformation> <ModbusMap> <Status> <ByteOrder>	This indicates the Modbus field device's byte order for 16 bit status data. Based on this configuration, CIU 888 inteprets the field device status value with correct byte ordering. There can be 2 formats in which data can be exposed (i) LSB first (ii) MSB first. Based on this configuration CIU interprets the data and converts it to its internal data format.	LSB_First MSB_First
<DeviceInformation> <ModbusMap> <Status> <WordOrder>	This indicates the Modbus field device's word order for 32 bit status data. Based on this configuration, CIU 888 interprets the field device status value with correct word ordering. There can be 2 formats in which data can be exposed (i) LSW first (ii) MSW first. Based on this configuration CIU interprets the data and converts it to its internal data format.	LSW_First MSW_First

H.17 Custom Value Map

This configuration defines the value mapping between device parameter value and CIU parameter value. This configuration would be defined only if a direct mapping of device parameter value to CIU

parameter value is not possible. For example, Product level value in device can be directly mapped to CIU Product level value but Gauge status / Gauge alarms from the device might not directly map to CIU Gauge status / Gauge alarms and needs a custom value map. Refer to the following table for more information.

XML Tag	Description	Possible Values
<CustomValueMap> <CustomValue> <DeviceParameterName>	This is the device parameter name as defined in the Manufacturer's product data sheet to which we need to associate the custom value.	Any value defined as part of <DeviceInformation>< ModbusMap> <Name> (or) <DeviceInformation>< ModbusMap> <Status><Name>
<CustomValueMap> <CustomValue> <CIUMapDetail> <Name>	This indicates the CIU Parameter Name to which device parameter is mapped.	ProductLevelStatus ProductTempStatus WaterMeasuredStatus DObsHIMSStatus VapRoomTempStatus VapRoomPressStatus AmbientTemperature Status GaugeStatus GaugeLevelAlarms ExternalContacts
<CustomValueMap> <CustomValue> <CIUMapDetail> <ValueMapType>	This indicates the value map type. Device parameter's enumeration to CIU parameter's enumeration shall be specified here.	EnumerationToEnume ration
<CustomValueMap> <CustomValue> <CIUMapDetail> <DefaultValue>	Default Value indicates what should be the CIU value if EnumerationToEnumeration is selected for ValueMapType and no mapping defined for a particular device parameter value	Any value as per CIU parameter
<CustomValueMap> <CustomValue> <CIUMapDetail> <DeviceParameterStartBitIndex> <CustomValueMap> <CustomValue> <CIUMapDetail> <DeviceParameterEndBitIndex>	This value indicates the portion of the device value which needs to be copied to the CIU parameter. For example, if Bits 15 to 8 of the device parameter needs to be copied then BitM = 8 and BitN = 15. If the entire device value needs to be copied then this tag shall be empty	Any value as per Modbus field device Modbus datasheet

XML Tag	Description	Possible Values
<CustomValueMap> <CustomValue> <CIUMapDetail> <CIUParameterStartBitIndex> <CustomValueMap> <CustomValue> <CIUMapDetail> <CIUParameterEndBitIndex>	This value indicates the portion in the CIU parameter where the device value needs to be copied. For example, if the device value needs to copied to Bits 12 to Bit 8 after value mapping is done then it BitM = 8 and BitN = 12 If the the device value (after value mapping) needs to completely replace CIU parameter value then this tag shall be empty.	Any value as per Modbus field device Modbus datasheet
<CustomValueMap> <CustomValue> <CIUMapDetail> <MapDetail> <DeviceParameterValue>	Device Value in Modbus data type.	Any value as per Modbus field device Modbus datasheet
<CustomValueMap> <CustomValue> <CIUMapDetail> <MapDetail> <CIUParameterValue>	CIU Value in CIU Parameter data type.	Any value as per CIU parameter

H.18 Supported Modbus Data types

Modbus Data types are not standard. Based on the analysis of the Modbus field devices, the following Modbus data types would be supported in CIU.

Modbus Data Type	Description
Not a number	This data represents 8 / 16 bit coded information.
Fixed number	This data represents a 16 bit fixed number.
ASCII string	The data represents a string of two ASCII characters per register.
Unicode string	The data represents a string of one UNICODE character per register
16-bit unsigned integer	The data represents an unsigned integer. Range : 0 to 65535
16-bit signed integer	The data represents an signed integer (in 2's complement). Range : -32768 to 32767

Modbus Data Type	Description
16-bit decimal float	Bit 15 : sign Bit 14..11 : Exponent power of 10 Bit 10..0 : Mantissa Value = -1 sign * mantissa * 10 (Exponent - 7) Range : -1023*E7 to +1023*E7
12-bit signed integer	Bit 15..13 : Not used Bit 12 : 0 – Positive 1 – Negative Bit 11..00 : Value 0 to 4095. If the sign is negative, the value is shown in 2's complement. Range : -4095 to +4095
32-bit signed integer	The data represents an signed integer. Range : + 2147483648 to – 2147483647
32-bit float (regular)	32 Bit IEEE floating point in TWO registers. All floating point data is coded into 4 Bytes Floating point. This format allows a representation of finite numbers from negative to positive 3.402823 *E38 Range : -3.402823*E-38 to +3.402823*E38
32-bit uint/f1	Most significant 16 bits represent integer data and least significant 16 bits is 0. Range : 0 to 65535.5
32-bit uint/f10	Most significant 16 bits represent integer data and least significant 16 bits represents 1 fraction digit. Range : 0...65535.95
32-bit uint/f100	Most significant 16 bits represent integer data and least significant 16 bits represents 2 fraction digits. Range : 0...65535.995
32-bit uint/f1000	Most significant 16 bits represent integer data and least significant 16 bits represents 3 fraction digits. Range : 0...65535.9995
32-bit uint/ f10000	Most significant 16 bits represent integer data and least significant 16 bits represents 4 fraction digits. Range : 0...65535.99995
Char	This data represents an ASCII character.
8-bit signed integer	This data represents an 8-bit signed data. Range : -127 to 128

Modbus Data Type	Description
8-bit unsigned integer	This data represents an 8-bit unsigned data. Range : 0 to 255

H.19 Supported Device Engineering Units

Device engineering units are not standard. Based on the analysis of the Modbus field devices, the following device engineering units would be supported in CIU.

Units of Measurement Type	Device Unit
Level	Meters
	Millimeters
	Tenth Millimeter (TRL/2)
	Feet
	Inches
	Sixteenth of Inch
	TwoFiftySixth of inch
	Centimeter
	Yard
Temperature	Celsius
	Tenth Celsius
	Tenth Fahrenheit
	Fahrenheit
	Kelvin
Pressure	KGF CM SQ
	Pascal
	Kilo Pascal
	PSI
	ATM
	Bar
	mBarG (TRL/2)
	mBarA (TRL/2)
	1/100 psiG (TRL/2)
	1/100 psiA (TRL/2)
	PSI RANGE 100
	PSI RANGE 1000

Units of Measurement Type	Device Unit
Density	Kilogram cubic meters
	Degrees API
	Pounds cubic feet
	RD60
	lbs_us_gallon
	kilogram_liters
	Gram / Millilitre

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APPENDIX I LIST OF ABBREVIATIONS

Abbreviation	Description
BPM	Bi-Phase Mark
CIU	Communication Interface Unit
DCS	Distributed Control System
GOV	Gross Observed Volume
GPU	Gauge Processing Unit
GSV	Gross Standard Volume
HTTP	Hypertext Transfer Protocol
PC	Personal Computer
PLC	Programmable Logic Controller
RAM	Random Access Memory
RTU	Remote Terminal Unit
SCADA	Supervisory Control And Data Acquisition
TOV	Total Observed Volume
TRL	Tank Radar Level
W&M	Weights and Measures
XML	Extensible Markup Language
LM	Legal Metrology

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