1.0 Introduction

The purpose of this document is to provide guidelines on how to change from Whessoe to Rosemount equipment by exchanging gauges. When a Whessoe gauge is replaced with a Rosemount device, it is necessary to configure the Rosemount 2410 Tank Hub for emulation.

The Rosemount field devices, for example Rosemount 5900 Radar Level Gauge and Rosemount 2240S Temperature Transmitter, are connected to the tank hub using the intrinsically safe Tankbus as usual. Emulation is done in the tank hub only. Each tank hub can emulate up to 10 tanks (10 separate Whessoe gauges).

Figure 1. Rosemount Devices Replacing Old Gauges in an Existing Whessoe System
1.1 Emulation capabilities

Emulation enables the ability to replace old devices in another vendor’s existing tank gauging system, with Rosemount devices. The Rosemount device will act just like the replaced gauge, using the other vendor’s protocol to communicate.

By using the other vendor’s field and control room communication protocol together with modern Rosemount tank gauging devices, the legacy system is modernized step-by-step. The legacy system can be upgraded while tanks are in operation and existing wiring can be re-used.

The tank hub can emulate replaced devices, acting as either slave or master(1). The tank hub slave emulation is described in this document.

**Tank hub acting as slave**

When an old gauge from another vendor is replaced with a tank hub connected to a Rosemount field device, the tank hub will act as a slave answering requests and sending data upwards towards the host. A stepwise “bottom-up” upgrade is done by replacing legacy gauges to begin with, and changing the complete control system at a later occasion.

**Figure 2. Tank Hub Slave Emulation**

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**Tank hub acting as master**

The tank hub can work as a master, polling measurement and status data from legacy field devices, forwarding the data to Rosemount TankMaster™ or another host system. Devices from another vendor can be connected to TankMaster through the tank hub, for example as part in a stepwise top-down upgrade.

**Figure 3. Tank Hub Master Emulation**

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1. Tank hub master emulation is supported for the Whessoe 550 protocol. For further information about Whessoe master emulation contact your Emerson Automation Solutions/Rosemount Tank Gauging representative.
1.2 Whessoe system characteristics

A typical Whessoe tank gauging system consists of a number of field devices such as level, temperature, and pressure devices.

The Rosemount 2410 Tank Hub supports the Whessoe protocols WM550 and WM660. The electrical interface can be either digital current loop or RS485, see Table 1 and Figure 4 for further information.

**Table 1. Whessoe Protocol Options**

<table>
<thead>
<tr>
<th>Protocol</th>
<th>Electrical interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>WM550</td>
<td>Digital current loop (DCL)</td>
</tr>
<tr>
<td>WM660</td>
<td>Digital current loop (DCL)</td>
</tr>
<tr>
<td></td>
<td>RS485</td>
</tr>
</tbody>
</table>

**Figure 4. Whessoe Connections**

- **Digital current loop - slave devices connected in series**
- **RS485 - slave devices connected in parallel**
1.3 Rosemount 2410 Tank Hub communication

The tank hub has slots for two independent communication boards, primary and secondary field bus, for TRL2 Modbus®, RS485 Modbus, emulation or wireless communication.

Whessoe emulation can be performed with RS485 on the primary field bus, or digital current loop on the secondary field bus.

Primary field bus - RS485

When the RS485 protocol is used for Whessoe emulation, the primary field bus is connected to the Whessoe host. Configuration should preferably be done with a TRL2 modem, like the Rosemount 2180 Field Bus Modem (FBM), connected to the secondary field bus.

It is possible to use the RS485 protocol for both configuration(1) and Whessoe emulation. In that case, the primary bus is first used for configuration and thereafter switched to the Whessoe host in order to start emulation.

Figure 5. Whessoe Emulation with RS485 on Primary Field Bus

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1. When using the RS485 protocol for configuring, different communication parameters must be used. See step 5 on page 8.
Secondary field bus - digital current loop

The digital current loop interface can only be connected to the Rosemount 2410 secondary field bus.

Configuration is performed as usual by connecting a FBM to the primary bus. The primary bus can be used for regular TRL2 or RS485 Modbus communication.

Figure 6. Whessoe Emulation with Digital Current Loop on Secondary Field Bus
2.0 Electrical installation

2.1 Rosemount 2410 Tank Hub connections\(^{(1)}\)

**Figure 7. Terminal Block in the Explosion-Proof/Flameproof Compartment**

![Terminal Block Diagram]

**Table 2. Terminal Assignment for Non-Intrinsically Safe Side**

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Designation</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N/-</td>
<td>Power, Neutral / DC -</td>
</tr>
<tr>
<td>2</td>
<td>L/+</td>
<td>Power, Line / DC +</td>
</tr>
<tr>
<td>3</td>
<td>K1 A</td>
<td>Relay 1 output (optional). Hardware configurable NO/NC.</td>
</tr>
<tr>
<td>4</td>
<td>K1 com</td>
<td>Relay 1 common</td>
</tr>
<tr>
<td>5</td>
<td>K2 A</td>
<td>Relay 2 output (optional). Hardware configurable NO/NC.</td>
</tr>
<tr>
<td>6</td>
<td>K2 com</td>
<td>Relay 2 common</td>
</tr>
<tr>
<td>7a/7b</td>
<td>P Bus B</td>
<td>Primary communication bus B</td>
</tr>
<tr>
<td>8a/8b</td>
<td>P Bus A</td>
<td>Primary communication bus A</td>
</tr>
<tr>
<td>9</td>
<td>S Pwr -</td>
<td>Secondary bus power - (N/A for Whesoe)</td>
</tr>
<tr>
<td>10</td>
<td>S Pwr +</td>
<td>Secondary bus power + (N/A for Whesoe)</td>
</tr>
<tr>
<td>11</td>
<td>S Bus B(^{(1)})</td>
<td>Secondary communication bus -</td>
</tr>
<tr>
<td>12</td>
<td>S Bus A(^{(1)})</td>
<td>Secondary communication bus +</td>
</tr>
<tr>
<td>PE</td>
<td>PE</td>
<td>Power supply protective ground</td>
</tr>
<tr>
<td>GND_1</td>
<td>GND_1</td>
<td>Housing chassis/shield Primary bus</td>
</tr>
<tr>
<td>GND_2</td>
<td>GND_2</td>
<td>Housing chassis/shield Secondary bus</td>
</tr>
</tbody>
</table>

1. The digital current loop is connected to the Rosemount 2410 Non-IS terminal S Bus A and S Bus B (current out from Whesoe master connected to S Bus A and return current to S Bus B).

1. Consult the Whesoe Electrical Installation Drawing (D7000002-526) for further information.
3.0 Configuration

The Rosemount 2410 Tank Hub is configured by using the TankMaster WinSetup configuration program\(^1\). WinSetup is a user-friendly software package that includes basic configuration options as well as advanced configuration and service functions.

Configuration of the Rosemount 2410 Whesoe emulation function can be performed with the WinSetup program using the FBM or a RS485 converter, depending on the tank hub configuration.

3.1 Set up Modbus communication protocol

This section describes how to configure the Modbus Master protocol channel for communication. To specify PC communication port and the standard communication parameters, do the following:

1. Open the Protocols folder in the Workspace window.
2. Select the Modbus Master icon.
3. Right click the proper MBMaster icon and select Properties to configure the protocol channel.
4. Select the Communication tab.

---

1. See the Rosemount Tank Gauging System Configuration Manual for more information on how to use the TankMaster WinSetup software to configure the Rosemount 2410 Tank Hub.
5. Set the communication parameters:

<table>
<thead>
<tr>
<th></th>
<th>FBM</th>
<th>RS485 converter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port</td>
<td>The COM port the FBM is connected to</td>
<td>The COM port the converter is connected to</td>
</tr>
<tr>
<td>Baud rate</td>
<td>4800</td>
<td>9600</td>
</tr>
<tr>
<td>Stop bits</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Parity</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Modem</td>
<td>FBM 2180</td>
<td>RS-485</td>
</tr>
<tr>
<td>Handshaking</td>
<td>None</td>
<td>RTS/CTS</td>
</tr>
<tr>
<td>Reply timeout</td>
<td>1000 ms</td>
<td>1000 ms</td>
</tr>
<tr>
<td>Retries</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Description</td>
<td>Text describing the configured channel</td>
<td>Text describing the configured channel</td>
</tr>
</tbody>
</table>

6. Select the **Enable Channel** check box to activate the protocol channel.

7. Select **OK** to store the current configuration and close the configuration window.

### 3.2 Install Rosemount 2410 Tank Hub in WinSetup

The TankMaster WinSetup wizard is the recommended tool for installing the tank hub. The installation wizard covers basic configuration of the tank hub.

Perform the following steps to start the installation wizard in TankMaster WinSetup:

1. In the **Workspace** window select the **Device** folder.

![Workspace window](image)

2. Right click and select **Install New**, or from the **Service** menu select the **Devices/Install New** option. The **Select Device** window appears.
3. From the *Device Type* drop-down list, select the **2410 Tank Hub** option.

4. Type a name on the **2410 HUB Tag** field. The 2410 Hub Tag will be used as an identifier for the tank hub in various windows and dialogs.

5. Select **Next**. The **2410 Tank Hub Communication** window appears.

6. Make sure TankMaster communicates directly with the tank hub and that the proper communication channel is chosen.
7. Default Modbus Address is 247 for the tank hub. It is recommended to change it to an address 101-199. Do the following:
   a. In the 2410 Tank Hub Communication window select Change Address on Device... to open the Change Address window.
   b. Enter the Unit ID and select the new Modbus Address. When changing the device address, the Unit ID is used as a unique identifier of the device. The Unit ID can be found on a label mounted on the device.
   c. Select OK to confirm the address settings and close the Change Address window.
   d. In the 2410 Tank Hub Communication window select Verify Communication to check that communication is established between the TankMaster work station and the tank hub. The Unit ID will appear when TankMaster finds the tank hub.

8. In the 2410 Tank Hub Communication window select Next to continue the installation procedure of the tank hub.

9. Continue configuration as usual for a tank hub installation.

3.3 Configure specific variables for Whessoe emulation

The tank hub holding registers are used to configure the Whessoe emulation variables.

1. In the TankMaster WinSetup workspace window, right click the tank hub device icon.

2. To view the holding registers, select the View Holding Registers option.
3. Enable Whessoe emulation by selecting the Whessoe protocol in holding register 700 (RS485) or holding register 750 (digital current loop).

4. When replacing a Whessoe gauge with a Rosemount device, the Rosemount device must have the same Whessoe address as the gauge being replaced.

Enter the required emulation address in holding registers 900-909 (valid Whessoe addresses are 0-31 for WM550, and 0-255 for WM660)\(^1\).

---

1. Emulation address is by default set to “65535” for tank positions that are not in use.
Tip!
In the Tank Database tab, set the Modbus address to the same as the chosen Whessoe address for each device.

5. Select Whessoe protocol in holding register 1040.

Double-click the grey background colored Value field.

From the drop-down menu select desired Whessoe protocol, and select the OK button.
6. Use holding register 1041 (MiscControl) to set some optional configuration bits.

**Bit 5 - Liquid pressure**
Whessoe Task 30[1] includes pressure. The normal pressure is vapor (gas) pressure. By setting bit 5, the pressure is changed to liquid pressure.

**Bit 6 - High resolution pressure**
The Whessoe Task 30[1] supports a 8-bit pressure value (0-255). Five bits are unused in the response. By setting bit 6, the five bits are activated and included in the pressure value. The high resolution pressure value will then include 13-bits (0-8191). Note that this is not Whessoe standard.

**Bit 7 - Task 32 for 2410**
By setting bit 7, the Rosemount 2410 software date is used in the Whessoe Task 32[1] response.

1. Type of request for the Whessoe protocol.
7. Once Whessoe emulation is selected (step 3 on page 11), the Whessoe emulation communication parameters is automatically configured to default values:

- **Baud rate**: 2400
- **Data bits**: 8
- **Parity**: Even
- **Start bit**: 1
- **Stop bits**: 1

To change the communication parameters, do the following:

a. In the *Workspace* window, right click the Rosemount 2410 icon and select **Properties**. Select the **Configuration** tab, and continue by selecting the **Primary Bus** button (RS 485) or the **Secondary Bus** button (digital current loop).

b. From the **Configuration drop-down list** select **Non Standard**.

c. From the **Protocol drop-down list** select protocol **WM550** or **WM660**.
d. Specify the communication parameters according to the Whesoo tank gauging system characteristics.

![2410 Tank Hub Primary Bus Configuration](image)

### 3.4 Optional Whesoo emulation configuration

1. Consider optional Whesoo emulation configuration, see section "Optional Whesoo emulation configuration" on page 18.

### 3.5 Configure field devices

When the tank hub configuration is completed, the Rosemount field devices, for example Rosemount 5900 Radar Level Gauge and Rosemount 2240S Multi-input Temperature Transmitter, must be configured as well. The field devices are configured as usual, for further information see the Rosemount Tank Gauging System Configuration Manual.

1. Configure the field devices by using the Properties window of each device.
2. Verify that level, temperature and pressure values are valid.

### 3.6 Start Whesoo emulation

**Tank Hub with primary and secondary field bus:**

1. If not already connected, connect the tank hub to the Whesoo host.
2. The tank hub will now automatically switch to Whesoo mode and act like a Whesoo gauge.

**Tank Hub with primary field bus:**

1. When the tank hub configuration is completed, disconnect TankMaster.
2. Connect the tank hub to the Whesoo host.
3. The tank hub will now automatically switch to Whesoo mode and act like a Whesoo gauge.
4.0 Troubleshooting

4.1 RS485 and digital current loop

Communication status

Table 3. Troubleshooting Chart

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
</tr>
</thead>
</table>
| No communication with Rosemount 2410 using TRL2 bus.                    | 1. Incorrect Modbus address.  
|                                                                       | 2. Incorrect communication parameter settings. Check LCD Display during startup, for used settings.                                     |
| No response from Rosemount 2410 using the Whessoe bus.                  | 1. Whessoe address is not the same as configured in Rosemount 2410.  
|                                                                       | 2. Bad cabling.  
|                                                                       | 3. Whessoe bus baud rate is not the same as configured in Rosemount 2410.  
|                                                                       | 4. Whessoe bus stop bit configuration is not the same as configured in Rosemount 2410.  
|                                                                       | 5. Incorrect Whessoe protocol selected in Rosemount 2410.  
|                                                                       | 6. Whessoe emulation is not enabled.  
|                                                                       | 7. Incorrect modem is installed in the Rosemount 2410.  
|                                                                       | 8. Rosemount 2410 software is older than 1.82.                                                                                     |
| No relay status is available in the host.                              | 1. The AlarmStatus register is not correctly configured (holding register 1042).  
|                                                                       | 2. Relay K1 or K2 are not correctly configured in Rosemount 2410.                                                                    |
| Pressure is indicated to be invalid.                                   | 1. The pressure source is not correctly configured. Check the pressure value on the LCD Display or in the Standard Input registers for TMV Pressure. |
**Message status**

Verify that communication is working properly, by checking the input registers as described in Table 4. See Table 5 for troubleshooting actions.

**Table 4. Messages Input Registers**

<table>
<thead>
<tr>
<th>Register number</th>
<th>Input register</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary field bus (RS485)</td>
<td>Secondary field bus (Digital current loop)</td>
<td></td>
</tr>
<tr>
<td>1206</td>
<td>1256</td>
<td>RecMessages</td>
</tr>
<tr>
<td>1208</td>
<td>1258</td>
<td>MessagesToMe</td>
</tr>
<tr>
<td>1210</td>
<td>1260</td>
<td>SentMessages</td>
</tr>
</tbody>
</table>

**Table 5. Messages Troubleshooting Chart**

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input register RecMessages does not enumerate</td>
<td>Check that:</td>
</tr>
<tr>
<td></td>
<td>- the tank hub is powered.</td>
</tr>
<tr>
<td></td>
<td>- cables are properly connected.</td>
</tr>
<tr>
<td></td>
<td>- the tank hub is in Whessoe mode.</td>
</tr>
<tr>
<td></td>
<td>- the tank hub is configured for Whessoe emulation.</td>
</tr>
<tr>
<td>Input register MessagesToMe does not enumerate</td>
<td>Check that the Whessoe address is correct.</td>
</tr>
<tr>
<td>Input register SentMessages does not enumerate</td>
<td>Check that the host is sending proper requests.</td>
</tr>
</tbody>
</table>

**4.2 Digital current loop modem**

If the Rosemount 2410 is mounted in a safe zone, it is possible to use the LEDs on the DCL modem for trouble shooting. Dismount the front cover to discover the red and green LEDs.

- Red LED: Always on, flashing when the Rosemount 2410 is transmitting.
- Green LED: On when there is 20 mA in the loop.

**Note**
The Rosemount 2410 front cover must only be dismounted in a safe zone.
5.0 Appendix

5.1 Optional Whessoe emulation configuration

Level and temperature units

No unit configuration is done for level. Whessoe length unit is always mm and average temperature is Celsius, despite the Rosemount 2410 configuration.

Level in percentage

The Whessoe protocol supports level in percent of range. The value is automatically calculated for the applicable tank. No special configuration of the Rosemount 2410 is required.

Alarm limit configuration

The level alarm limits are configured in the holding register block TMVAAlarm-AlarmLevelLimit 2400-2478.
Alarm configuration

The alarm configuration is implemented differently for the WM550 and the WM660 protocols.

WM550

There are four alarm bits available in the WM550 protocol Task 04 response:

- Alarm 1: Relay K1
- Alarm 2: Level high alarm
- Alarm 3: Level low alarm
- Alarm 4: Relay K2

Use holding register 1042 to individually enable/disable the WM550 alarm bits:

![Holding register 1042 screenshot]

WM660

The Modbus read request receives the status of the alarms from the tank hub registers:

- Alarm 1: Level HH Alarm
- Alarm 2: Level High Alarm
- Alarm 3: Level Low Alarm
- Alarm 4: Level LL Alarm
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