OPW

FUEL MANAGEMENT SYSTEMS

A DOVER COMPANY

M00-8225-QRIM

Quad-Port Reconciliation Interface Module

Installation Guide

Copyright Information

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Section 1 Cautions! Read First

1.1 Warnings

| | DANGER: | Do not mount your system site controller, or any other electrical part of the system, including printers and modems, within or above the defined "hazardous" areas. | |

Installation Codes:

Any fuel dispenser is a hazardous area as defined in the National Electrical Code. Installation must be in accordance with the following:

- National Electrical Code (NFPA No. 70) Automotive and Marine Service Station Code (NFPA No.30A). The installer is responsible for investigating and following any local codes applicable in the country of installation.

- If the Q-RIM is being installed in countries other than those governed by the National Electrical Code, installation should be performed according to the prevailing standards.

Hazardous Areas:

Q-RIM is listed for use in a non-classified area. All of the equipment must be installed outside of the hazardous areas.

Section 2 Introduction

This manual is a guide through the installation process of the Quad-Port Reconciliation Interface Module (QRIM).

When an Automatic Tank Gauge (ATG) system is supplied by OPW Fuel Management Systems with the Automatic Calibration and Reconciliation (ACR) option, it is necessary to connect the ATG with the dispensers in order to capture sales data. This sales data is subsequently used to reconcile fuel for each tank, taking into account initial volumes, deliveries and dispenser sales. In addition, and if so configured, this information is also used to automatically re-strap the storage tank height to the volume relationship based upon the sales data input and resultant tank depletion.

Designed for use with electronic dispenser (non-electro-mechanical pulser-based systems), the Q-RIM is designed to operate with one of four (4) different dispenser types (selected via DIP switches) simultaneously on one or more of four independent dispenser interface loop channels.

The Q-RIM is designed as a listening device, monitoring the dispenser loop activity (sales activity) and parsing that activity data into a single PV4 (proprietary ACR protocol) interface to the ATG console.

Due to the flexibility of the system and the unique nature of every site, it is not possible to show every possible installation scenario.

Local codes may dictate specific installation requirements. Installation is subject to approval by the local authority having jurisdiction at the site.

The system installation instructions are the same for all Q-RIM systems. Specific differences between the systems are noted within the text.

These Installation instructions are for a typical installation.

2.1 Technical Specifications

Technical Specifications	
Enclosure Dimensions:	8" x 8" x 4" (20.3 cm x 20.3 cm x 10.2 cm)
Power Requirements:	100-240 VAC; 50/60 Hz; 0.5 A (dedicated circuit with earth ground)
Operating Temperature Range:	-32°F - 122°F (0°C - 50°C) <95% RH Non-Condensing
Dispenser Monitoring Channels:	2 Current Loop; 2 Current Loop/RS-485; 1 Passport; RS232
Dispenser Protocol Supported:	Wayne Dresser US Current Loop; Gilbarco 2-Wire, Gilbarco Passport
ATG Port:	RS-232 PV4 Protocol

Section 3 Suggested Installation

3.1 Prior to Installation

Prior to installation, check the following:

Enclosure Mounting:

- Knockouts and mounting means are provided for all cabinetry.

> **IMPORTANT:** Do not drill holes in any of the enclosures. Doing so would violate the safety listing of this system.

Grounding:

> **NOTE:** For applications where wire conduits are used, follow the applicable local codes and requirements.

A Q-RIM system incorporates internal noise suppression circuitry. In order to ensure proper operation of the equipment and provide the necessary safety, the circuitry must be grounded. A ground wire, if applicable, per local code, must be connected between the Q-RIM ground terminal and the main electrical service panel.

WARNING: In applications using steel conduit, the conduit should not be used as ground!

3.2 Installation Procedure

Be sure that all dispensers, ATG console, POS, pump controller and dispenser distribution box (D-Box) are installed according to manufacturer's specifications and tested for proper operation before installation of the Q-RIM.

1. Verify that the ATG has been installed to specifications.

2. Mount the Q-RIM at a location that is within 6' (1.8 m) from the dispenser distribution box and 15 m (50') of the ATG console, as indicated in Section 3.2.1.

> **NOTE:** If the ATG is greater than 15 m (50') from the Q-RIM, an RS-232 to RS-485 converter may be used, see Appendix A for these instructions.

3. The Q-RIM may be connected to more than one dispenser loop (this will be determined by the site). Some applications may require the use of two (2) loops (even though a single dispenser model may be installed at the site) since larger sites will balance the dispensers across the two loops. Other locations may have a mixture of dispenser types installed, dispenser protocol settings per loop are set using DIP switches (see Section 4).

4. Make sure that power to the dispensers is switched OFF and that the pump controller is either powered OFF or the communication loop of the dispenser D-Box is disconnected. Each loop should be connected to the appropriate pair in the dispenser D-Box.

5. Once the Q-RIM is connected, test the dispenser operation to make sure that the dispenser communication has not been disrupted.

6. Connect the Q-RIM PV4 output directly to the ATG serial port configured for ACR PV4 protocol.

Circuit Breakers:

> **IMPORTANT:** Power to the Q-RIM must be supplied from a clean circuit. Do not use a circuit that is powering dispensers or STP contactors.

Q-RIM Power Conduit:

Where applicable, this conduit, following all local codes, should run from the main circuit panel to the Q-RIM.
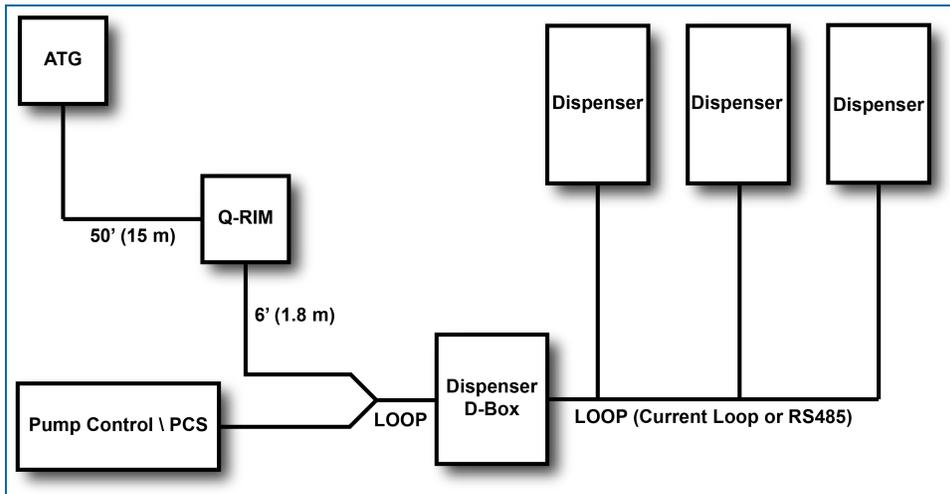
Figure 3-1 Typical Q-RIM Installation Diagram
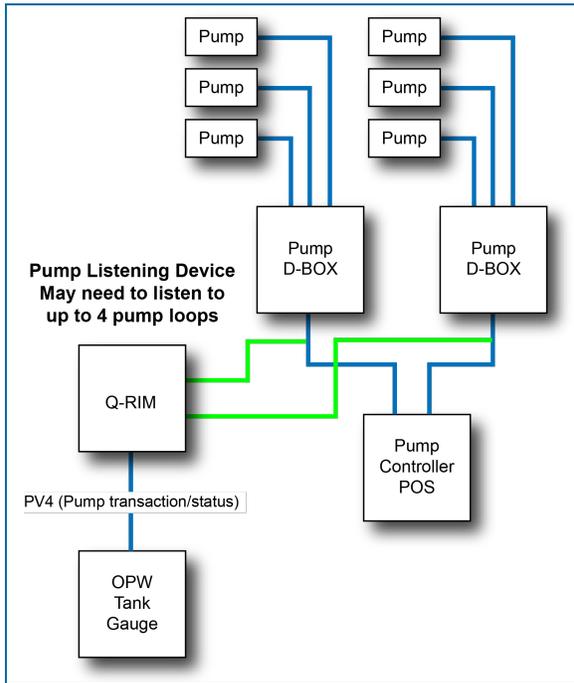
Figure 3-2 ATG, POS and Pump Connection Diagram

3.2.1 Q-RIM Hardware Installation

1. Attach the enclosure to a wall with fasteners (not-supplied) within 15 m (50') of the ATG controller.
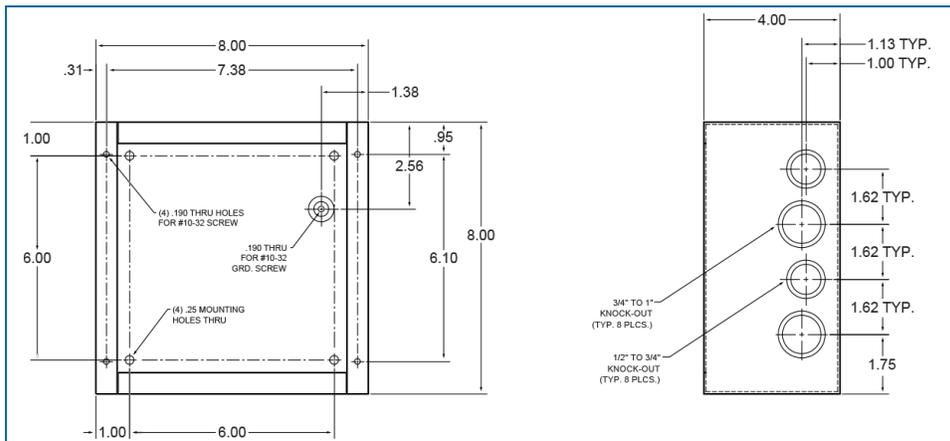
Figure 3-3 Q-RIM Enclosure Dimensions

DANGER: The enclosure must be mounted in a non-hazardous location!

2. Install the following 1/2-inch or 3/4-inch steel conduits (where applicable, or mandated by local codes) and power wiring.

    ▪ Q-RIM power source conduit and pull three 14-AWG wires from the breaker panel.

    ▪ Q-RIM must be powered from a dedicated single circuit breaker. The neutral must come directly from the neutral bus in the electrical supply panel. No other neutral circuits may be connected to this wire.

3. Remove Q-RIM safety cover.

4. Attach line and neutral wires from the breaker panel to the power connection block.

5. Connect the grounding braid to the back of the box using the green grounding screw. Connect the opposite end on the inside of the faceplate.
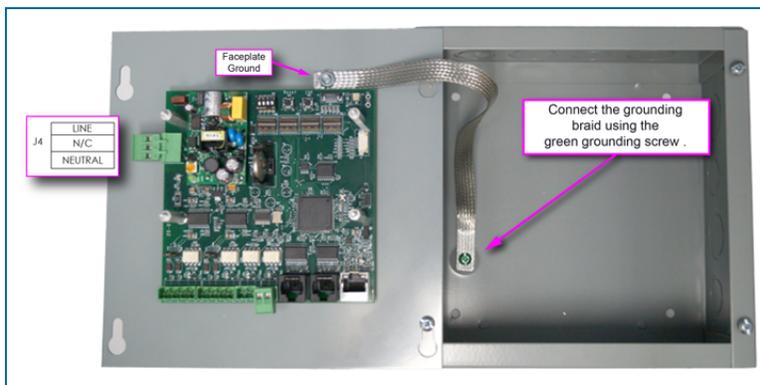
Figure 3-4 Q-RIM Power Connections

Section 4 Q-RIM Interface Board

4.1 Q-RIM DIP Switch Setup

4.1.1 SW1 (Global Settings)
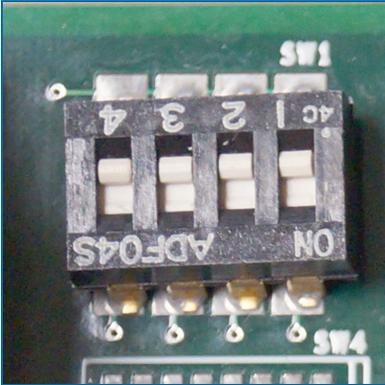
Figure 4-1 Four Position DIP Switch (SW1)

The Q-RIM is equipped with one (1) four-position DIP switch. This DIP switch is used to configure the global board settings as defined in the tables below.

SW1 - Global Settings	POS 1	POS 2	POS 3	POS 4
Test Mode	ON	X	X	X
Normal Operation	OFF	X	X	X
Unit Measure - Liters	X	ON	X	X
Unit Measure - Gallons	X	OFF	X	X
Operations Mode – Clear Memory	X	X	ON	X
Operations Mode – Normal	X	X	OFF	X
Unused	X	X	X	ON
Unused	X	X	X	OFF

4.1.2 SW 4, SW 5, SW 6, SW 7 (Channel Setup)
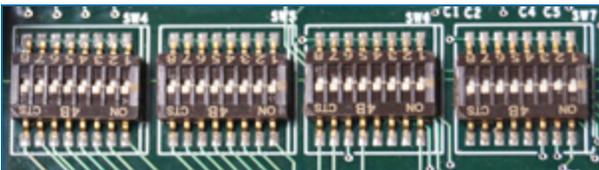
Figure 4-2 SW4-7
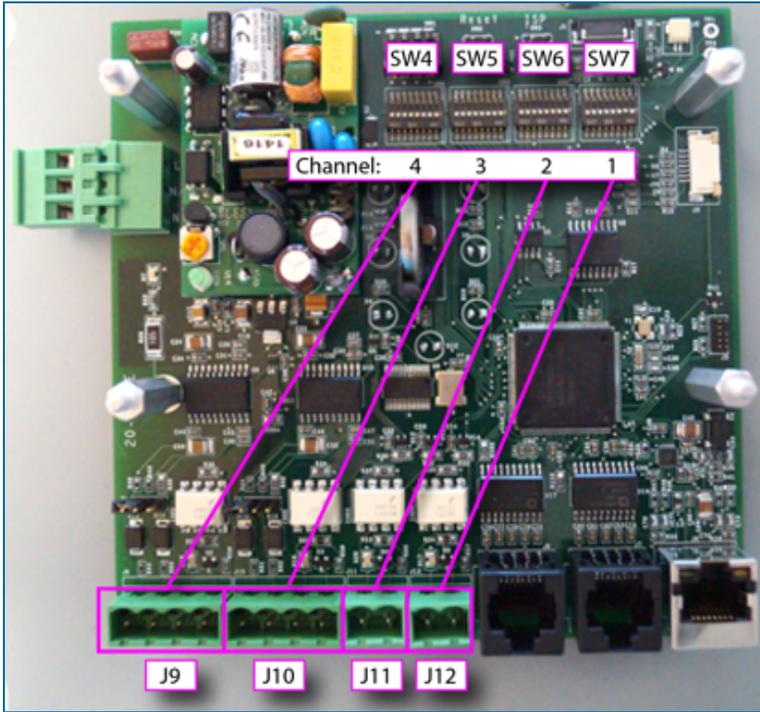
Figure 4-3 Channel/Switch - Connection Associations

The Q-RIM is supplied with four (4) sets of eight-position DIP switches. Each switch is used to show dispenser type (position 1-3) and dispenser number offset (position 4-8) for each channel as specified in the tables below.

Channel 1 – SW7; Channel 2 – SW6; Channel 3 – SW5; Channel 4 – SW4

Dispenser Type Protocol Selection			
	POS 1	POS 2	POS 3
Gilbarco	OFF	OFF	OFF
Gilbarco 422*	OFF	**ON**	OFF
Wayne	OFF	OFF	**ON**
Passport	**ON**	**ON**	OFF
Disabled	**ON**	**ON**	ON

* Loop 3 or 4 only.

Dispenser ID Offset					
	POS 4	POS 5	POS 6	POS 7	POS 8
0	OFF	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	OFF	
2	OFF	OFF	OFF	ON	OFF
3	OFF	OFF	OFF	ON	ON
4	OFF	OFF	ON	OFF	OFF
5	OFF	OFF	ON	OFF	OFF
6	OFF	OFF	ON	ON	OFF
7	OFF	OFF	ON	ON	ON
8	OFF	ON	OFF	OFF	OFF
9	OFF	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON	OFF
11	OFF	ON	OFF	ON	ON
12	OFF	ON	ON	OFF	OFF
13	OFF	ON	ON	OFF	ON
14	OFF	ON	ON	ON	OFF
15	OFF	ON	ON	ON	ON
16	ON	OFF	OFF	OFF	
17	ON	OFF	OFF	OFF	ON
18	ON	OFF	OFF	ON	OFF
19	ON	OFF	OFF	ON	ON
20	ON	OFF	ON	OFF	OFF
21	ON	OFF	ON	OFF	ON
22	ON	OFF	ON	ON	OFF
23	ON	OFF	ON	ON	ON
24	ON	ON	OFF	OFF	OFF
25	ON	ON	OFF	OFF	ON
26	ON	ON	OFF	ON	OFF
27	ON	ON	OFF	ON	ON
28	ON	ON	ON	OFF	OFF
29	ON	ON	ON	OFF	ON
30	ON	ON	ON	ON	OFF
31	ON	ON	ON	ON	ON

4.2 Q-RIM Board Connections

The photo and diagram below shows the Q-RIM board connection pin-outs and their applications.
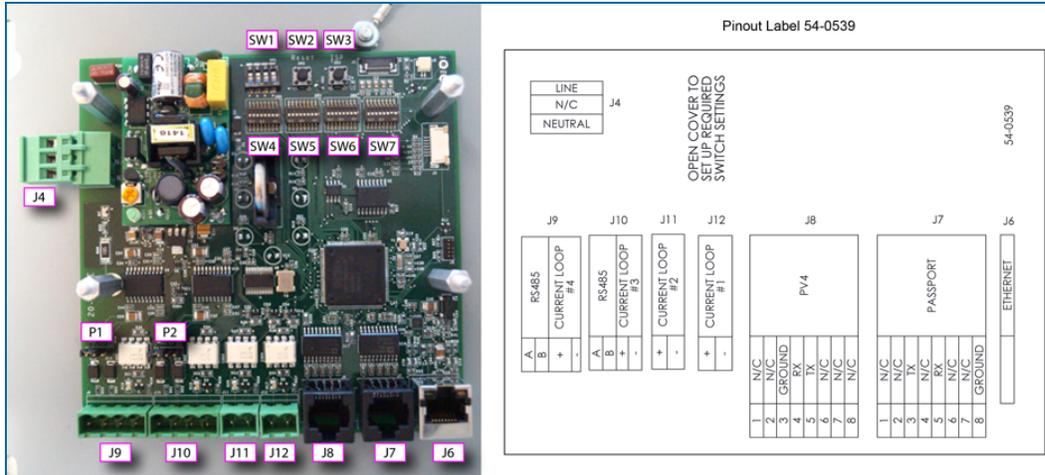
Figure 4-4 Board Connections

J4

This connector is the power input (96-264 VAC)

1. Neutral
2. N/C
3. LINE

J12, J11

Channel 1 and 2 respectively (Current Loop).

1. Current Loop "-"
2. Current Loop "+"

J10, J9

Channel 3 and 4 respectively (Current Loop and RS-485).

> **IMPORTANT:** Use only one interface (Current Loop or RS-485) at a time.

1. Current Loop "-"
2. Current Loop "+"
3. RS485 B signal
4. RS485 A signal

J8

This is a galvanically isolated communication port, port-to-interface with PV4 sites (RS-232)

1. N/C
2. N/C
3. Ground from tank gauge
4. RS-232 RX from tank gauge
5. RS-232 TX to tank gauge
6. No connection
7. N/C
8. N/C

J7

Galvanically isolated RS-232 port for Passport Interface/programming.

1. N/C
2. N/C
3. RS-232 TX to Passport Terminal/Programmer
4. N/C
5. RS-232 RX from Passport Terminal/Programmer
6. N/C
7. N/C
8. Ground from Passport Terminal/Programmer

4.3 Q-RIM Board Jumper Settings

Q-RIM Termination Resistor Jumper Settings		
	P1	**P2**
Listening Channel 3 Termination Resistor	X	Terminated
Listening Channel 4 Termination Resistor	Terminated	X
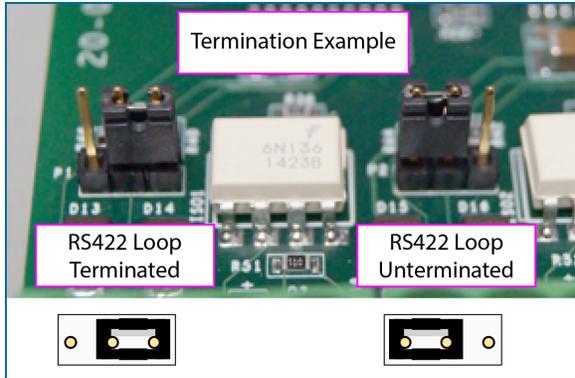
Figure 4-5 Termination Example

NOTE: Jumpers P1 & P2 provide the option to terminate the RS422 lines with a 130 Ω resistor. This is recommended if the Q-RIM is located at the end of the RS422 run.

5.1 Q-RIM LEDs
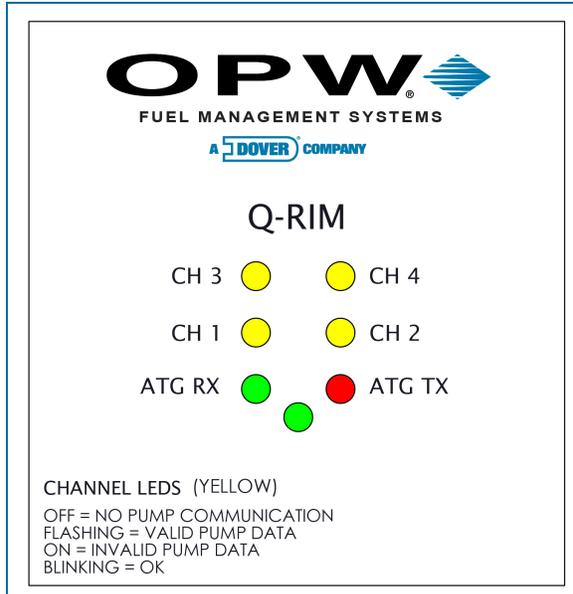
Figure 5-1 Q-RIM Front Panel Label (P/N 54-0511)

The LED lights on the face of the Q-RIM enclosure are visible through the label, as demonstrated above. The function of each of these lights can be found in the table below.

Q-RIM LED Functions	
CH 1	Listening channel 1 valid data. This LED blinks when a valid controller-pump package has been detected. For example, it will blink when a pump controller polls a pump and the pump sends a response.
CH 2	Listening channel 2 valid data. This LED blinks when a valid controller-pump package has been detected. For example, it will blink when a pump controller polls a pump and the pump sends a response.
CH 3	Listening channel 3 valid data. This LED blinks when a valid controller-pump package has been detected. For example, it will blink when a pump controller polls a pump and the pump sends a response.
CH 4	Listening channel 4 valid data. This LED blinks when a valid controller-pump package has been detected. For example, it will blink when a pump controller polls a pump and the pump sends a response.
ATG RX	PV4 Rx indicator. This LED blinks when data is received from the ATG.
ATG TX	PV4 indicator. This LED blinks when PV4 reconciliation data is transmitted to the ATG (Vend data or pump status package).
(Unlabeled)	Power indicator/Pulse. This LED blinks to indicate that the board's operating system is running.

Section 6 Reprogramming the Original Q-RIM

Equipment Required

- "QRIM Config" serial adapter
- Flat CAT5 cable
- PC and Flash Magic program
- USB Serial port adapter (if required on your PC)

Connection

Figure 6-1 QRIM Enclosure Removable Port Covers

For safety and convenience the QRIM is provided with removable port covers on the bottom of the enclosure that allow access to the Ethernet and RS-232 ports without the need to remove the front cover of the QRIM.

| ⚠️ WARNING | **WARNING:** | High voltages exist in the daughter board power supply when the cover is removed. Use extreme caution when working in this condition. | ⚡ |

Figure 6-2 Serial Adapter Connection

Unscrew the port cover of the J7 RS-232 port. Use theQRIM Configurator cable (P/N 20-1520-08) to plug into the QRIM J7 port. Plug the other end into your PC serial port (or USB to serial port adapter).

Go to **Control Panel > Device Manager** to determine which COM port your USB COM port is enumerated as.

P/N 20-1520-08 QRIM Configurator Cable

> **TIP:** The 20-1520-08 cable has a removable serial port connector so the cable can be used for a regular RS-232 connection. When you are finished using this cable, store the removable serial adapter inside the enclosure for safekeeping.

Programming

To download the latest version of Flash Magic, scan the QR code below or click on the QR image link to go to http://www.flashmagictool.com/.
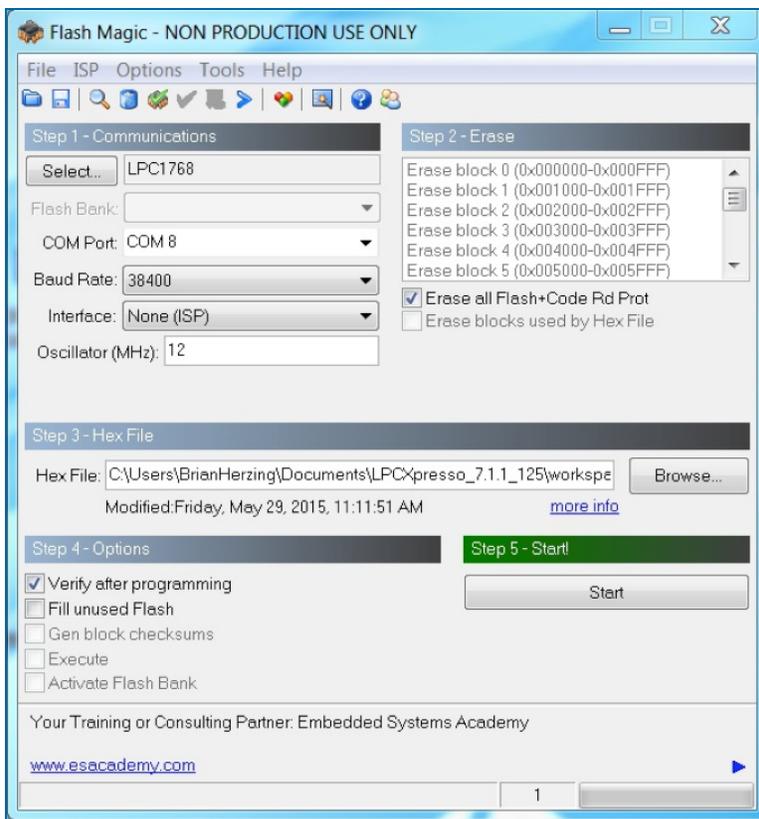
Figure 6-3 Q-RIM Programming in Flash Magic

- Power up the QRIM. Run Flash Magic on your PC. Set it up as shown below.

NOTE: Your COM port will most likely be different.

Figure 6-4 Step 1 - Communications

- Set the micro to **LPC1768** for the original QRIM.

- Set the **Baud Rate** to **38400** (this is not mandatory but it is a good range to use – the processor will autobaud to match the program).

- Set the **Interface** to **ISP** (In System Programming).

- **Oscillator** must be set to **12MHz**.

Figure 6-5 Step 2 - Erase

- Tick the box for Erase all Flash+Code Rd Prot. (also tick the Option for Verify after programming). (These options are generally defaults.)

Figure 6-6 Step 3 - Hex File

- Select the path to the **Hex File** provided to you.

Step 4 - Options

- Select **Verify after programming**.
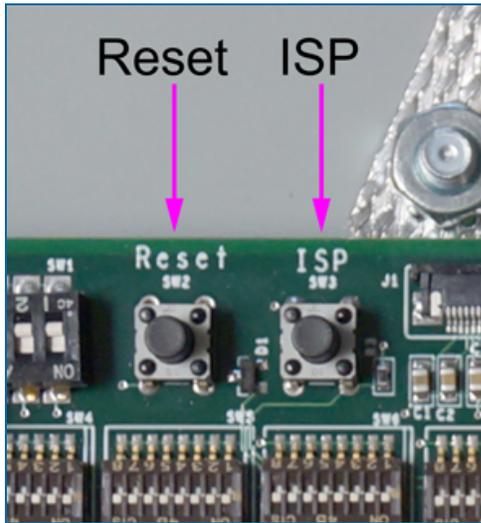
- Before you click the Start button the Q-RIM must be put into **ISP Mode**.

  - Push the **Reset** and **ISP** buttons at the same time.

  - Release the **Reset** button.

  - Release the **ISP** button.
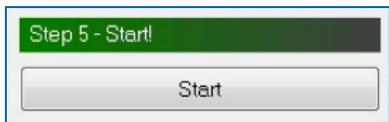
Step 5 - Start

- Click the **Start** button

You should get a progress bar at the bottom indicating that programming is underway.

Section 7   Configuring the QRIM for Operation with Passport

Why does the QRIM need to be configured when working with a Passport?

In a Passport system the QRIM interfaces with the back-end serial connection of the system, as opposed to "sniffing" the pump loops. The QRIM receives sale information from the Passport POS in the form of quantities and totalizers dispensed from the tanks, with blended products split into their constituent pure products. The tank gauge, however, is programmed to receive information based on front-end dispenser hose information, and is usually programmed with pure product ratios to split into blended products. To adapt one system to another, program the Integra dispenser map to have only hoses dispensing pure products from their respective tanks, no blended products. Next, the QRIM is configured with this information using a special terminal session through the Passport serial port (shown below). The QRIM saves this data and when it is told by the Passport of a sale from a particular dispenser and tank, it will be able to determine a correct hose to communicate the sale to the Integra console. Blended sales are already split by the Passport. They will be relayed to the Integra as two pure product vends from different hoses on the same pump. This tank to hose mapping is accomplished with the **:Pump** command below.

The QRIM also communicates tank level and alarm information to the Passport. For correct operation, the QRIM needs to be told what product code is in what tank (as programmed into the Passport) to embed it into data returned to the Passport. This is accomplished via the **:Tank** command.

> **NOTE:** When entering commands in the parser the command shortcuts will be shown in uppercase bold with the full command (e.g. ":**P**ump"). Note that some commands will show all in upper case (e.g. ":**SHOWALL**"). These must be fully spelled out. All commands **must** begin with a colon (:).

Terminal Session to Configure QRIM for Passport Connectivity

1. Terminal:
   - Set up terminal to:
     - 1200baud
     - 7bit
     - Even parity
     - 1 stop bit.
   - Set up local echo and configure **Enter** to send CR/LF
2. Connect a flat ethernet cable to Qrim passport port (J7). Use "QRIM Config" RJ45 to DB-9 adapter to adapt to your computer's serial port (see Figure 6-1, Serial Adapter Connection).
3. Set up the DIP switches (SW7) for Loop1 to be a passport loop:
   - Position 1 - ON
   - Position 2 - ON
   - Position 3 - OFF.

4. Set up the DIP switch (SW7) for the Loop1 pump offsets. Since the passport can handle all the pumps on a site, set DIP switche positions 4-8 OFF. Turn the other loops off by setting their DIP switch positions 1-3 ON.

5. Power up the QRIM. Wait for it to finish its lamp test.

6. Hit '*' asterisk to enter the parser.

> **NOTE:** If you hit any other key you must recycle power. Asterisk must be the first byte to be able to enter passport parser.

7. Once in parser, type: `:INIT<Enter>` to initialize hoses.

Type: `:H<Enter>` for help.

Pump Hose/Tank Mapping

Pump hoses are entered as follows:

Type:

`:P` 1 2 3<Enter>

This will enter pump 1, hose 2 and drawing product from tank 3.

`:P`ump 1 3 4<Enter>

This will be pump 1, hose 3 and drawing product from tank 4.

> **NOTE:** You only need to enter hoses for pure products into the QRIM. You also only need to program the gauge for pure products in a passport system. This is because the passport will break down a blended product into individual tank, volume and totalizer information for you. Hose mapping must match the tank gauge.

Show Hose/Tank Mapping

To show all hoses on all pumps type:

`:SHOWALL`<Enter>

To show hose information for a specific pump type:

`:S`how <pump#><Enter>

Copy Pump Information

To copy one pump to another (copy hose information from source to destination pump):

`:C`opy <Source Pump#> <Destination Pump#><Enter>

Program Hoses and Tank Product

> **NOTE:** Product numbers must match those programmed into Passport. Hose mapping must match the tank gauge.

:Tank <Tank#> <Product#><Enter>

List All Tanks and Product Numbers

:SHOWTANK<Enter>

Save Data in Non-volatile Memory

:SAVE<Enter>

> **IMPORTANT:** To prevent losing data during a reset or power loss this step MUST be done to store data in the Non-Volatile Memory.

Exit the Parser

:EXIT<Enter>

To get back into the parser you must re-cycle the power, then hit '*' again.

You can now disconnect the RJ from the RJ/DB9 converter on the PC and plug the RJ directly into the passport port #6 without the Gilbarco adapter.

List of Parser Commands

Command	Syntax	Description
:**P**ump	:Pump<Hose#><Pure Product Tank#><CR>	Enter pump hose information.
:**C**opy	:Copy <Source Pump> <Destination Pump> <CR>	Copies hose information from source to destination pump.
:**INIT**	:INIT <CR>	Initializes all pump hose information and tank info to zero.
:**S**how	:Show <Pump> <CR>	Shows hose info from a particular pump.
:**SHOWALL**	:SHOWTANK <CR>	Shows all pump hose information. Hit any key to terminate.
:**T**ank	:Tank <Tank #> <Product #> <CR>	Sets product in a particular tank - must match passport.
:**SHOWTANK**	:SHOWTANK <CR>	Shows all tank product information.
:**SAVE**	:SAVE <CR>	Saves the hose data and tank products to non-volatile memory.
:**EXIT**	:EXIT <CR>	Exits the parser and returns to passport interface.
:**H**elp	:Help<CR>	Lists all commands.

Warranty

OPW Fuel Management Systems warrants that all OPW Tank Gauge and Petro Vend Fuel Control systems supplied by OPW Fuel Management Systems to the Original Purchaser will be free from defects in material and/or workmanship under normal use and service for a period of 12 months from the date of installation or 15 months from the date of shipment from OPW. Additionally, OPW Fuel Management Systems warrants that all upgrades and replacement parts (new and remanufactured) supplied by OPW Fuel Management Systems will be free from defects in material and workmanship under normal use and serviced for a period of 90 days from the date of installation or for the remainder of the system's original warranty, whichever is greater, as set forth in the first sentence of this statement. The foregoing warranties will not extend to goods subjected to misuse, neglect, accident, or improper installation or maintenance or which have been altered or repaired by anyone other than OPW Fuel Management Systems or its authorized representative. The buyer's acceptance of delivery of the goods constitutes acceptance of the foregoing warranties and remedies, and all conditions and limitations thereof.

If a claim is made within the warranted time period that any equipment and/or remanufactured part is defective in material or workmanship under normal use and service, such equipment and/or remanufactured part shall be returned to OPW Fuel Management Systems, freight prepaid. If such equipment or remanufactured part is found by OPW Fuel Management Systems in its sole judgment to be defective in material or workmanship under normal use and service, OPW Fuel Management Systems shall, at its sole option, repair or replace such equipment and/or remanufactured part (excluding, in all instances, fuses, ink cartridges, batteries, other consumable items, etc.) OPW Fuel Management Systems shall not be held responsible for data loss or retrieval on returned products.

The warranties, as set forth above, are made expressly in lieu of all other warranties, either expressed or implied (including, without limitation, warranties of merchantability and fitness for any particular purpose and of all other obligations or liabilities on OPW Fuel Management Systems' part.) Further, OPW Fuel Management Systems neither assumes, nor authorizes any other person to assume for it, any other liability in connection with the sale of the systems, or any new/replacement part that has been subject to any damage from any act of nature or any force majeure. Any terms proposed by the Original Purchaser either orally or in writing are expressly rejected. The terms and conditions expressed in this document may only be changed upon the express written consent of OPW Fuel Management Systems.

The term "Original Purchaser" as used in these warranties shall be deemed to mean the authorized OPW Fuel Management Systems' distributor to which the system or any new/replacement part was originally sold. These warranties may be assigned by the original purchaser to any of its customers who purchase any OPW Fuel Management Systems' systems or new/replacement parts. This document shall be governed by and construed in accordance with the law of the State of Illinois. OPW Fuel Management Systems and Original Purchaser agree that any legal action or proceeding under or with respect to this document may ONLY be brought in the courts of the State of Illinois, or the United States District Court having jurisdiction in the City of Hodgkins, Illinois. Original Purchaser expressly consents to personal jurisdiction in any of the above-mentioned forums and agrees to waive all defenses based on improper venue or inconvenient form should an action be brought therein.

The sole liability of OPW Fuel Management Systems, for any breach of warranty, shall be as set forth above. OPW Fuel Management Systems does not warrant against damage caused by accident, abuse, faulty or improper installation or operation. In no event shall manufacturer's liability on any claim for damages arising out of the manufacture, sale, delivery or use of the goods exceed the original purchase price of the goods. In no event shall OPW Fuel Management Systems be liable for any direct, indirect, incidental or consequential damage or loss of product.

TERMS

Ex-works our factory, Hodgkins, Illinois, USA
Installation not included.
All trade names are registered. Patents pending.
Subject to engineering improvement and/or other changes.

OPW

A DOVER COMPANY

OPW Global Operations

1. OPW Corporate Headquarters
2. OPW Fuel Management Systems
3. OPW Retail Fueling
4. OPW Engineered Systems
5. Midland Manufacturing
6. Civacon
7. PDQ Manufacturing Inc.
8. OPW Mexico
9. OPW Latin America

10. Poland/Petro Vend of Poland, Inc.
11. OPW EMEA Headquarters
12. OPW EMEA Czech Republic
13. OPW FTG Europe
14. OPW India
15. OPW Asia Pacific
16. OPW Russia

OPW

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