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## **Programmable Serial Interface Card Driver ChemTec Metering Pump**

### **USER MANUAL**

**Rev. P1.55**

**August 2010**

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Printed in the U.S.A.

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## **1 INTRODUCTION**

### **1.1 Scope**

This document is the User Manual for the ChemTec Metering Pump serial communication driver firmware for the Emerson Process Management (EPM) DeltaV Control System; it provides information required to install, configure, and maintain the driver firmware on the DeltaV Programmable Serial Interface Card (PSIC). The reader should be familiar with EPM's DeltaV PSIC and connected ChemTec pumps.

The section *Document Format* briefly describes the contents of each section of this manual. *System Specifications* outlines hardware and software requirements for the ChemTec Driver firmware.

### **1.2 Document Format**

This document is organized as follows:

<b>Introduction</b>	Describes the scope and purpose of this document.
<b>Theory of Operation</b>	Provides a general functional overview of the ChemTec Driver.
<b>Flashing Firmware</b>	Describes flashing procedures for the ChemTec Driver firmware on to the DeltaV PSIC.
<b>Configuration Information</b>	Describes procedures and guidelines for configuring the DeltaV PSIC.
<b>Operational Check</b>	Provides tips and assistance to ensure PSIC is properly setup and configured.
<b>DeltaV–Field Device Electrical Interface</b>	Describes the electrical interface between DeltaV PSIC and the ChemTec pumps.
<b>Technical Support</b>	Describes who to call if you need assistance.



**1.3 System Specifications**

The following table lists the minimum system requirements for the ChemTec Driver:

**Table 1: System Specifications**

<b>Firmware</b>	ChemTec Driver Firmware v1.55 or later
<b>Protocol Compatibility</b>	Communications with the ChemTec are based on the following document, Page 60:  ChemTec Manual Rev C 080504.pdf
<b>Software Requirements</b>	DeltaV System Software (Release 4.2 or later) installed on a hardware-appropriate Windows workstation configured as a ProfessionalPlus for DeltaV  Serial Interface Port License (VE4102) if required.
<b>Minimum DeltaV Hardware Requirements</b>	DeltaV Series 2 Serial Module, Hardware Rev 1.1r or later  DeltaV M3, M5, M5+, MD, MD Plus or MX Controller, Power Supply and 8 wide controller carrier
<b>Other Optional Hardware</b>	N/A



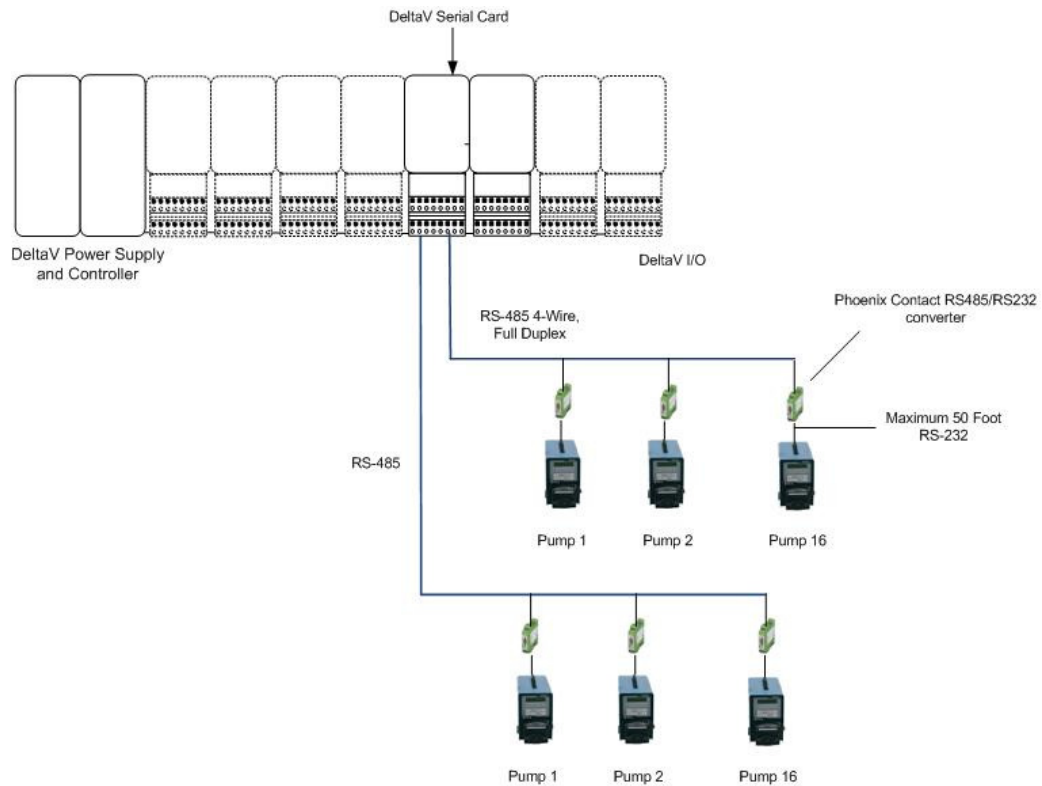
## 2 THEORY OF OPERATION

DeltaV comprises an I/O sub-system, in which the PSIC is one type of card. The purpose of the PSIC is to serially integrate third-party devices, allowing data to be read into and written out from DeltaV. Each PSIC has 2 communication ports that can be configured as Master or Slave, using RS-232, RS-485 (Half Duplex), or RS-422 (Full Duplex). Various communications parameters, such as baud rate, are configurable

The PSIC driver functions only in Master mode, while the ChemTec pump functions as the communications Slave. The ChemTec pump has two ports, labeled Printer and Balance. The serial card will connect to the Balance port. The Balance port only receives remote control commands while it is in Serial, Remote mode, and does not provide any feedback. Hence, this driver is output only.

Each PSIC port can support a maximum of 16 ChemTec pumps, which will be configured as individual devices with a unique device address. The configured device address in DeltaV must match the pump address. Each pump occupies one dataset. From DeltaV, a Control Module is used to write pump control commands, which are translated and sent to the corresponding pump.

The physical architecture will be as follows:



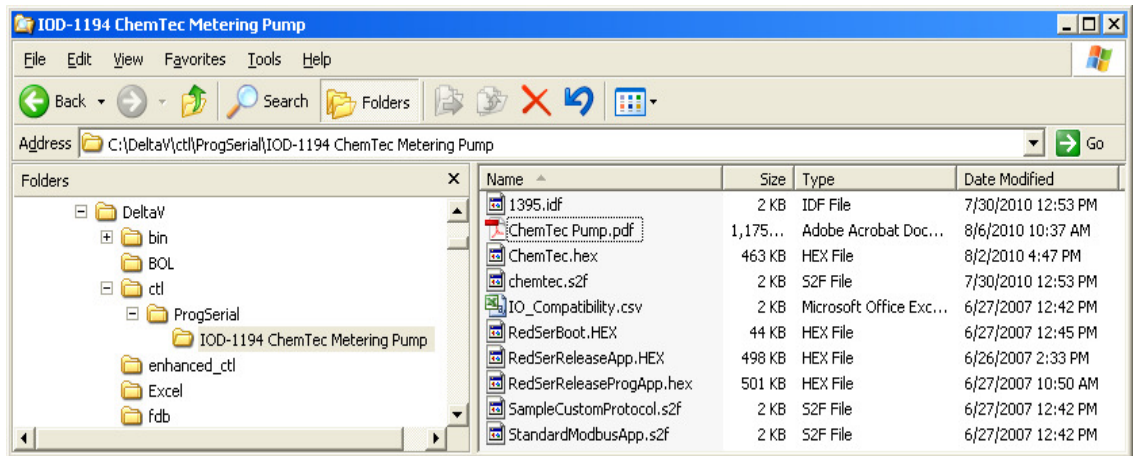


### 3 Flashing the firmware

The driver software distribution contains 10 files. These files must be copied to the DeltaV directory on your ProPlus Workstation. The path is:

**\DeltaV\ctl\ProgSerial\IOD-1194 ChemTec Metering Pump**

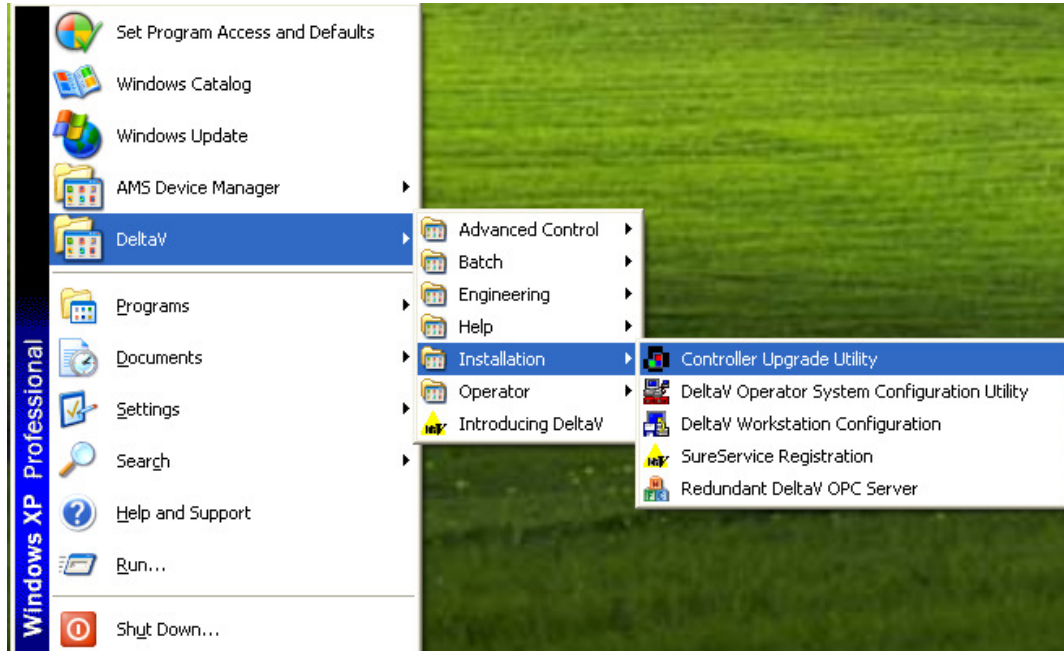
Note that you will have to create this subdirectory. The following shows a completed copy operation:



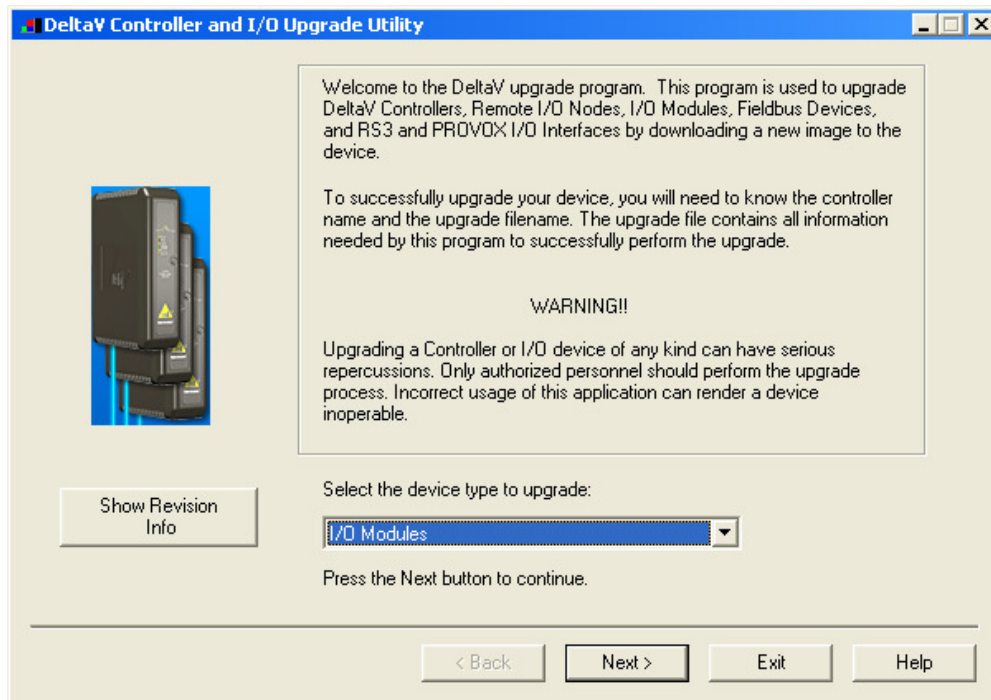
After copy completion, you are ready to program (or upgrade) the Programmable Serial Card with the supplied custom driver software. The steps are as follows:

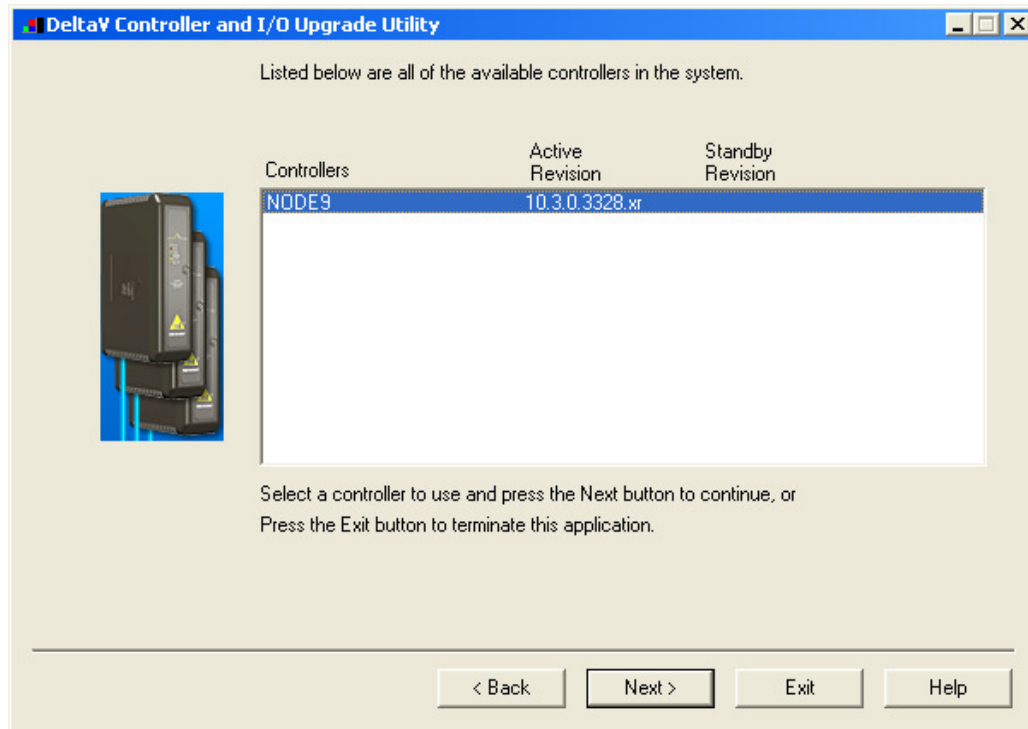


1. Click on the Start button and select DeltaV-> Installation-> Controller Upgrade Utility as shown below, and the following dialog will appear:



2. Click on the Upgrade I/O Modules radio button, and then click Next.

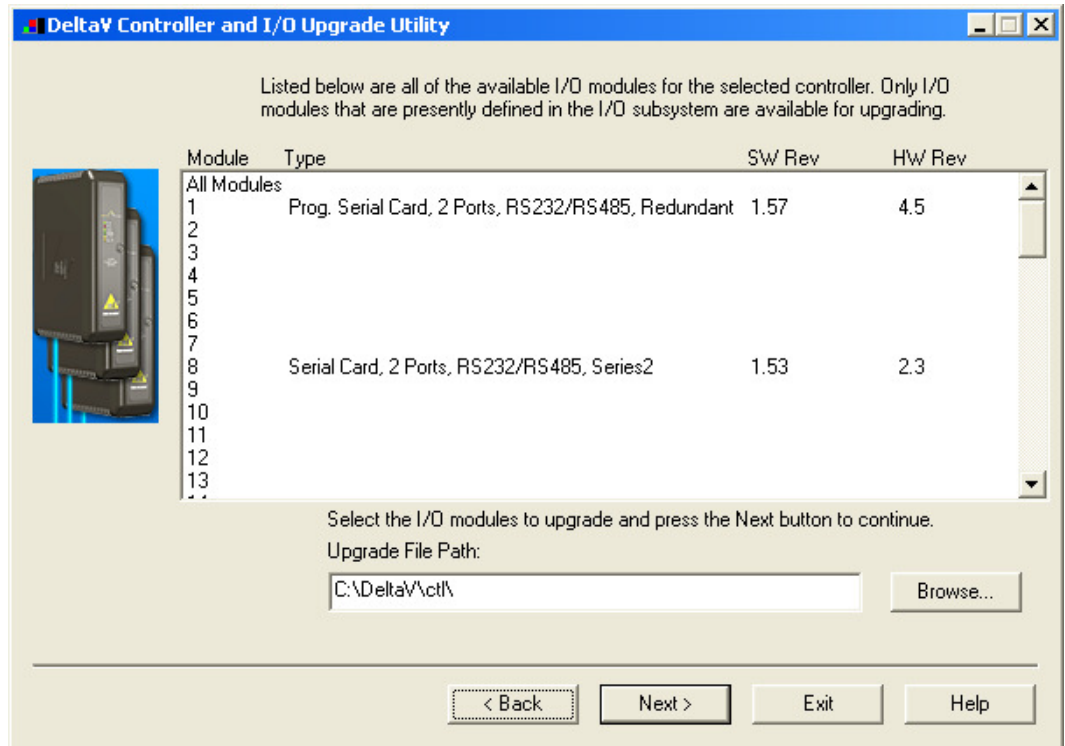




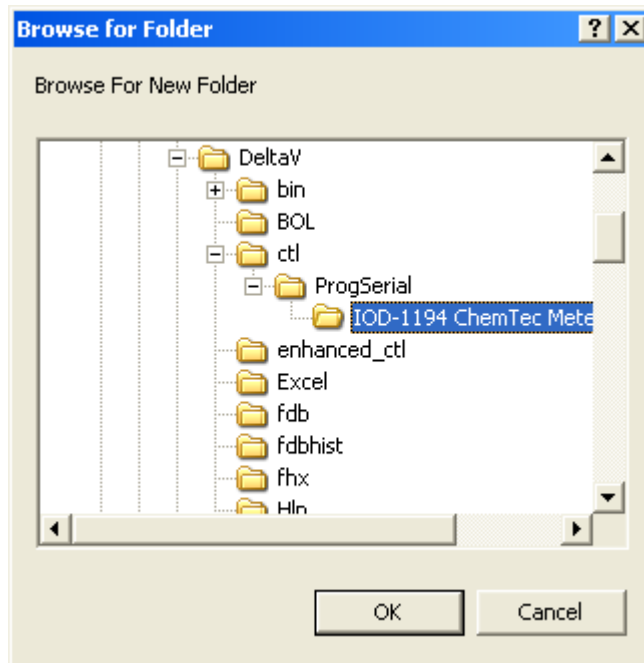
3. The above dialog will appear, listing all the available Controllers in your network. From this dialog, select the appropriate Controller and then Click Next.

4. The following dialog will appear, listing all the I/O modules in your selected Controller. The shown list of I/O modules is an example only. Your list will be different.

**Note: The first time a standard Serial card is upgraded to the Chemtec Driver, the dialog will be as shown below (card 8). When upgrading an existing Programmable Serial Card, skip Steps 5 and 6, and go to Step 7.**

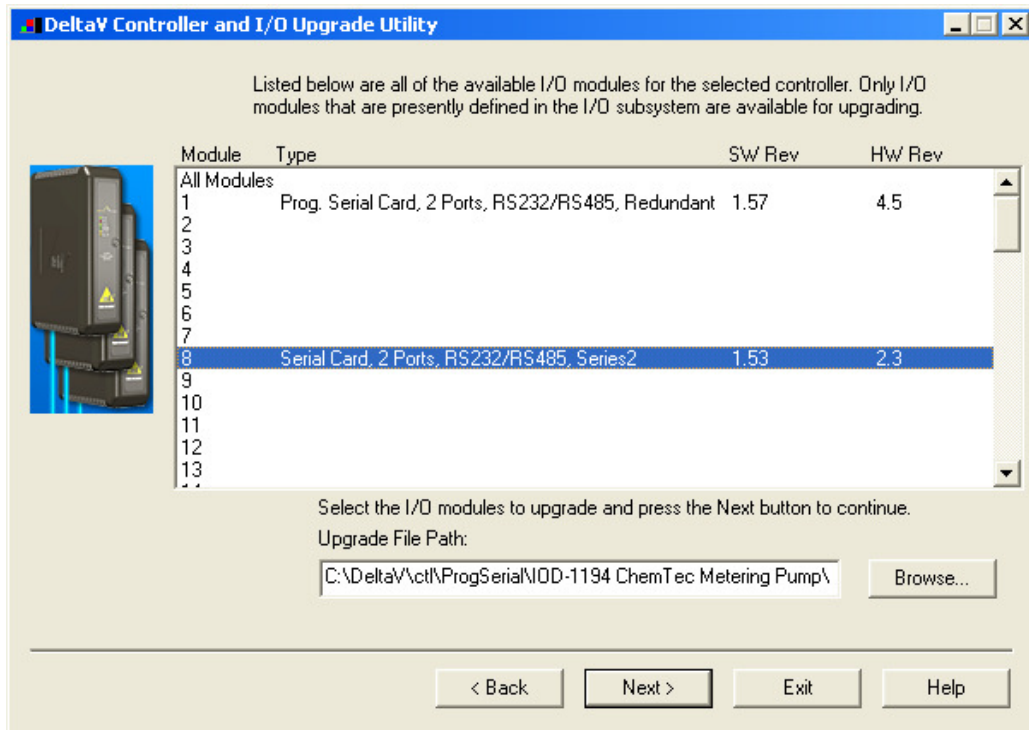


5. Click the Browse button and select the DeltaV path as shown below, and then click Ok. Note that the disk drive could be C or D.



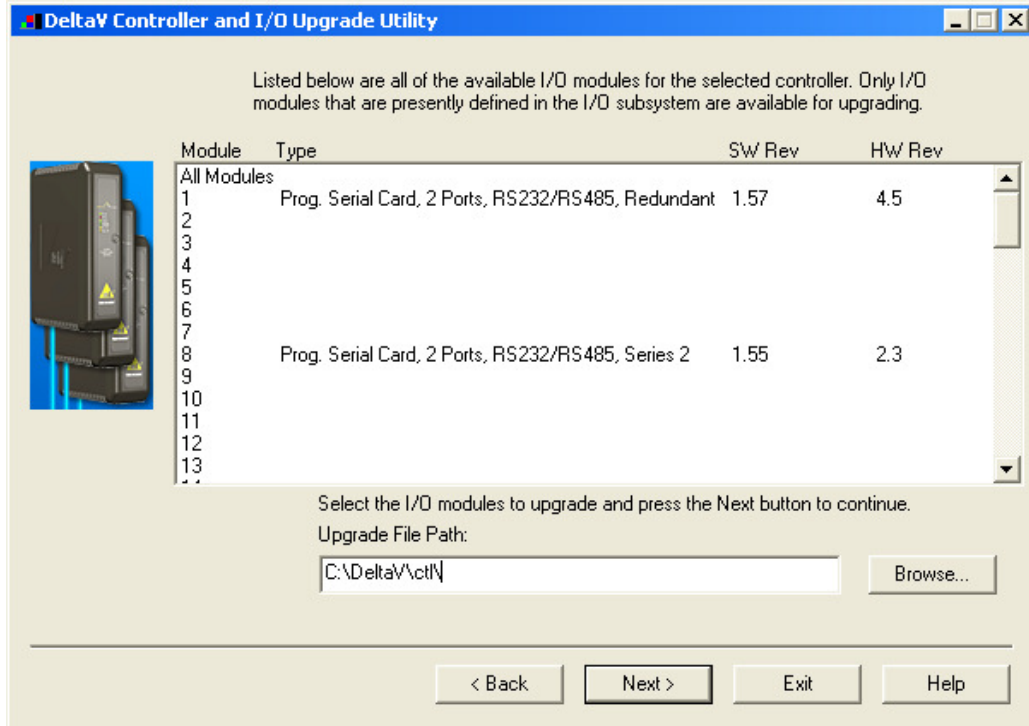


6. Select the I/O module again as shown below and then click Next. Go to Step 9.





7. If you are upgrading an existing Programmable Serial Card, the dialog will be as shown below. From this dialog, select the Programmable Serial Card I/O Module in the list.



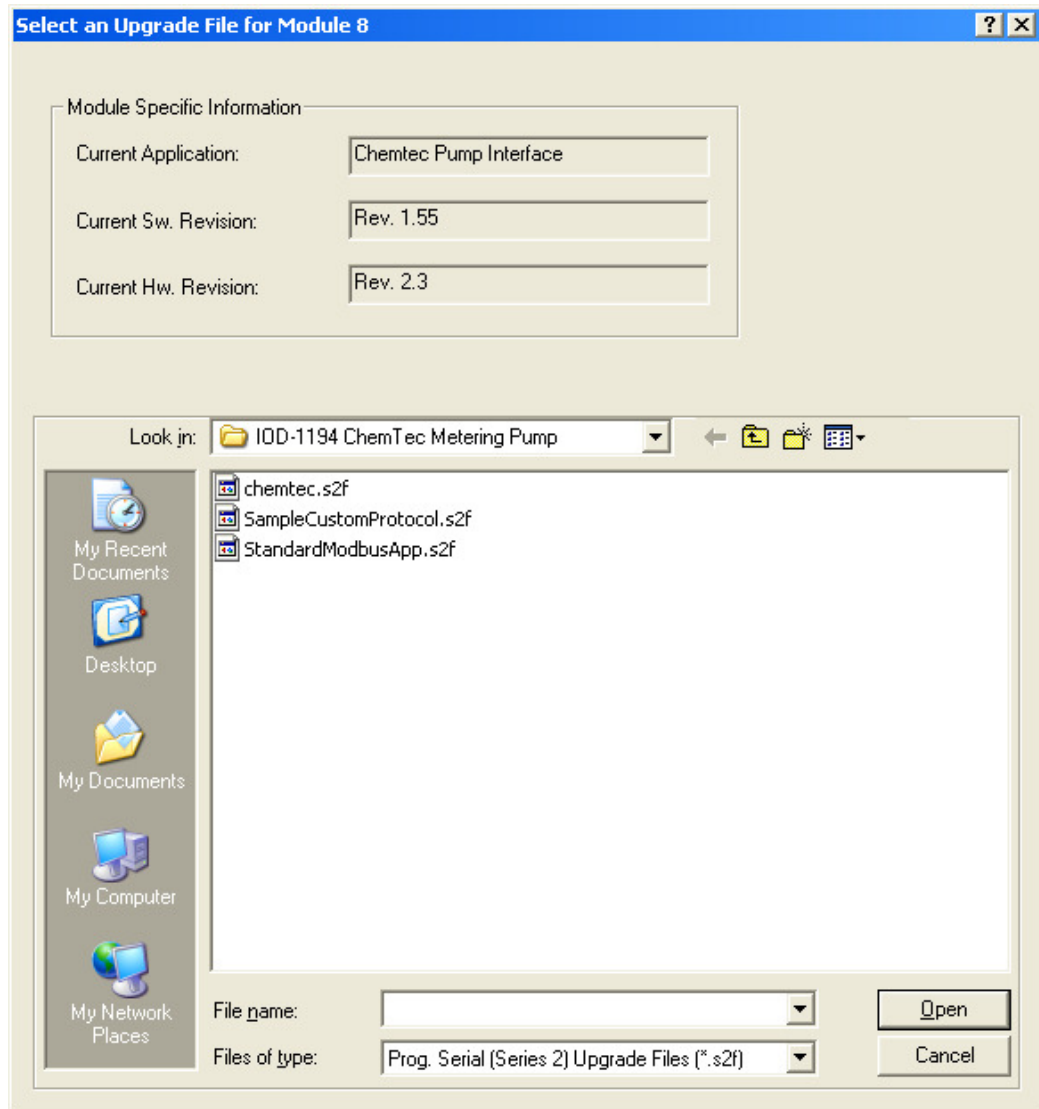
For example, we will select I/O Module 8. This will give you a dialog, from which you will select the file path to where the driver software is located. This path will be:

**\DeltaV\ct\ProgSerial\IOD-1194 Chemtec Metering Pump**

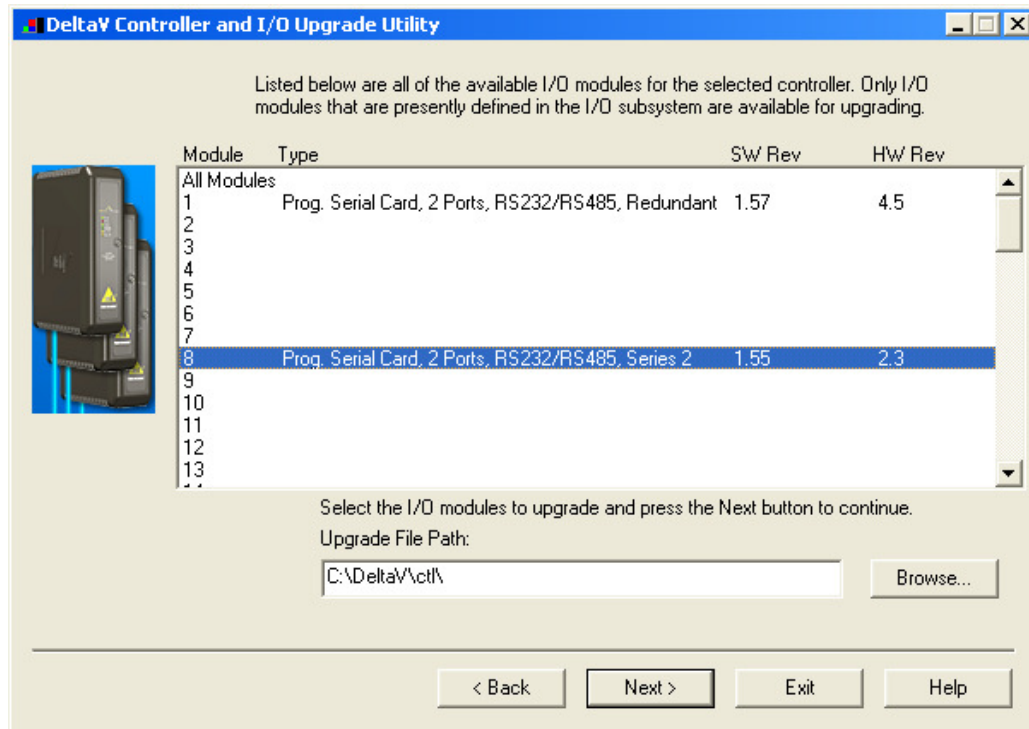
Once you are in the specified directory, you will need to select the following file:

**Chemtec.s2f**

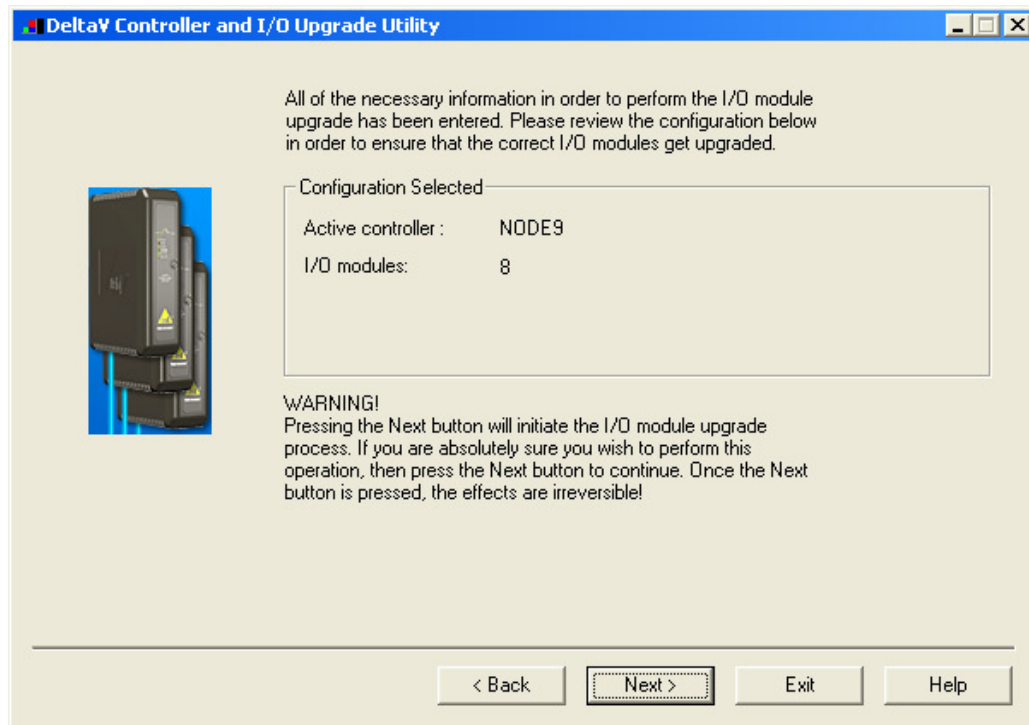
This is shown in the following dialog.



8. After selecting the .S2F file, Click on Open. This dialog will close and you will be back to the following:

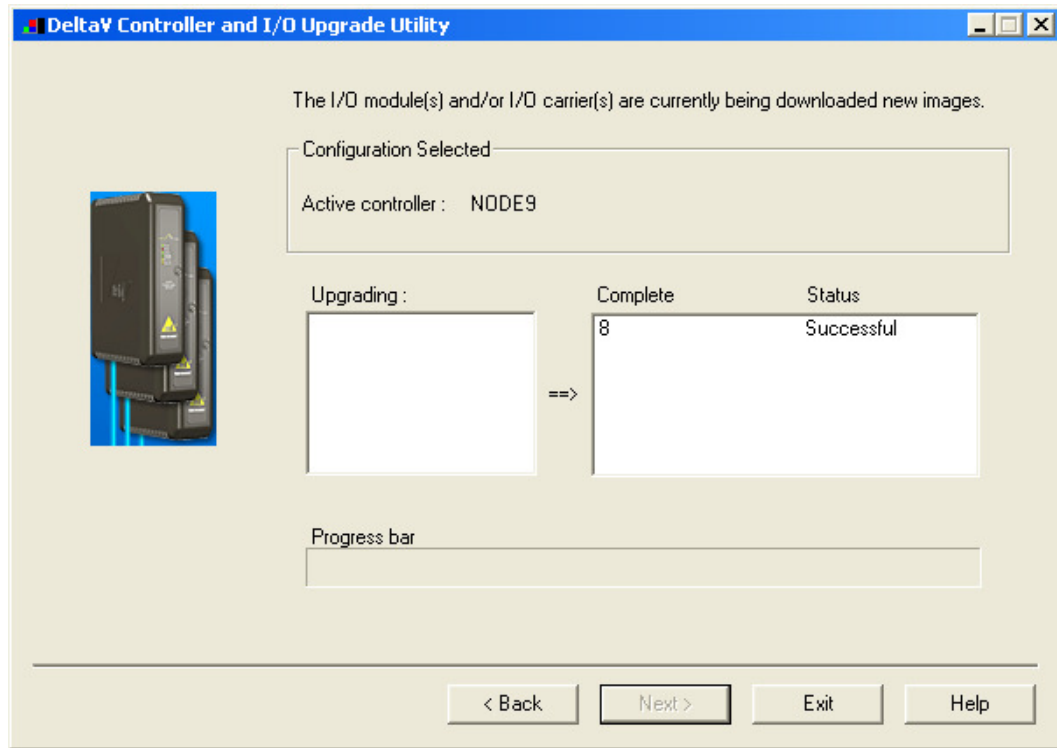


9. In this dialog, Click Next again. You will get the following dialog, confirming the Controller and I/O Module to program.





10. Click Next and the I/O Module upgrade process will begin. After completion, you will receive the following dialog, indicating success.



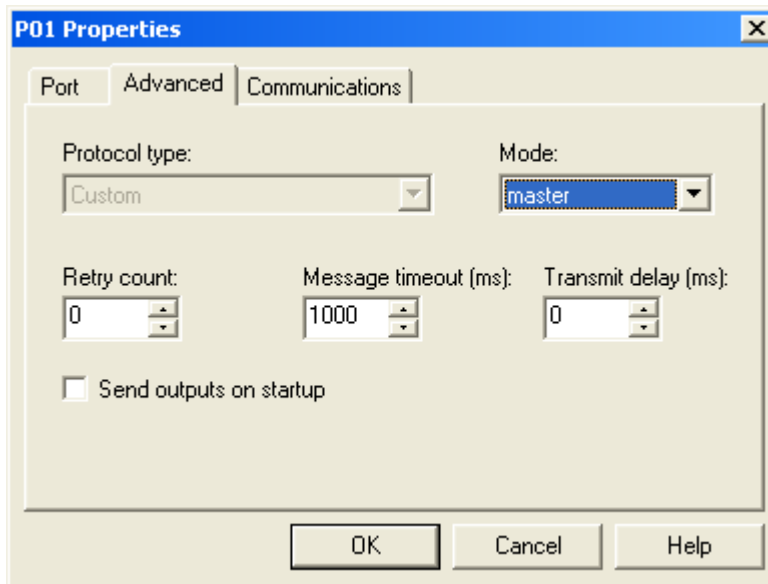
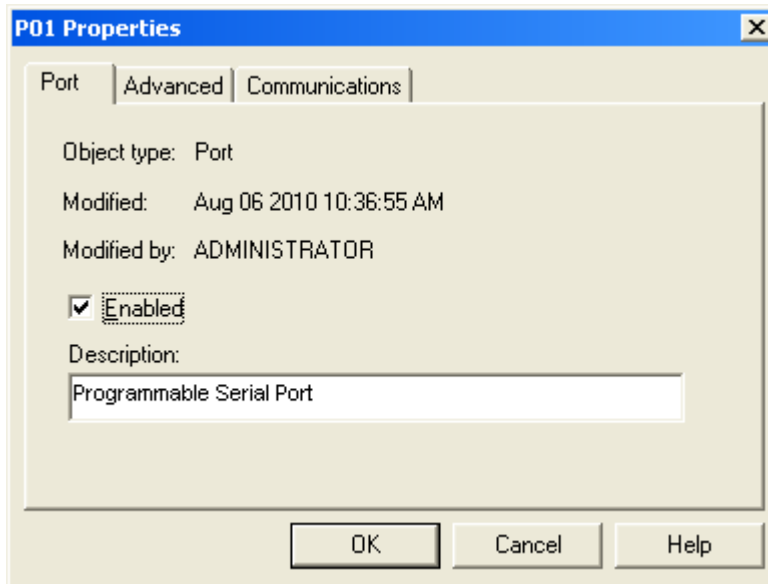
11. This completes the I/O Module upgrade process.

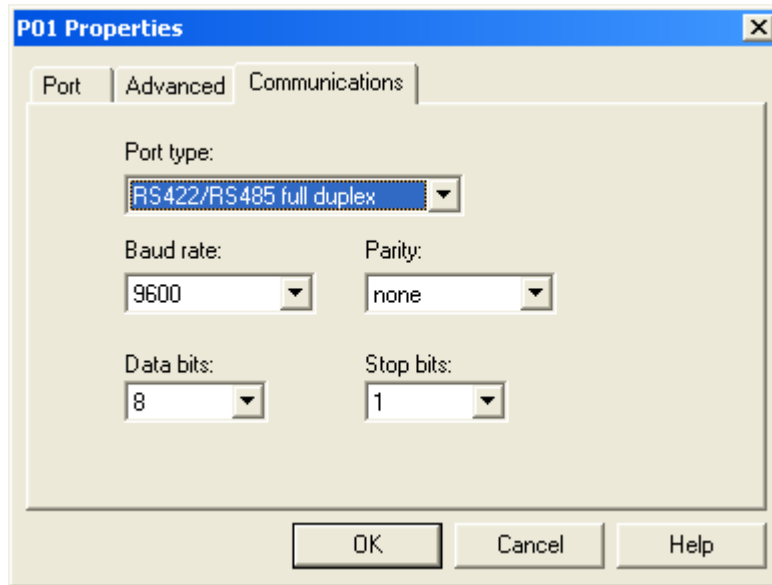


## 4 CONFIGURATION INFORMATION

### 4.1 Port Configuration

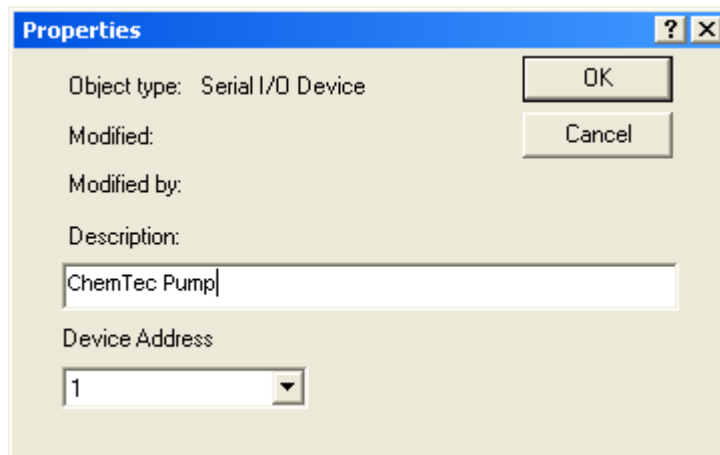
First, enable the port. Then click on the Advanced Tab and select Master. Next, click on the Communications Tab and specify the Port type. The Port type will be RS-422/485 Full Duplex (4 wire). Lastly, select the Baud rate, Parity, Data bits and Stop bits parameters; these must match the ChemTec. The following screen shots show the example configuration:





## 4.2 Device Configuration

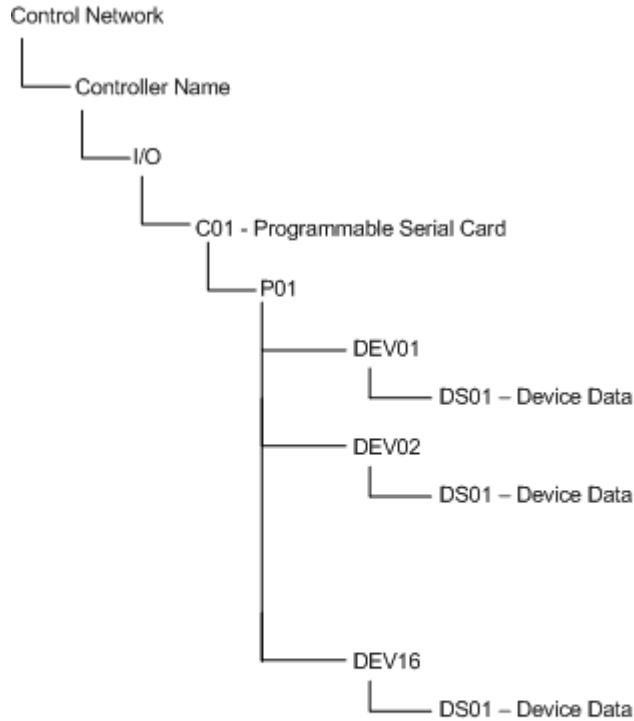
Specify a device corresponding to each connected ChemTec pump. The device address must match the pump address. A maximum of 16 pumps may be configured under a single PSIC port. Maximum supported device address is 31.





### 4.3 Dataset Configuration

A fixed dataset architecture is used to represent the pumps, where each configured device is assigned a single dataset.





**4.3.1 Dataset Configuration:**

Configure each dataset as follows:

<b>Direction</b>	Output
<b>DeltaV Data Type</b>	16-bit UINT w/status
<b>Device Data Type</b>	0
<b>Start Address</b>	0
<b>Number of Values</b>	2
<b>Special Data 1-5</b>	0, 0, 0, 0, 0

The dataset registers will be used as follows:

<b>Register Number</b>	<b>Description</b>
R1	Command Number
R2	Parameter

The following commands are supported:

<b>Command Number</b>	<b>Description</b>
1	Turn Pump ON
2	Turn Pump OFF
3	Change Pump direction to Clockwise
4	Change Pump direction to Counter Clockwise
5	Change Pump Speed. See speed parameter description below.
6	Change Pump TTL state. The TTL parameter is expected as one of the following numbers: 0 (interpreted as 0000) 1 (interpreted as 0001) 2 (interpreted as 0010) 3 (interpreted as 0011) ... 15 (interpreted as 1111)

Pump commands 1, 2, 3 and 4 do not require any parameter. Only commands 5 and 6 do. In these cases, specify the parameter first, and then write the command number. The driver will acknowledge that the command is executing by adding a 100 to the command number and writing it back into the register.

For example, when the pump is turned on, the Control Module will write a 1 into Register R1. The driver will update the register with 101.



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It is recommended that a CALC or ACT block be used to write commands into the command register. Wiring the register will interfere with the readback driver acknowledgement post command execution.

The pump speed parameter is a percent number if the pump is not calibrated, or the actual flow rate if calibrated. For example, specify a parameter of 500 in an uncalibrated pump. This will set the speed to 50%. For a calibrated pump, this will be 500 ml/min.

There are 4 TTL points. The TTL command allows users to control the TTL output state to be low or high. Only the low order 4 bits of the specified parameter are used. A bit value of 0 sets the TTL output to low, while a bit value of 1 sets the output to high.



## **5 Operational Check**

### **5.1 Scope**

The following sections provide some assistance to ensure the interface is working properly.

### **5.2 Verify Hardware and Software Version Number**

The user can verify that the ChemTec driver has been installed using the DeltaV Diagnostics tool. The Diagnostics tool will show the Hardware Revision No. (HwRev) and the Software Revision No. (SwRev).

To begin the DeltaV Diagnostic tool select Start-> DeltaV-> Operator-> Diagnostics. In the Diagnostics tool expand the Controller, I/O and then double click on the Programmable Serial Interface Card that has the driver installed.

The following information will be displayed:

:	:	:
HwRev	Hardware Revision	1.1 (or later)
SwRev	Software Revision	P1.55 (or later)

### **5.3 Verify Configuration**

- Verify port configuration: The serial port must be enabled. User needs to make sure communication settings such as baud rate, parity, and number of data bits match the field device settings.
- Verify dataset configuration: The datasets configured must be as shown above.

### **5.4 Verify I/O Communication With Control Studio**

User can create I/O modules in the control studio to verify correct values are read from the PSIC. For AI and DI data, the values should be changed in the field device and verified that the new data are correctly reported in DeltaV. Similarly, verify that the AO and DO data is being written correctly from DeltaV to the field device.

### **5.5 Using Diagnostics**

- Verify PSIC communication: Select the PSIC on Diagnostics and press the right mouse button. Select Display Real -Time Statistics from the drop down menu. If the Programmable Serial Interface Card is functioning then the user will see the Valid Responses counter and the Async and/or Sync Transactions counters incrementing. There will not be any error counting up.
- Verify port statistics: Select the Port on the Programmable Serial Interface Card and press the right mouse button. Then select Display Port Statistics form the drop down menu. Verify that the port communications statistics are being displayed properly and are counting as expected for the protocol's functionality.



- Verify dataset values: Select a dataset and press the right mouse button. Select View Dataset Registers from the Drop down window. Verify that the dataset values are displayed as expected.
- Verify that there are no errors at the dataset level.

## **5.6 LED Indication**

The Yellow LED for the port should be on solid when all communications on that port are valid. The Yellow LED should be blinking if there is some valid communications and some communications with errors on that port. The Yellow LED should be OFF if there are no valid communications on that port.



## 6 Connecting DeltaV PSIC to the ChemTec Pump

The electrical interface between DeltaV and the ChemTec Pumps is a combination of RS422/485 and RS232. RS422/485 Full Duplex (4-wire) will be used between the serial port and the Phoenix Contact converter. RS232 with a maximum cable length of 50 feet will be used from the Phoenix Contact converter and a ChemTec pump.

### Serial Termination Block

The serial port P01 pin out is as follows, and port P02 is similar:

Screw Term	Description
1	Ground
2	TxD+
4	TxD-
6	RxD+
8	RxD-

### Phoenix Contact Converter

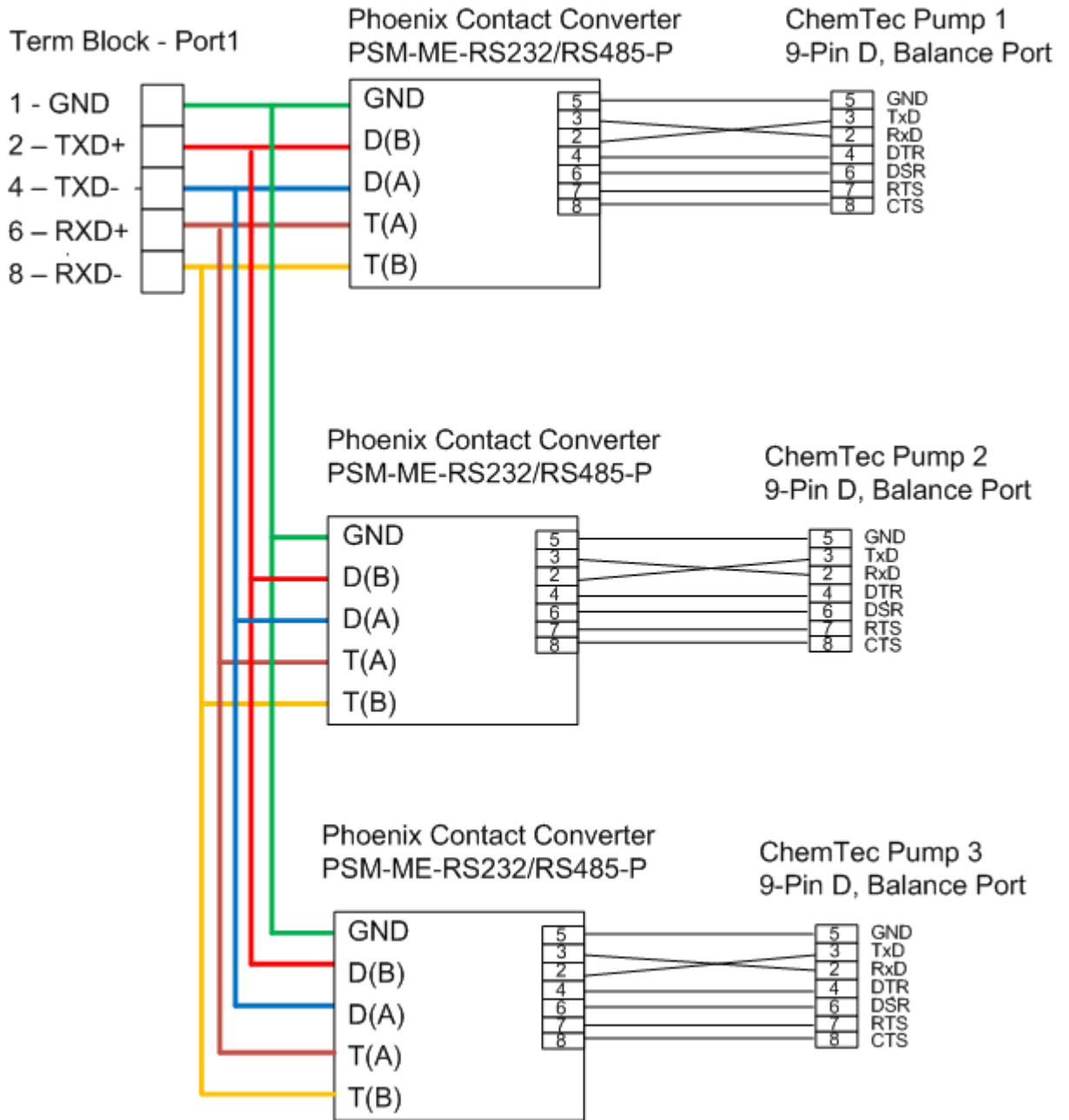
Configure the Phoenix Contact converter as follows:

1. Dip Switches: 1=ON, 2=OFF, 3=ON, 4=ON, 5=OFF, 6=OFF, 7=ON, 8=OFF.
2. DTE selected.
3. Termination On.



Wiring for all devices

Connect the serial termination block, the Phoenix Contact Converter and the ChemTec pumps as illustrated in the following diagram. Note that RS-232 cable between the Phoenix Contact converter and the ChemTec pump has a maximum length of 50ft, and the TxD/RxD lines are crossed.





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## **7 Technical Support**

For technical support or to report a defect, please give MYNAH Technologies a call at (636) 681-1555. If a defect is discovered, please document it in as much detail as possible and then fax your report to us at (636) 681-1660.

You can also send us your questions via e-mail. Our addresses are:

[support@mynah.com](mailto:support@mynah.com)

Thank you for using DeltaV.