



**M Y N A H<sup>SM</sup>**

**Isco Driver for DeltaV  
Programmable Serial Interface Card  
Series 2**

**USER MANUAL**

**Rev. P1.55**

**August 2009**

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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 Isco Syringe Pump Controller serial communication driver firmware for the Emerson DeltaV Control System; it provides information required to install, configure, and maintain the Isco driver firmware on the DeltaV Series 2 Programmable Serial Interface Card (PSIC). The reader should be familiar with Emerson's DeltaV controller system and the Isco Equipment. Isco pumps, which communicate via the DASNET protocol, are supported.

The section *Document Format* briefly describes the contents of each section of this manual. *System Specifications* outlines hardware and software requirements for the Isco Driver (P1.55) firmware. *Related Documents* lists other documents used to prepare this manual.

## **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 Isco Driver.
<b>Downloading Firmware</b>	Describes downloading procedures for the Isco firmware on to the DeltaV PSIC.
<b>PSIC Configuration</b>	Describes procedures and guidelines for configuring the DeltaV PSIC.
<b>Driver Communications</b>	Describes Isco commands used and DeltaV Registers containing Isco data.
<b>Operational Check</b>	Provides tips and assistance to ensure PSIC is properly setup and configured.
<b>DeltaV – Isco Electrical Interface</b>	Describes the electrical interface between DeltaV and the Isco devices. Also describes the pin assignments for RS-232 communications.
<b>Technical Support</b>	Describes who to call if you need assistance.



### 1.3 System Specifications

The following table lists the minimum hardware requirements for the Isco Driver:

**Table 1: System Specifications**

<b>Firmware</b>	Isco Driver Firmware (P1.55)
<b>Protocol Compatibility</b>	Isco Protocol (DASNET) as defined in Section 6, Serial Interface, for Syringe Pump Controllers.
<b>Software Requirements</b>	DeltaV System Software (Release 4.2 or later) installed on a hardware-appropriate Windows NT workstation configured as a ProPlus for DeltaV Serial Interface Port License (VE4102)
<b>Minimum Hardware Requirements</b>	FRSI DeltaV PSIC Hardware PN: 12P2506X022 FRSI DeltaV M3, M5, MD or Series 2 MD Controller, Power Supply and 2 wide controller carrier FRSI 8 wide I/O card carrier Isco Pump Controllers supporting DASNET



## 2 THEORY OF OPERATION

As part of the serial interface port license, a standard Modbus protocol is installed on the DeltaV PSIC prior to customization. The PSIC needs to be flash upgraded from the Modbus protocol to the Isco protocol before operation.

The RS-232 communication settings must be configured properly to ensure accurate communication between the PSIC and Isco devices. RS-422/485 may be used if the Isco devices support this electrical standard, or a RS-422/485 to RS-232 converter is used.

This driver functions as a master only. In master mode, the PSIC continuously sends data read commands to the connected Isco devices. The received responses are reported to DeltaV via dataset registers. Outputs are written only when a user command is detected (commands are listed below), and the corresponding response is reported back to the dataset.

A fixed architecture will be used in order to maximize the number of Isco devices, which can be connected to a PSIC port, while maintaining ease of data access and scan throughput. A maximum of five (5) Pump Controllers under each PSIC port will be allowed, each corresponding to a PSIC Device. Since each controller supports a maximum of three (3) pumps, the data for these pumps will be located under the PSIC Device. The device address in PSIC configuration will have to match the Controller address.

Note that this is a fixed architecture. If a particular Controller only has 1 pump attached to it, the PSIC configuration must still comprise 3 datasets. Only one dataset will contain pump data, while the remaining two will be unused.

The following illustrates the DeltaV PSIC and underlying architecture.





The driver will continuously send read commands to read pump run-time data. The following data will be read:

**Table 2: Dataset 1-3 Assignments for Read/Write data**

<b>Data Name</b>	<b>Assigned Register</b>	<b>Type</b>
ANLG1	R1	Read
ANLG2	R2	Read
ANLG3	R3	Read
ANLG4	R4	Read
ANLG5	R5	Read
Digital Status	R6	Read/Write
Digital Control	R7	Read/Write
Flow	R8	Read
Actual Flow DS1=Flow A DS2=Flow B DS3=Flow C	R9	Read/Write
Limits – Max Pressure	R10	Read
Limits – Min Pressure	R11	Read
Limits – Max Flow	R12	Read
Limits – Min Flow	R13	Read
Maximum Flow SP DS1=MaxFlow A DS2=MaxFlow B DS3=MaxFlow C	R14	Read/Write
Maximum Pressure SP DS1=MaxPress A DS2=MaxPressB DS3=MaxPress C	R15	Read/Write
Maximum Flow limit SP DS1=MFlow A DS2=MFlow B DS3=MFlow C	R16	Read/Write
Minimum Flow rate SP DS1=MinFlow A DS2=MinFlow B DS3=MinFlow C	R17	Read/Write
Minimum Pressure SP DS1=MinPress A DS2=MinPress B DS3=MinPress C	R18	Read/Write
Pressure	R19	Read
Actual Pressure DS1=Press A DS2=Press B DS3=Press C	R20	Read
Press Diff	R21	Read/Write
DS1=Range A DS2=Range B DS3=Range C  4 values are returned	Max Pressure=R22 Max Flow = R23 Max Refill Rate=R24 Max Volume=R25	Read



Refill Flow Rate Limit DS1=Limit A DS2=Limit B DS3=Limit C	R26	Read
Flow Rate Setpoint DS1=Flow A DS2=Flow B DS3=Flow C	R27	Read
Pressure Setpoint DS1=Pressure A DS2=Pressure B DS3=Pressure C	R28	Read
Volume DS1=Vol A DS2=Vol B DS3=Vol C	R29	Read
Volume Total	R30	Read
Pump Status 0 – STOP 1 – RUN 2 – REFILL 3 – HOLD 4 – EQUIL. 5 – LOCAL 6 – REMOTE 7 – EXTERNAL  32769 – OVER PRESSURE 32770 – UNDER PRESSURE 32771 – CYLINDER FULL 32772 – CYLINDER EMPTY 32773 – MOTOR FAILURE	R31	Read



**Table 3: Dataset 1-3 Assignments for Write Only data**

<b>Data Name</b>	<b>Assigned Register</b>	<b>Type</b>
IPUMP DS1=A DS2=B DS3=C  0=Off; 1=On	R35	Write Only
Pressure SP (Const Pressure Mode) DS1=A DS2=B DS3=C	R36	Write Only
Pressure Control Differential range DS1=A DS2=B DS3=C	R37	Write Only
Pressure Differential Setpoint	R38	Write Only
UnitsA 1 = ATM 2 = BAR 3 = KPA 4 = PSI 5 = ML/MIN 6 = ML/HR 7 = UL/MIN 8 = UL.HR	R39	Write Only
Refill Rate DS1=A DS2=B DS3=C	R40	Write Only
%B	R41	Write Only

**Note: If a write error occurs in write-only commands, the driver will write a -1 into the register.**



For Type 2 and 3 commands, Registers 45-50 will be reserved. Usage for these registers is as follows:

**Table 4: Command and Parameter Registers**

Register Number	Usage
R45	Command register. The DeltaV module will write a command number in this register, after the parameter 1 and parameter 2 registers have been updated (if needed). Command numbers are listed below.  <b>This register is set to zero after the command is executed.</b>
R46	Parameter 1 value
R47	Parameter 2 value
R48	Reserved
R49	Reserved
R50	Command Status. The driver will write a 0 into this register if the command completed successfully, and a -1 if the command failed.

**NOTE: For commands with parameters, write the parameters into the register first, and then write the command number into the command register.**



Table 5 details Type 2 and 3 commands.

**Table 5: User commands**

<b>Command</b>	<b>Command Number</b>	<b>Parameters</b>
Clear	1	0
Continuous Const Flow	2	0
Continuous Const Pressure	3	0
Const Flow A Const Flow B Const Flow C	4	0
Const Press A Const Press B Const Press C	5	0
Independent Mode	10	0
LGG0	11	0
LGSL	12	1; F #
LGDL	13	2; F#, S#
LGUL	14	2; F#, S#
Local	15	0
Modifier	16	0
Pressure Control Differential1	17	0
Pressure Control Differential2	18	0
Pressure Control Differential3	19	0
Pressure Control Normal	20	0
Activate Rapid Pressurization Cycle A Activate Rapid Pressurization Cycle B Activate Rapid Pressurization Cycle C	21	0
Refill A Refill B Refill C	22	0
Remote	23	0
Run A Run B Run C	24	0
Stop A Stop B Stop C	25	0
Volume Reset	26	0
Zero A Zero B Zero C	27	0
Zero Diff1	28	0
Zero Diff2	29	0
Zero Diff3	30	0

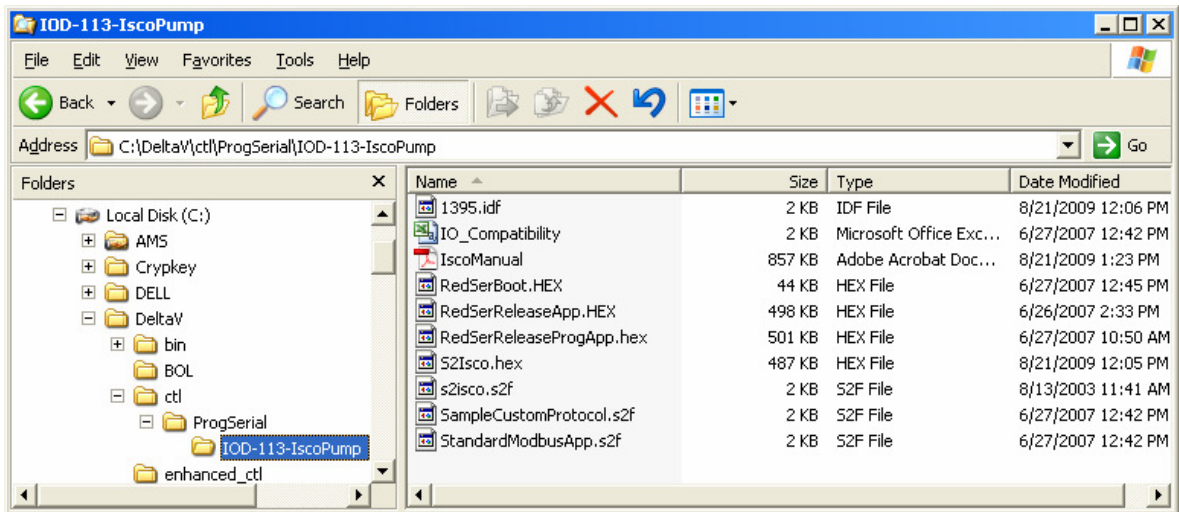


### 3 Downloading the firmware

The driver software distribution comprises 10 files, distributed on a CD. These files must be copied to the DeltaV directory on your ProPlus Workstation. The path is:

**\\DeltaV\ctl\ProgSerial\IOD-1131-IscoPump**

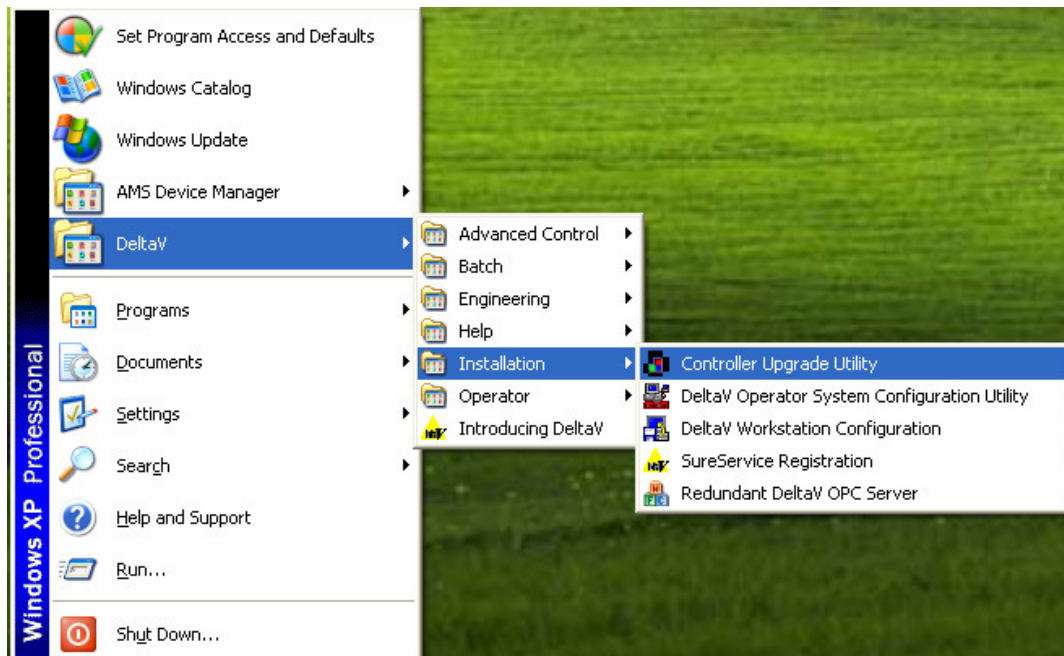
Note that you will have to create the \IOD-1131-IscoPump subdirectory. The following files will be copied:



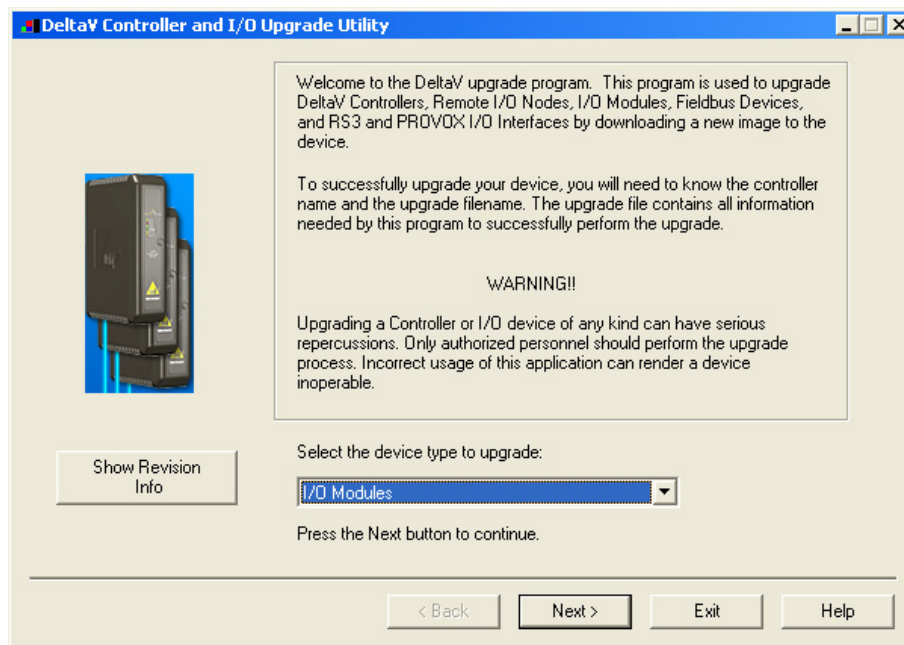


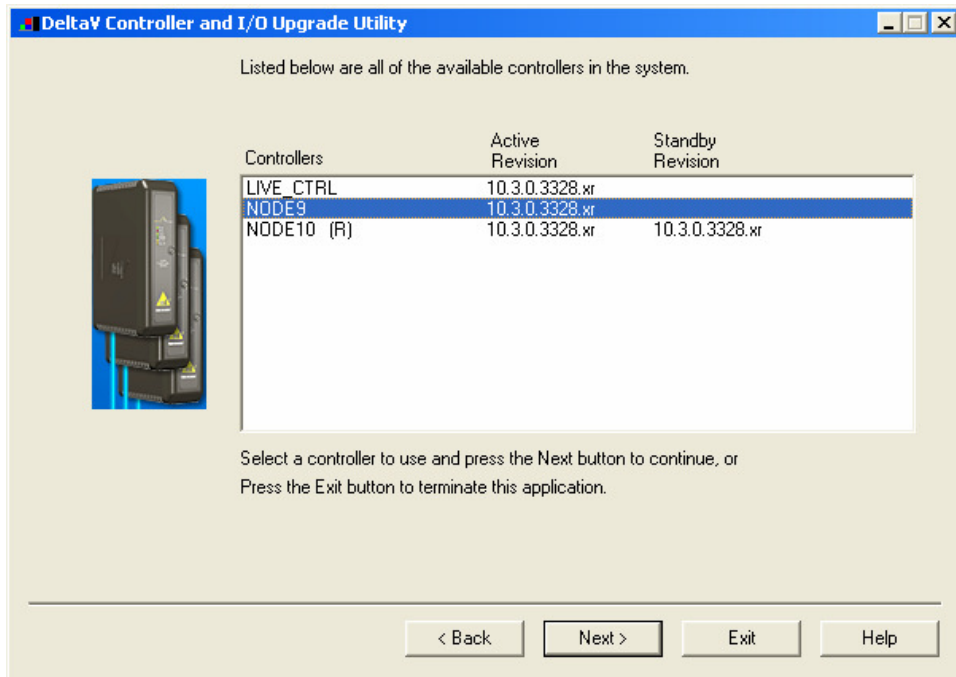
After copy completion, you are ready to program (or upgrade) the Programmable Serial Card with the supplied custom driver software. The steps are as follows:

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.

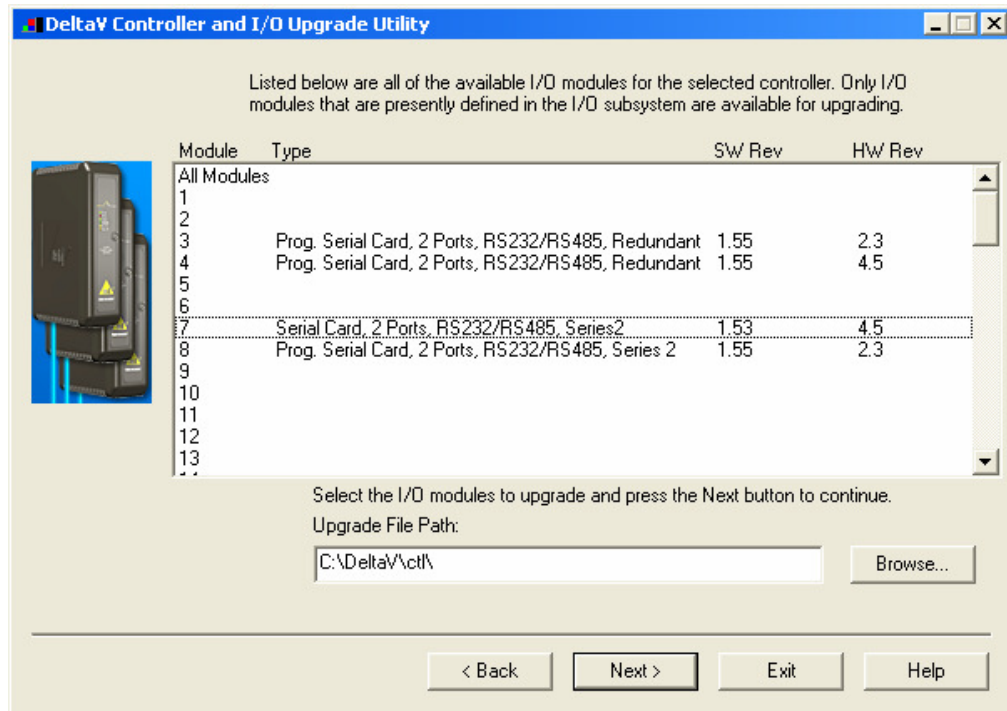




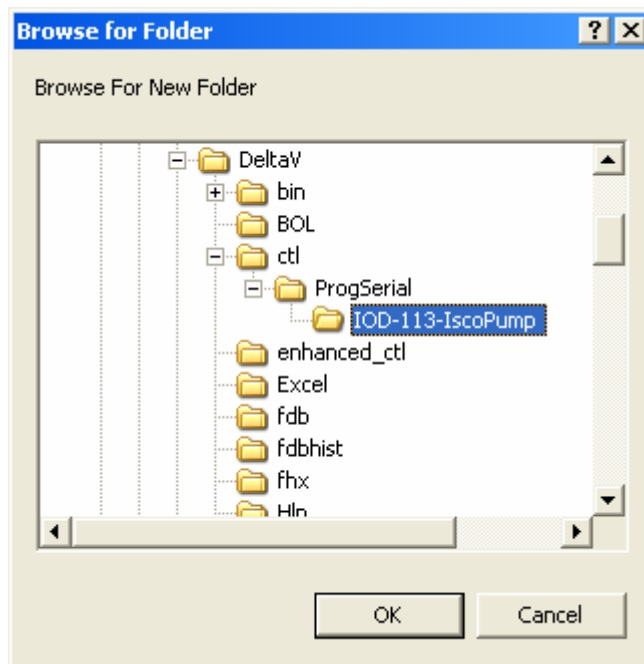
3. The above dialog will appear, listing all the available Controllers in your network. From this dialog, select the appropriate Controller and then Click Next.

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 Isco Pump Driver, the dialog will be as shown below. When upgrading an existing Programmable Serial Card, skip Steps 5 and 6, and go to Step 7.**

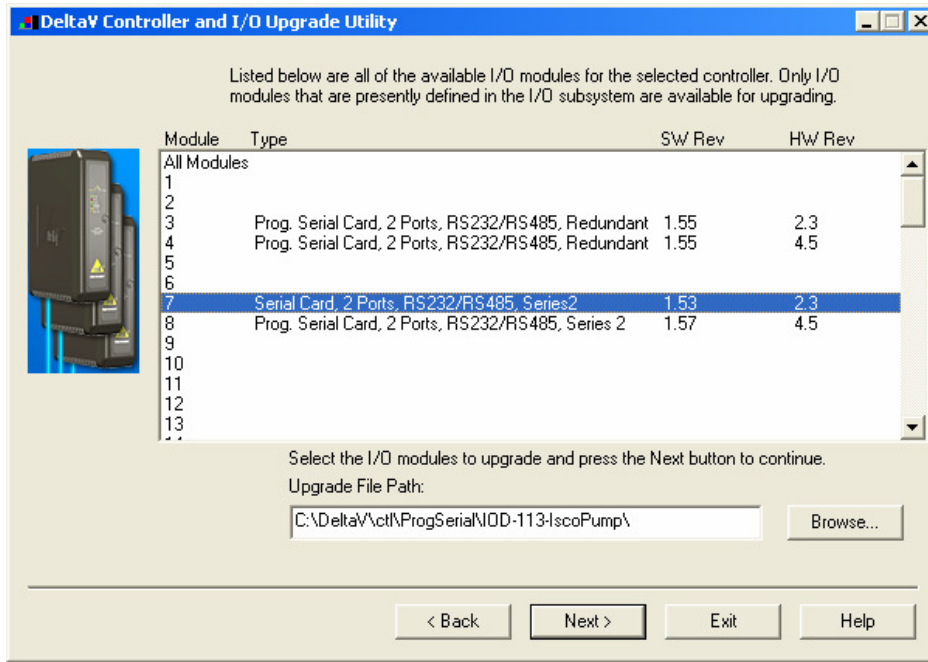


5. Click the Browse button and select the DeltaV path as shown below, and then click Ok. Note that the disk drive could be C or D.

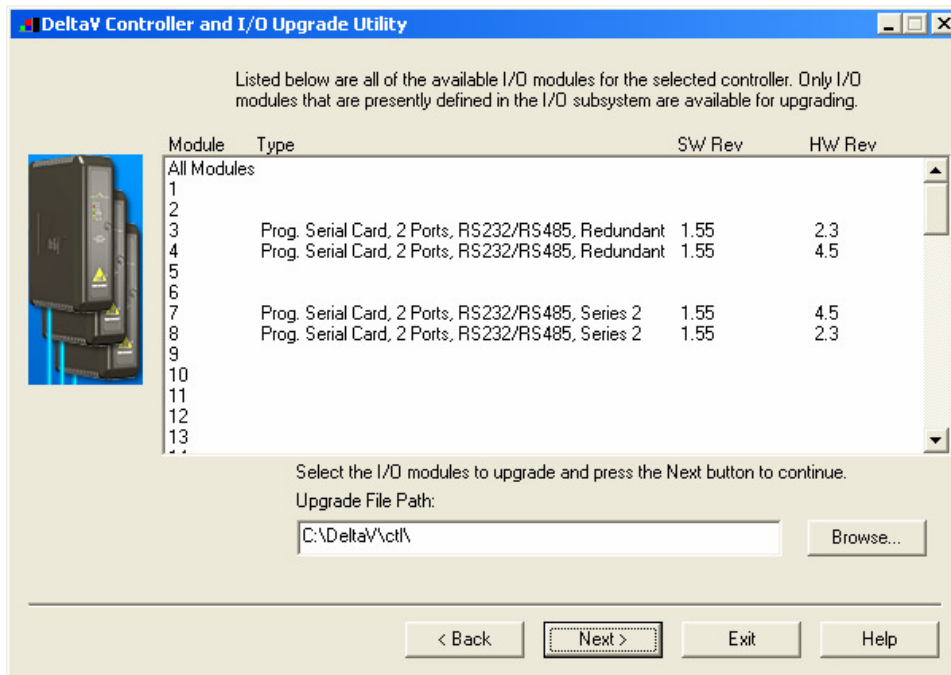




6. Select the I/O module again as shown below and then click Next. Go to Step 9.



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 7. 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:

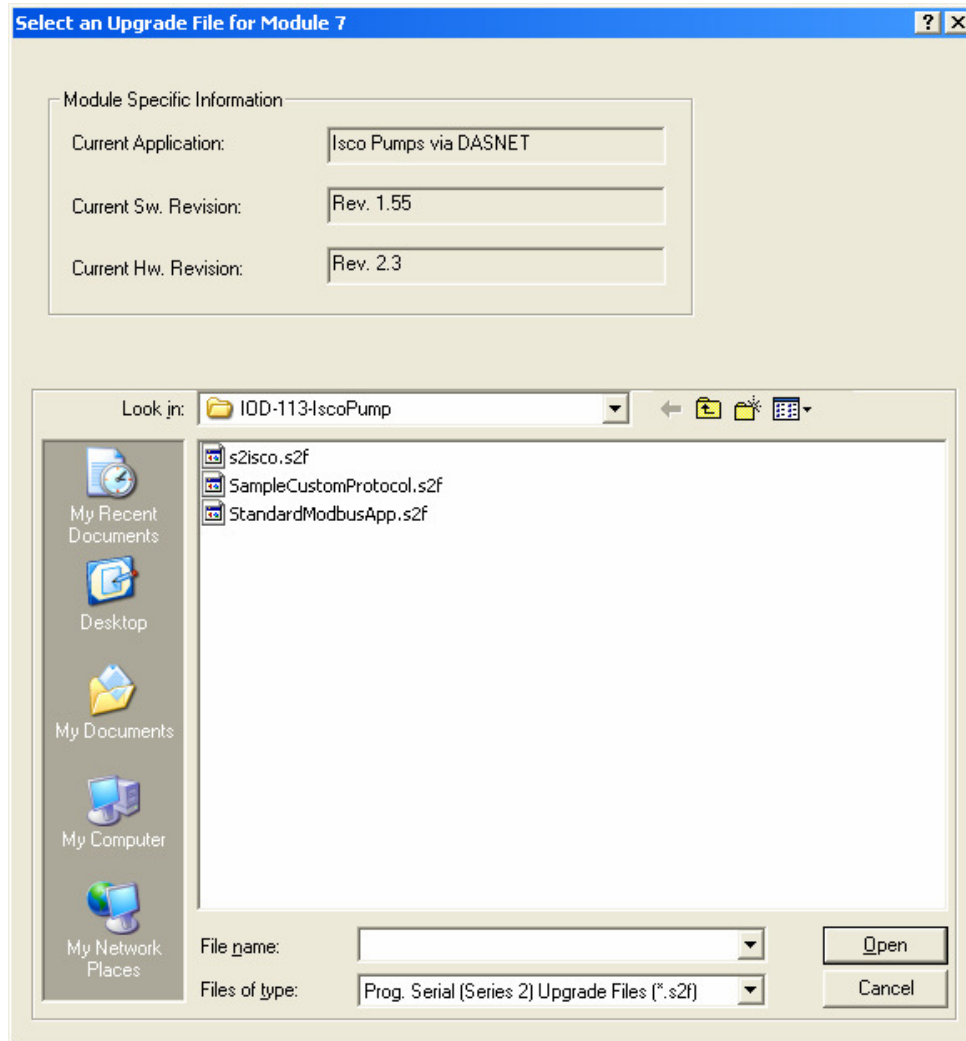


**\Delta\ctl\ProgSerial\IOD-1131-IscoPump**

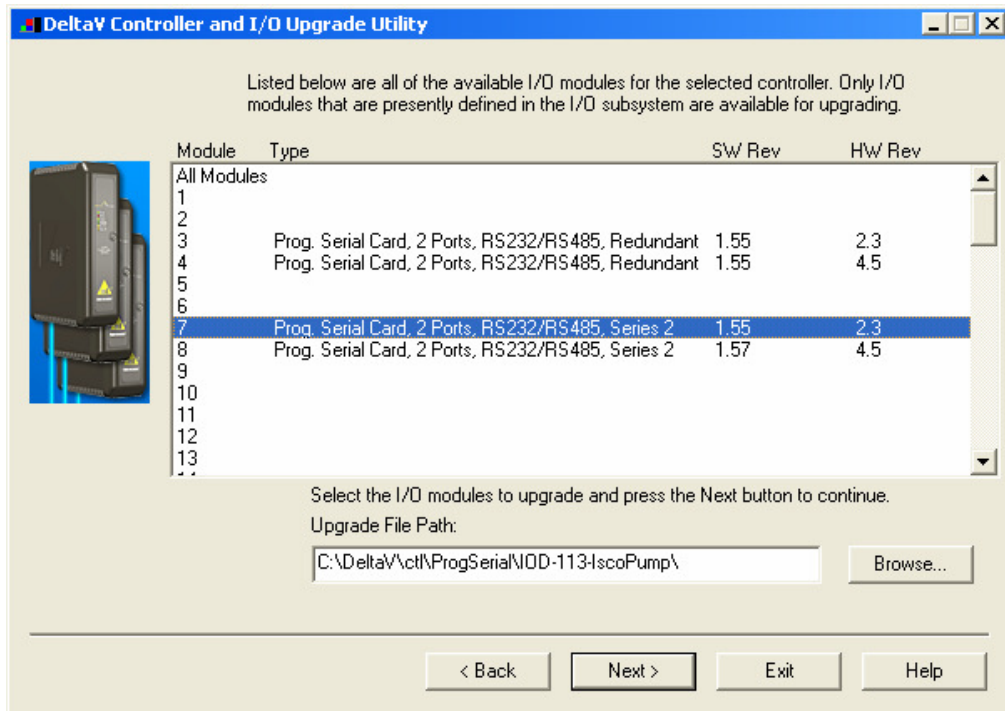
Once you are in the specified directory, you will need to select the following file:

**S2ISCO.S2F**

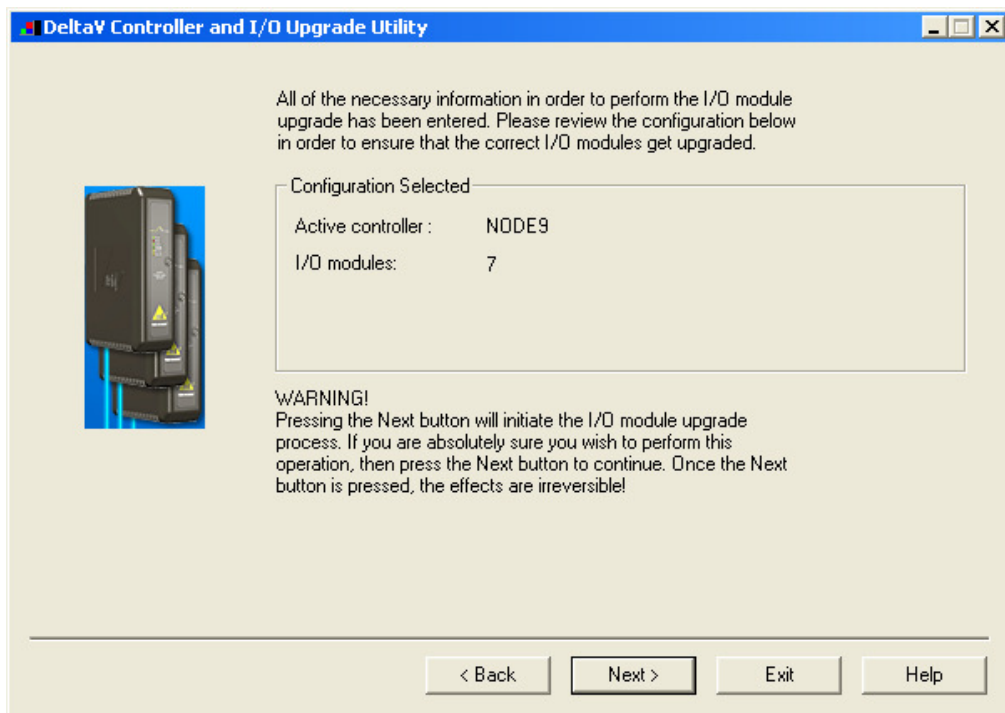
This is shown in the following dialog.



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

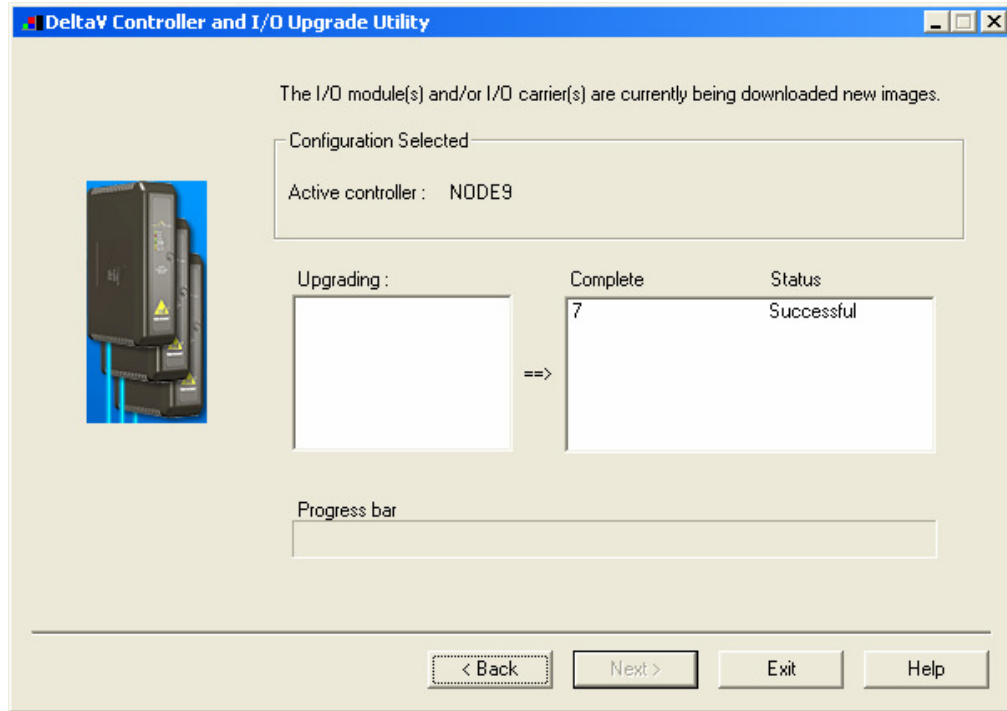


9. In this dialog, Click Next again. You will get the following dialog, confirming the Controller and I/O Module to program.





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**

This section describes the steps necessary to configure the DeltaV PSIC and the Isco device to obtain proper communication.

### **4.1 Device And Dataset Configuration**

The following paragraphs discuss some attributes in the device and dataset configuration:

#### **4.1.1 Device Address:**

You can configure a maximum of five (5) Pump Controllers under each PSIC port. Furthermore, each controller in turn supports a maximum of three (3) syringe pumps. The specified device address will be the address of the Controller. Specify this address as a single digit. It must match the address configured in the Controller device

#### **4.1.2 Output Mode:**

All datasets will be of type Output with Readback. Two output modes are available in the DeltaV PSIC: block output (0) and single output (1). The driver does not use this value. Specifically, when data is written out, it will be on a single value basis. Leave this value at its default setting.

#### **4.1.3 DeltaV Data Type:**

Each controller device will use three (3) datasets. The datasets must be configured as Floating point with status.

#### **4.1.4 DeviceDataType**

The driver does not use this value. Leave this value at its default setting of 0 if the pump corresponding to the dataset is not connected. For connected pumps, this value must be 1, 2 or 3, corresponding to pumps A, B and C, respectively.

#### **4.1.5 Data Start Address and Number of Values**

Configure all datasets with Starting Address as 0, and Number of values as 50.

#### **4.1.6 Special Data 1-5**

Configure all Special data values as 0.



## **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 Isco 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 Isco driver installed.

The following information will be displayed:

:	:	:
HwRev	Hardware Revision	1.1 (or later)
SwRev	Software Revision	P1.0 (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 Isco 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 Isco and the PSIC. For input data, the values should be changed in the Isco and verified that the new data are correctly reported.

### **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 from the drop down menu. Verify that the port communications statistics are being displayed properly and are counting as expected for the Isco 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.

## **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 DeltaV - Isco Electrical Interface

The electrical interface between DeltaV and the Isco devices conforms to the RS-232 protocol. The RS-232 cable connecting Isco and the DeltaV PSIC should not exceed 50 feet as specified by the EIA standard for RS-232 protocol. Section 6.1 shows the pin assignments for the PSIC serial terminal block for RS-232 protocol.

### 6.1 RS-232 Pin Assignments for DeltaV PSIC

Terminal Number	Signal Description
1	Port 1 - Isolated Ground (GND)
2	Unused
3	Port 1 - Transmit Data (TXD)
4	Unused
5	Port 1 - Receive Data (RXD)
6	Unused
7	Port 1 - Data Terminal Ready (DTR)
8	Port 1 - Dataset Ready (DSR)
9	Port 2 - Isolated Ground (GND)
10	Unused
11	Port 2 - Transmit Data (TXD)
12	Unused
13	Port 2 - Receive Data (RXD)
14	Unused
15	Port 2 - Data Terminal Ready (DTR)
16	Port 2 - Dataset Ready (DSR)

### 6.2 Wiring Connections for RS-232 Communications

Five terminals need to be connected between the PSIC and the Isco device port. Pins 3 (TXD) and 5 (RXD) need to be crossed so that the Isco TXD is connected to PSIC RXD, and the Isco RXD is connected to PSIC TXD. Pins 7 (DTR) and 8 (DSR) also need to be crossed in the same manner between the PSIC and the Isco. Alternatively, you can jumper DTR and DSR on the PSIC terminal block. In all cases, the GND signal goes through, i.e., connect terminal block screw 1 to GND on the Isco device. If the Isco port is 9-pin D-shell, then GND is pin 5. If the port is 25-pin D-Shell, then the GND is pin 7.



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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 address is:

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

Thank you for using DeltaV.