MYNAH℠

Limitorque DDC-100
Programmable Serial Interface Card
Series 2

USER MANUAL

Rev. P1.10

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1 INTRODUCTION

1.1 Scope

This document is User Manual for the Limitorque DDC-100 communications driver firmware for the Emerson Process Management (EPM) DeltaV Control System. The driver will run in the DeltaV Series 2 Programmable Serial Interface Card (PSIC). The reader should be familiar with EPM's DeltaV PSIC and connected DDC-100 devices.

1.2 Document Format

This document is organized as follows:

Introduction	Describes the scope and purpose of this document.
Theory of Operation	Provides a general functional overview of the Limitorque Driver.
Downloading Firmware	Describes downloading procedures for the driver firmware on to the DeltaV PSIC.
Configuration Information	Describes procedures and guidelines for configuring the DeltaV PSIC.
Operational Check	Provides tips and assistance to ensure PSIC is properly setup and configured.
DeltaV–Field Device Electrical Interface	Describes the electrical interface between DeltaV and the Limitorque DDC-100 devices. Also describes the cable pin assignments for RS-485.
Technical Support	Describes who to call if you need assistance.

1.3 System Specifications

The following table lists the minimum system requirements for the driver:

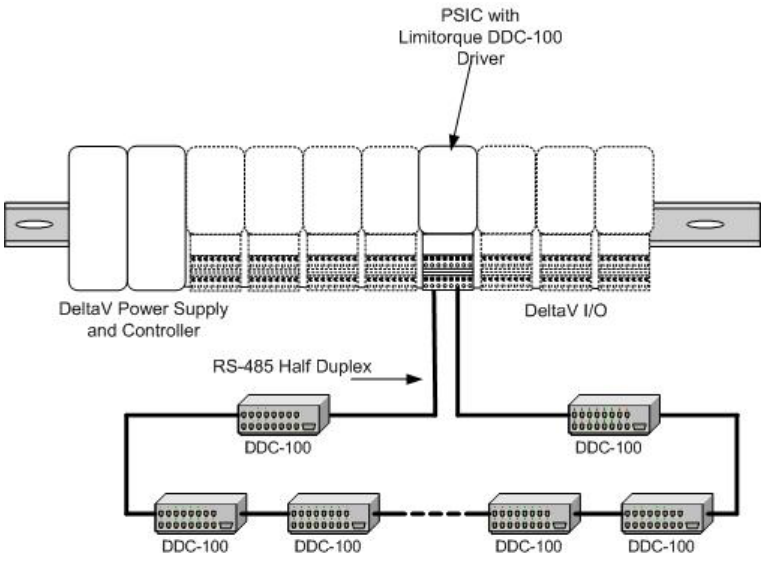
Protocol Compatibility and Reference documents	The communication protocol used will be the DDC-100 RS485 Communication Protocol described in DDC 100 Direct-to-Host Programming Guide. Document number 435-23009, Revision B, April 2002
Software Requirements	DeltaV System Software (Release 6.3.2 or later) installed on a hardware-appropriate Windows workstation configured as a ProfessionalPlus for DeltaV Serial Interface Port License (VE4102)
Minimum DeltaV Hardware Requirements	FRSI DeltaV Serial Interface Series 2, 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

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. The PSIC has 2 communication ports that can be configured as RS-232, RS-485 (Half Duplex), or RS-422 (Full Duplex). Various communications parameters, such as baud rate, are configurable. In general, both ports work independently.

Under each communication port, a user can configure devices with unique addresses. Under devices, one or more datasets can be assigned. There are a maximum of 16 datasets available under each port. Consequently, the total available devices and datasets are 32 for the entire PSIC. Assignment of datasets to devices is user dependent. A device may have one or more datasets. This allows a user to configure a maximum of 16 devices under a given port, each with a single dataset, or 8 devices, with 2 datasets each.

For this specific driver application, both ports function together as a single system. The DDC-100 devices, each with a unique address, must be installed in an RS-485 ring, with one end of the cable connected to Port 1, and the other connected to Port 2. The following depicts the network layout:



Limitorque DDC-100 Ring Network

The driver runs master mode only, and uses Port 1 on PSIC start-up, while Port 2 is used as the backup. More than one DDC-100 device can be configured under each communication port, with a maximum of 16 per port. All configured DDC-100 devices are continuously scanned using Port 1. Port 2 simply monitor the status of all configured DDC-100 devices.

The ring nature of the RS-485 physical device network allows for redundant communications with DDC-100 devices. Each device in the network is physically connected to both Port 1 and Port 2. In normal communications, if Port 1 losses communications with one or more DDC-100 devices, the driver will attempt to communicate with them using Port 2. If Port 2 also cannot communicate with the failed

devices, they will be marked as Bad in DeltaV. And DeltaV Diagnostics will show these devices as Not Communicating.

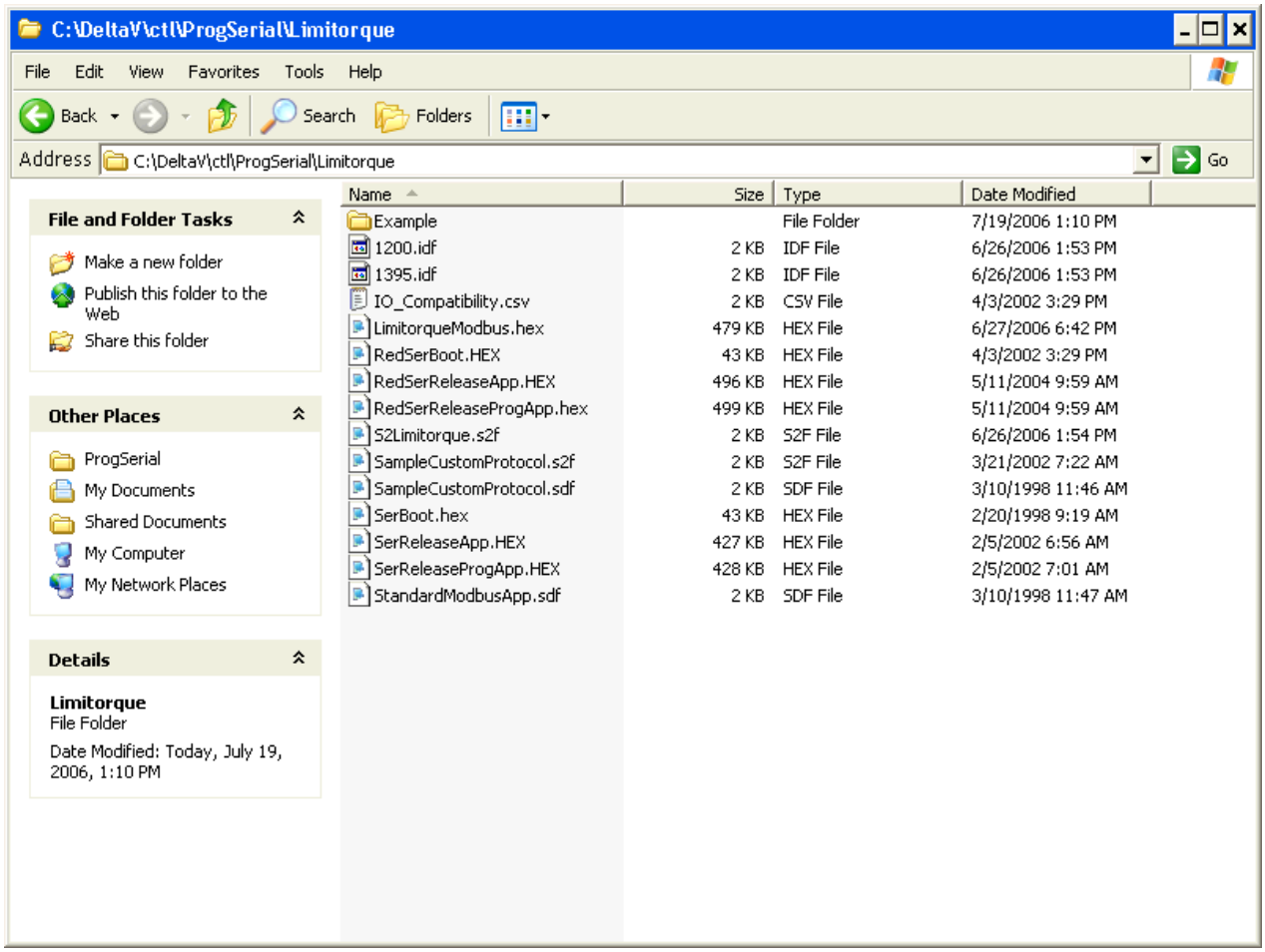
This driver is designed to allow configuration of a maximum of 32 DDC-100 devices over both ports. A single dataset is assigned to each device. The assigned dataset must be configured as Output, with Readback. The first half of the dataset (50 16-bit registers) will be used to read any 3X registers from the field. The second half of the dataset will be dedicated to 4X read/write registers. The address ranges to be Read or Written will be specified in the Special Data registers of the dataset.

3 Downloading the firmware

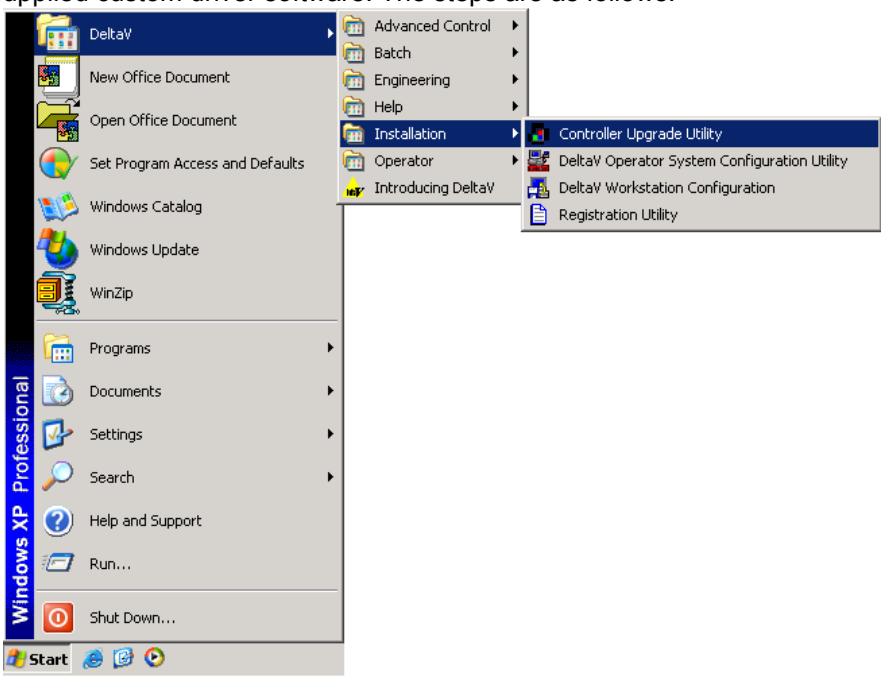
The driver software distribution comprises 14 files, distributed on a CD. These files must be copied to the DeltaV directory on your ProPlus Workstation. The path is:

\DeltaV\ctl\ProgSerial\Limitorque

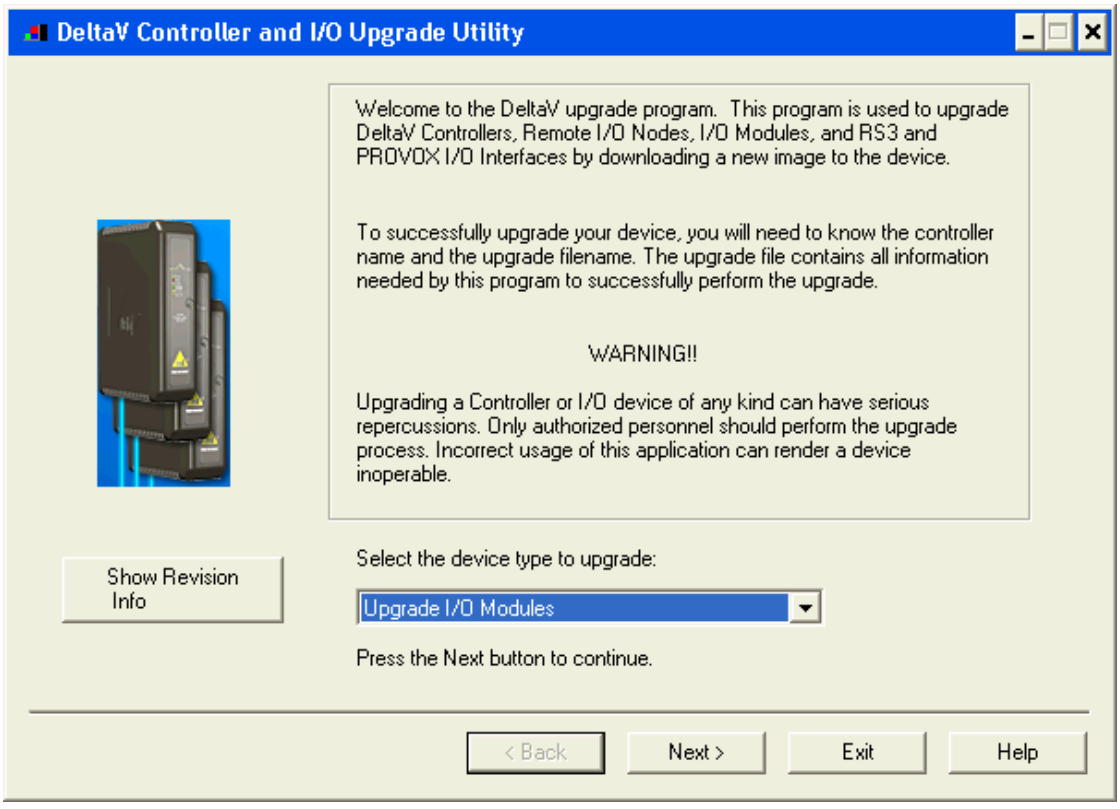
Note that you will have to create the \Limitorque subdirectory. The following files will be copied:



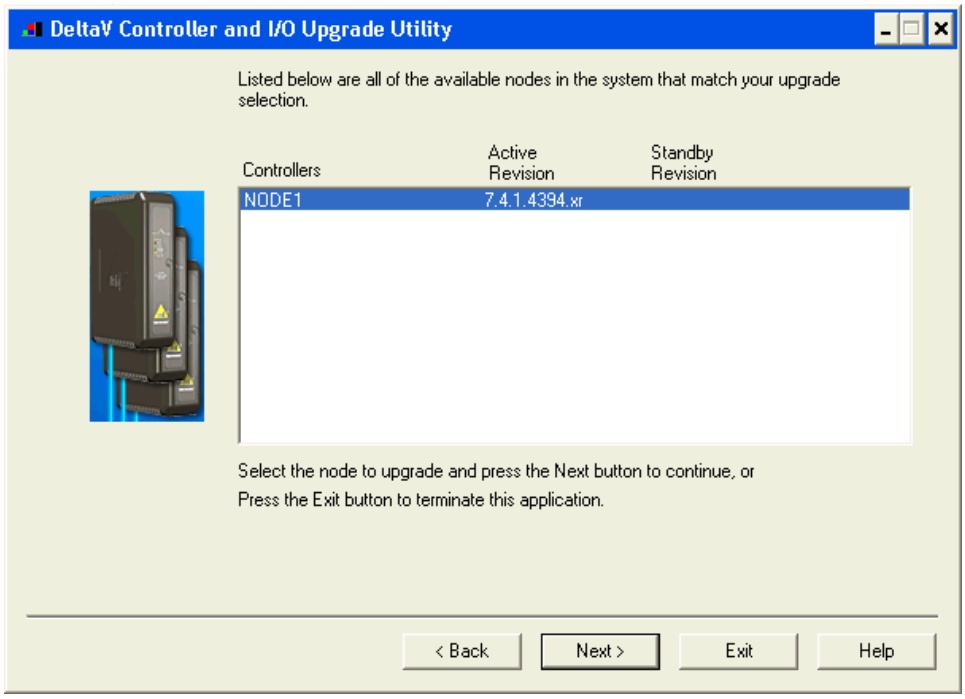
After copy completion, you are ready to program (or upgrade) the Programmable Serial Card with the supplied custom driver software. The steps are as follows:



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

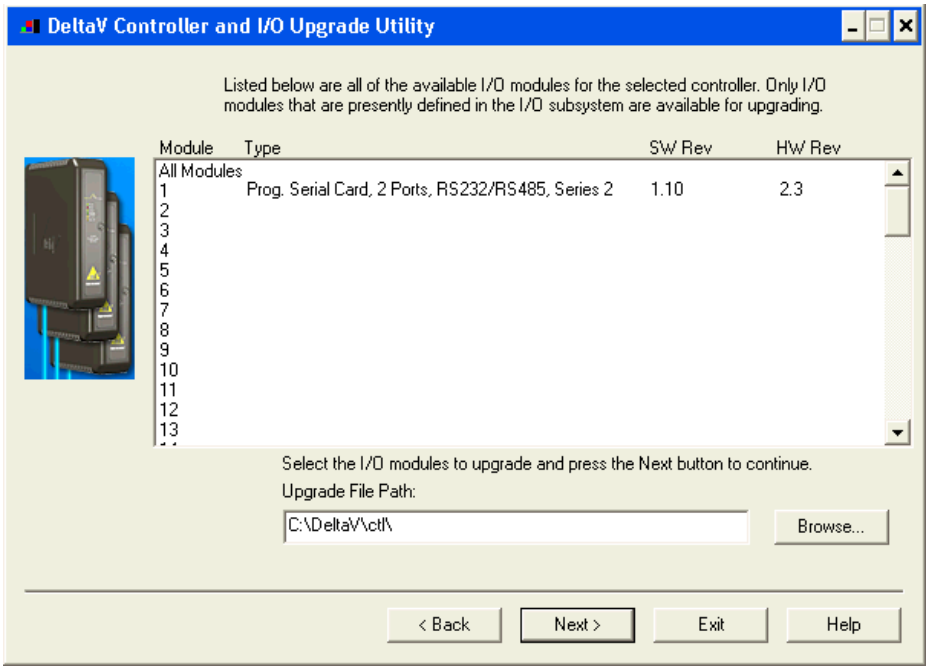


2. Choose Upgrade I/O Modules from the drop down menu and click Next.

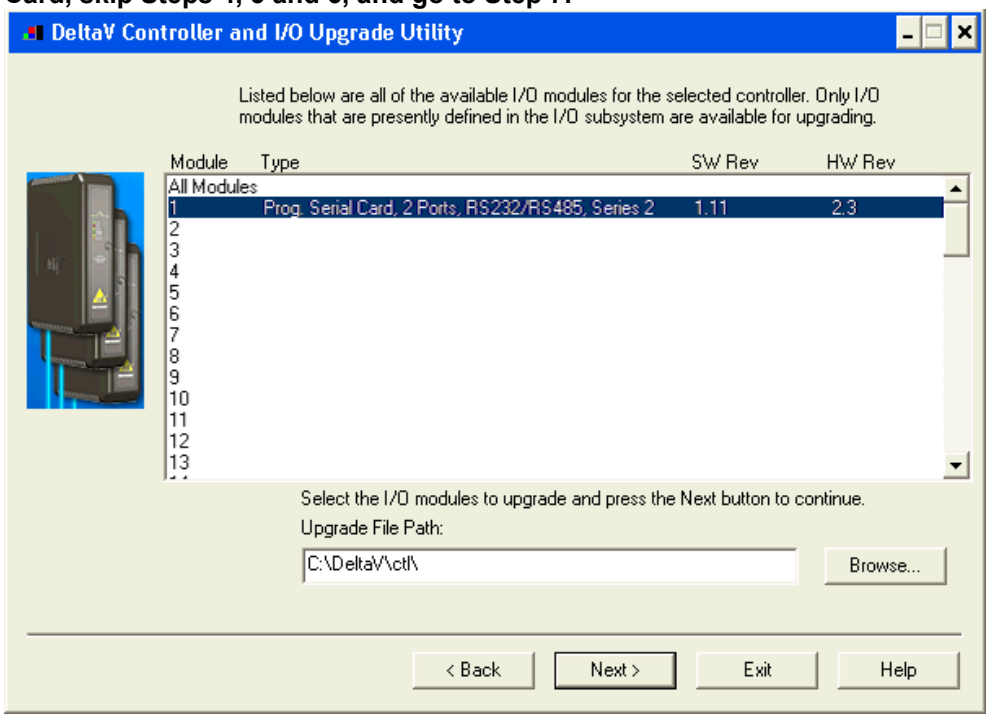


3. The above dialog will appear, listing all the available Controllers in your network. From this dialog, select the appropriate Controller and then Click Next.

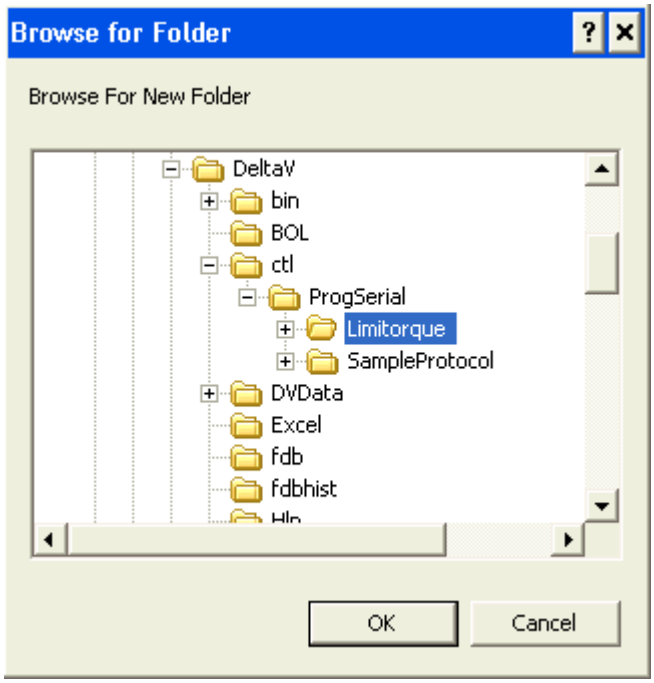
4. The following dialog will appear, listing all the I/O modules in your selected Controller. The shown list of I/O modules is an example only. Your list will be different.



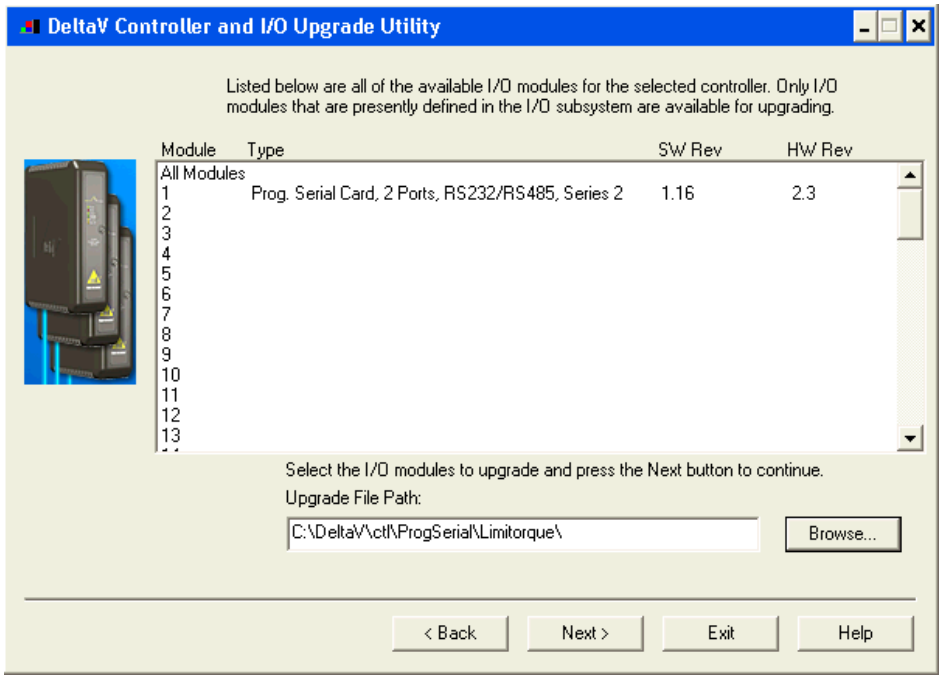
Note: The first time a standard Serial card is upgraded to the ControlNet Driver, the dialog will be as shown below. When upgrading an existing Programmable Serial Card, skip Steps 4, 5 and 6, and go to Step 7.



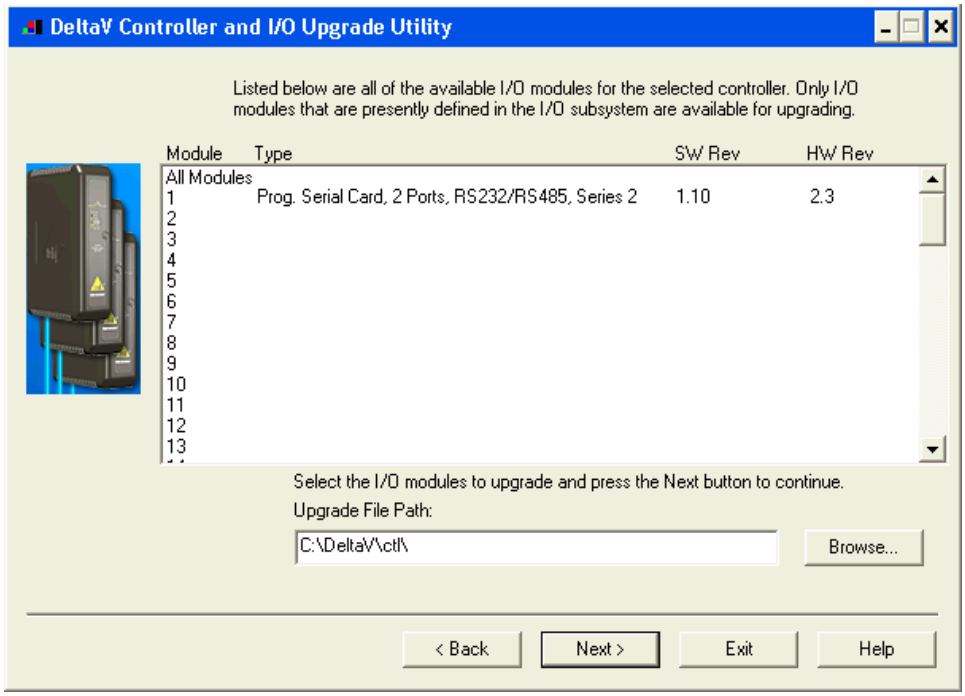
5. Click the Browse button and select the DeltaV path as shown below, and then click Ok. Note that the disk drive could be C or D.



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.



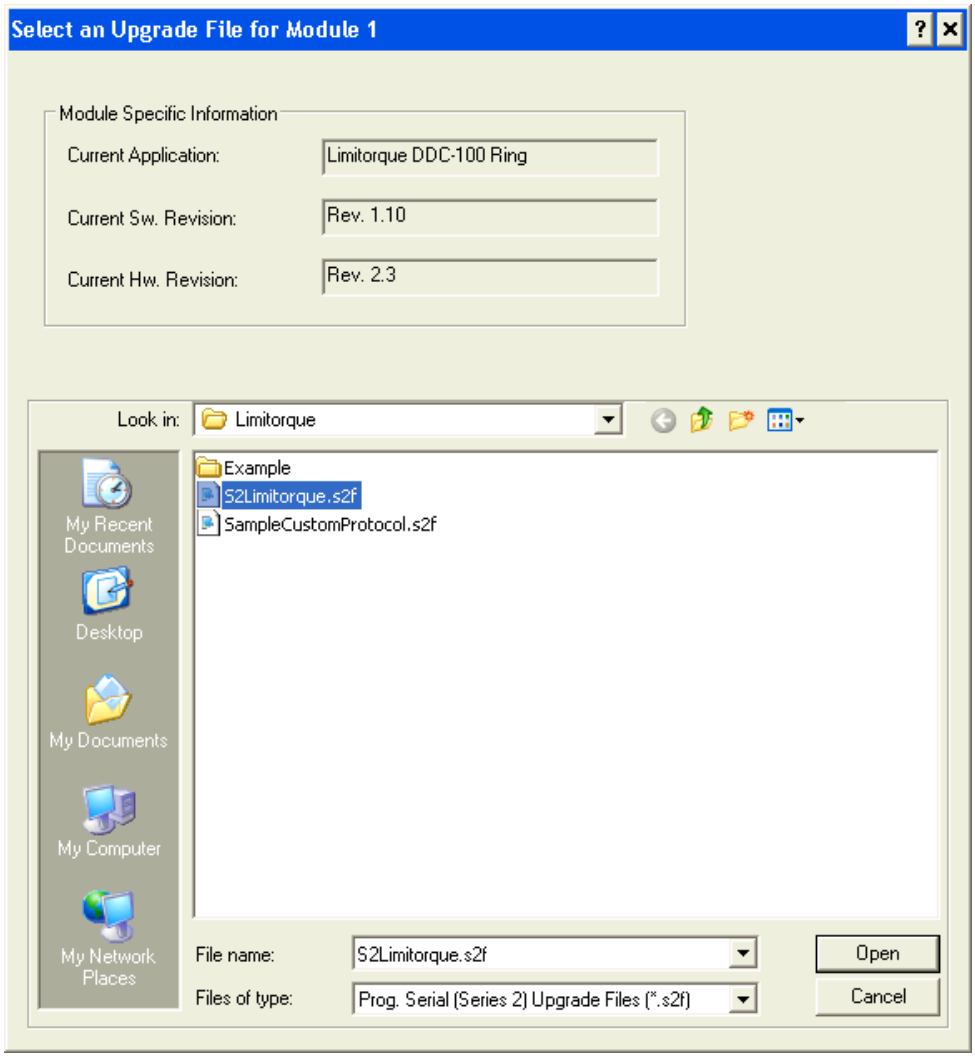
For example, we will select I/O Module 1. This will give you a dialog, from which you will select the file path to where the driver software is located. This path will be:

\DeltaV\ctl\ProgSerial\Limitorque

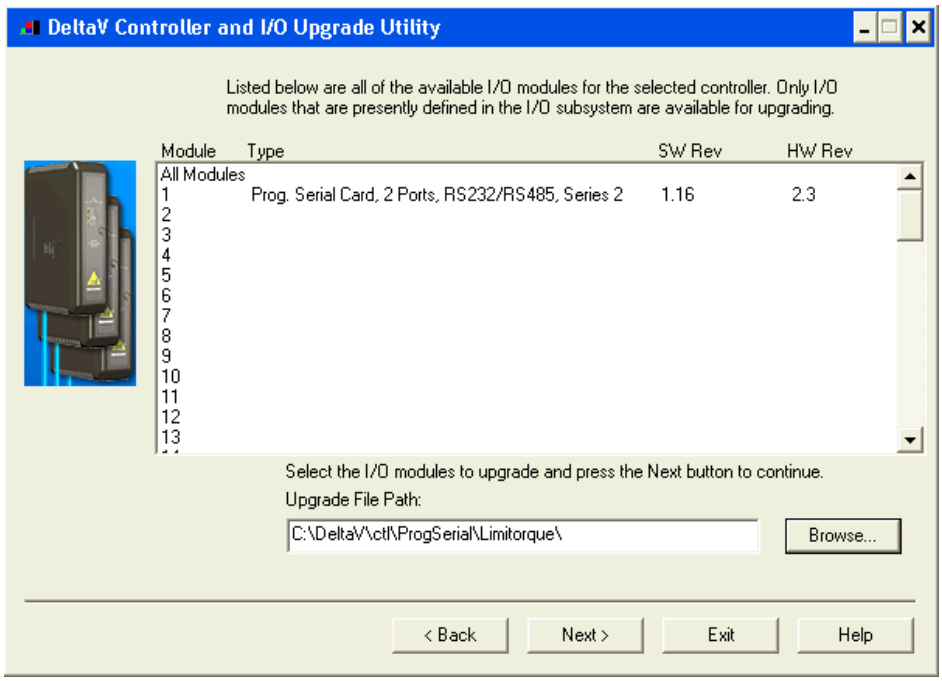
Once you are in the specified directory, you will need to select the following file:

S2Limitorque.S2F

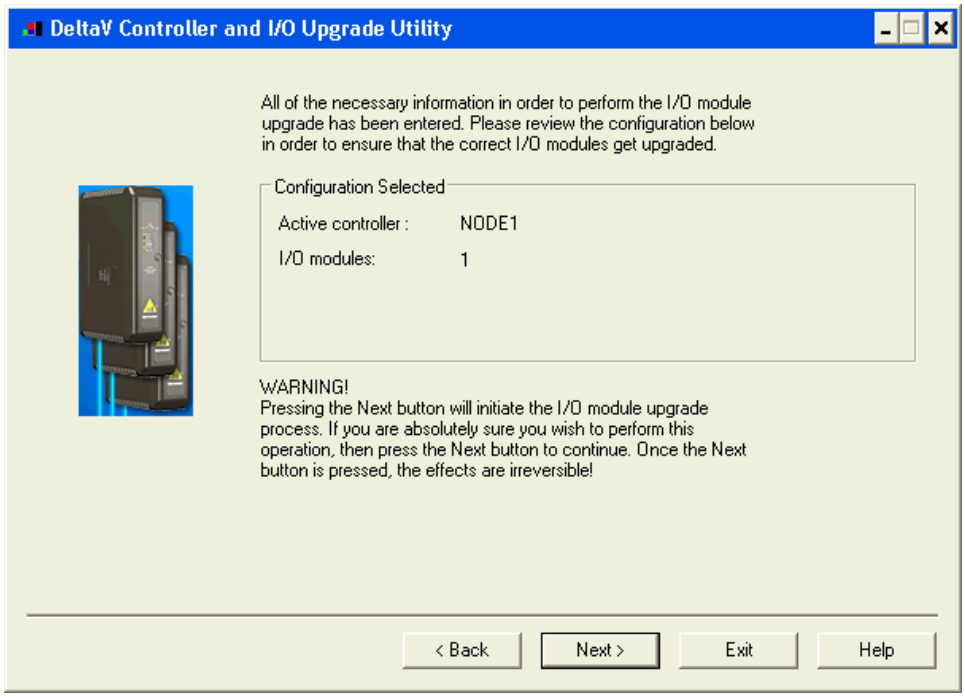
This is shown in the following dialog.



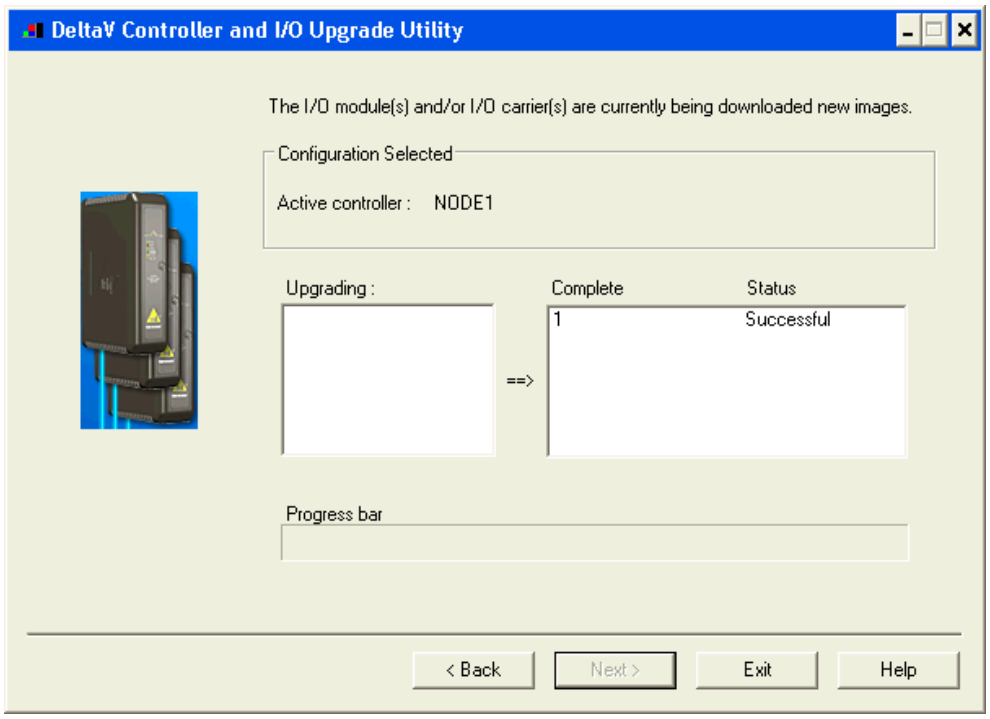
8. After selecting the .S2F file, Click on Open. This dialog will close and you will be back to the following:



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



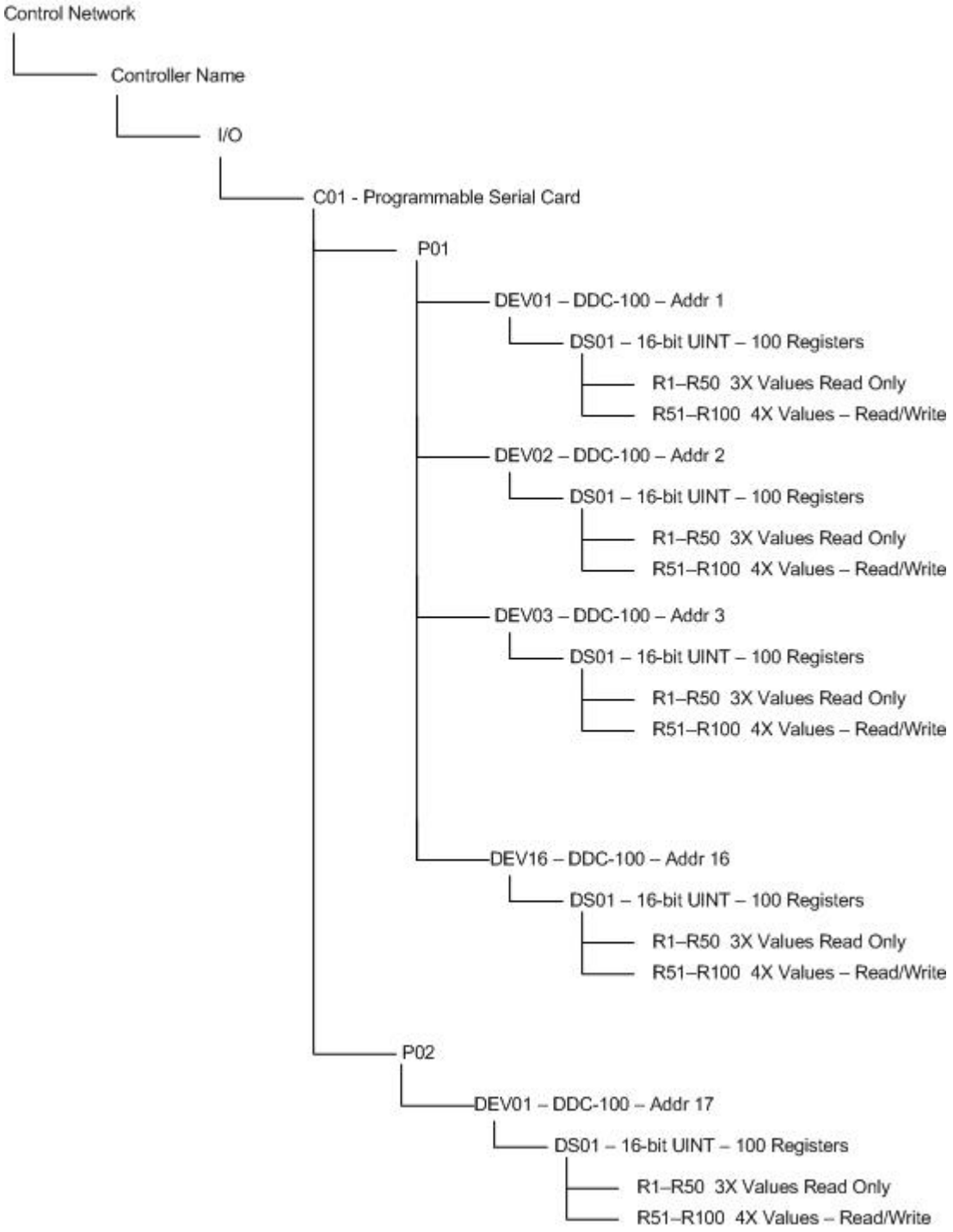
10. Click Next and the I/O Module upgrade process will begin. After completion, you will receive the following dialog, indicating success.



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

4 CONFIGURATION INFORMATION

One PSIC device must be configured for each DDC-100 device. The PSIC device address will be configured to match the DDC-100 address to uniquely identify the device. Valid device addresses are 1-255. One PSIC dataset will be allocated for each device.



4.1 Port Configuration

Both ports must be configured as master. Retry Count, Message Timeout and Transmit Delay can be left as default or changed at users' discretion. The Port Type should be defined as RS-485 Half-Duplex for multi-dropped connectivity. If RS-232 is used, an RS232 to RS485 converter must be used before connecting any of the DDC-100 devices. The DDC-100 devices will use RS-485 exclusively. Data Parity, Data Bits, and number of Stop bits must match the DDC-100 devices.

4.2 Device Configuration

One PSIC device should be configured for each DDC-100 device connected to the ring. The PSIC device address should match the DDC-100 address. A maximum of 16 devices can be configured on each port, for a maximum of 32 per ring.

4.3 Dataset Configuration

4.3.1 Data Direction:

Each dataset will be configured as Output.

4.3.2 Output Mode and Readback:

Output mode must be configured as 1. This will enable single value writes from the serial card to the DDC-100. Select the Output Readback checkbox to enable the driver to readback 4X registers.

4.3.3 DeltaV Data Type:

Select 16-bit UINT with Status.

4.3.4 Device Data Type and Number of Values

The device data type is not used and should be left at its default value. Each dataset will be configured with 100 values. The dataset will be divided into two groups. The first group of 50 values will be designated as Read Only 3X registers. The second group of 50 values will be designated as Read/Write 4X registers. The specific address range of 3X and 4X registers accessed from the DDC-100 device will be assigned using the Special Data registers of the dataset.

4.3.5 Special Data

Special Data 1	Starting 3X register number
Special Data 2	Number of consecutive 3X registers to read. Maximum 50.
Special Data 3	Starting 4X register number
Special Data 4	Number of consecutive 4X registers to read/write. Maximum 50

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 DDC-100 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	1.10 (or later)
SwRev	Software Revision	2.3 (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 DDC-100 settings.
- Verify device configuration: User must check for the proper device address is entered. The DDC-100 address should match the Device Address.
- Verify Dataset configuration. All datasets must be configured identically as described 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 and written between the foreign device into the PSIC. For input data, the values should be changed in the foreign device and verified that the new data are correctly reported. For output data, change the values in the controller and then verify that the values are transferred to the foreign device.
- To assign a Dataset and a register in the Dataset to an I/O module, follow these steps:

    1. Double click the IO_IN/IO_OUT parameter for the module. This brings up the IO_IN/IO_OUT Property window.
    2. Click on the Browse button. This brings up the Browse window.

3. Click on the Object_Type drop down list, select All. This displays all the Dataset tags.

4. Double click on the desired Dataset tag. This assigns the tag to the module and closes the Browse window.

5. Choose the desired register in the Parameter drop down list.

6. Click the OK button.

- For output modules, user also needs to change the MODE parameter to Manual for Normal Mode and Target.

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.

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–Field Device Electrical Interface

The electrical interface between DeltaV and field devices conforms to the RS-232 and RS-422/485 standards.

Each PSIC has 2 ports. The Limitorque DDC-100 devices operate in RS-485 Half-Duplex mode only. If RS-232 is required, the appropriate converter must be used.

6.1 Pin Assignments for DeltaV PSIC

RS-422/485 Half Duplex Standard
Table 7

Terminal Number	Signal Description
1	Port 1 – Isolated Ground (GND)
2	Port 1 - Data +
3	Unused
4	Port 1 - Data -
5	Unused
6	Unused
7	Unused
8	Unused
9	Port 2 – Isolated Ground (GND)
10	Port 2 – Data +
11	Unused
12	Port 2 - Data -
13	Unused
14	Unused
15	Unused
16	Unused

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

Thank you for using DeltaV.