APC79/SPG761 I/O Driver
Programmable Serial Interface Card

USER MANUAL

Rev. P1.10A

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1 INTRODUCTION

1.1 Scope

This document is the User Manual for the Logika APC79 and SPG761 I/O 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 and field devices (supporting the APC79/SPG761 protocol) connected to the PSIC.

The section *Document Format* briefly describes the contents of each section of this manual. *System Specifications* outlines hardware and software requirements for the APC79/SPG761 I/O Driver (P1.10) firmware.

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 APC79/SPG761 I/O Driver.
Downloading Firmware	Describes downloading procedures for the APC79/SPG761 I/O 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 set up and configured.
DeltaV–Field Device Electrical Interface	Describes the electrical interface between DeltaV and the Field Device. Also, describes the pin assignments for RS-232 communications.
Technical Support	Describes who to call if you need assistance.

1.3 System Specifications

The following table lists the minimum system requirements for the Julabo/IKA I/O Driver:

Table 1: System Specifications

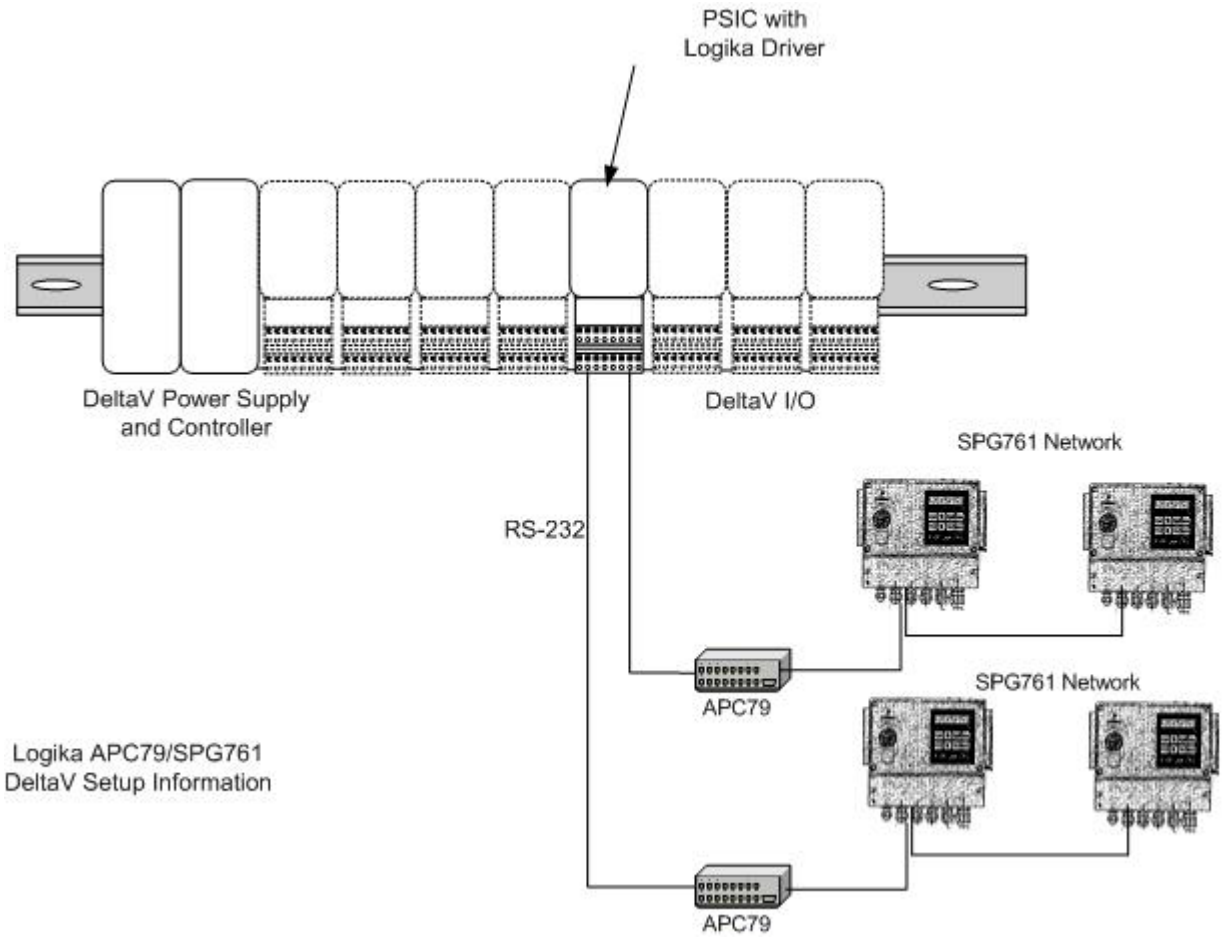
Firmware	APC79/SPG761 I/O Driver Firmware (P1.10)
Protocol Compatibility	Protocol is based on publication: SPNetwork – DeltaV Interface Design Document, Version 1.0
Software Requirements	DeltaV System Software (Release 6.3.2 or later) installed on a hardware-appropriate Windows NT or later workstation 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

The Programmable Serial Interface Card (PSIC) has 2 ports which can be configured for RS-232, RS-422/RS-485 Half Duplex, or RS-422/RS-485 Full Duplex communications with external devices.

The DeltaV Serial Card Driver functionality will be as follows.

1. The driver will be flashed into the PSIC.
2. The driver will run in Master mode only. For each connected and configured external device, the driver will send dataset specific commands. The corresponding responses received will be checked for correctness, and the data contained therein will be parsed and written to dataset registers. All invalid responses will be discarded.
3. The two ports of the PSIC work independently, each connected to a single Logika APC79 adapter unit. Each port can support a maximum of 5 SPG761 devices.
4. There are three (3) channels of information available in an SPG761 device. Each channel will be continuously read and the data stored in a separate PSIC dataset. The data read from SPG761 channels is fixed and non-configurable. Refer to Section 4.3 Table 3 for scanned data definition.

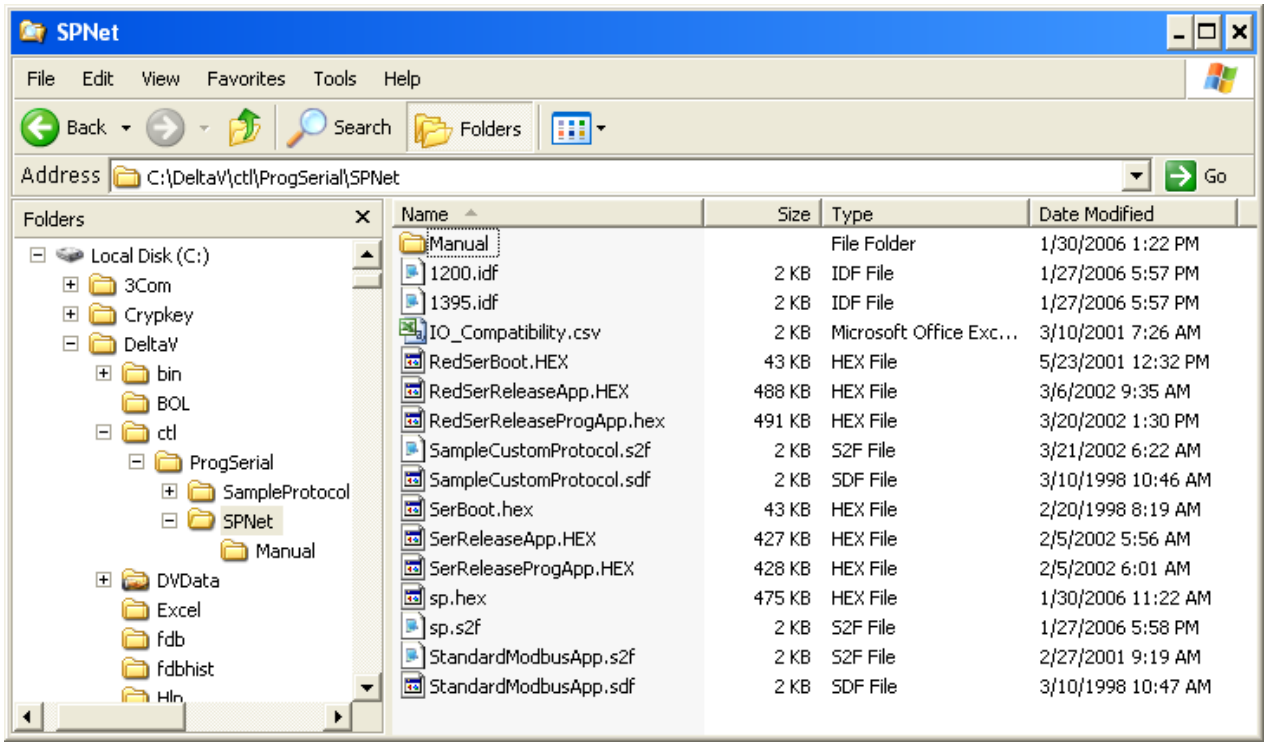


3 Downloading the firmware

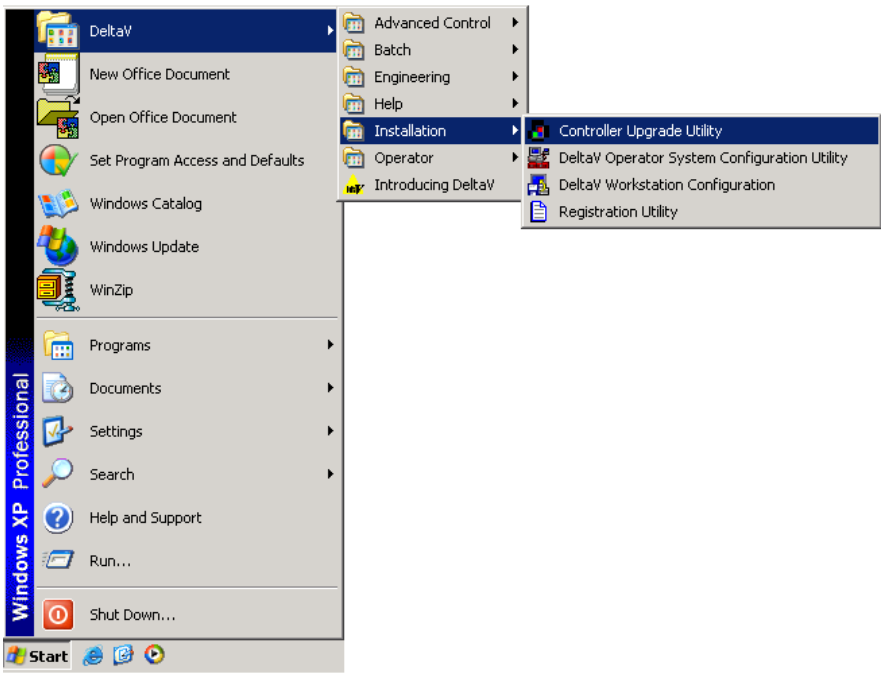
The driver software distribution comprises 15 files, distributed on a CD. These files must be copied to the DeltaV directory on your ProPlus Workstation. The path is:

\DeltaV\ctl\ProgSerial\SPNet

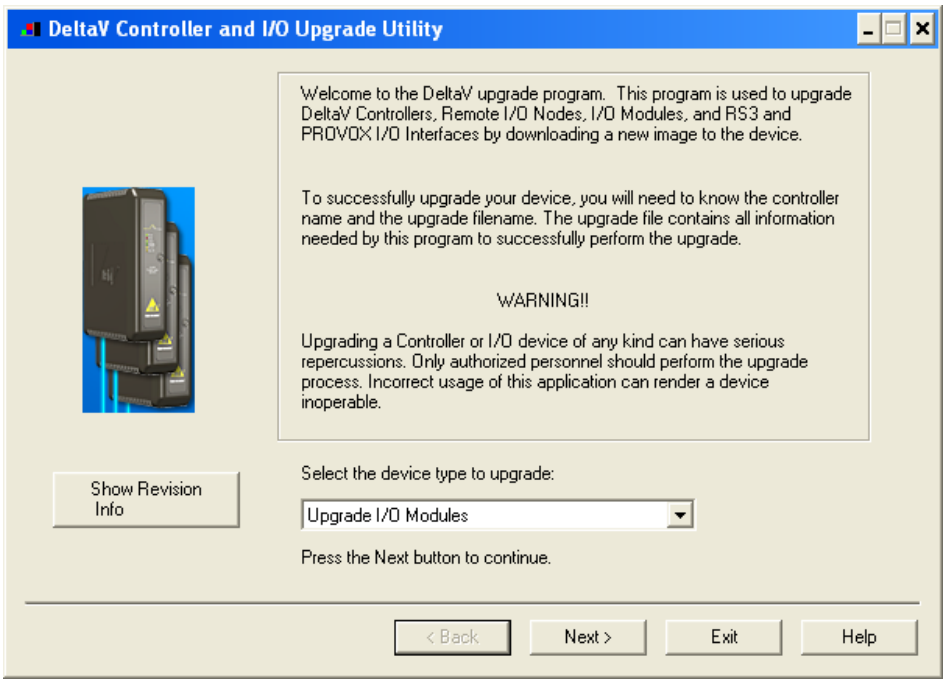
Note that you will have to create the SPNet subdirectory. The following files will be copied:



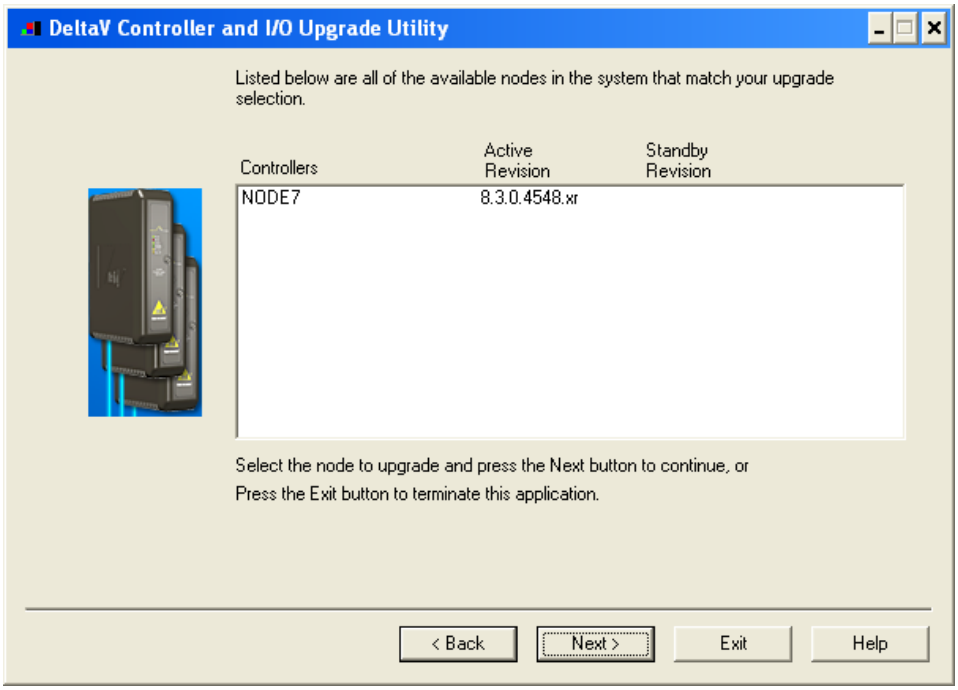
After copy completion, you are ready to program (or upgrade) the Programmable SerialCard with the supplied custom driver software. The steps are as follows:



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

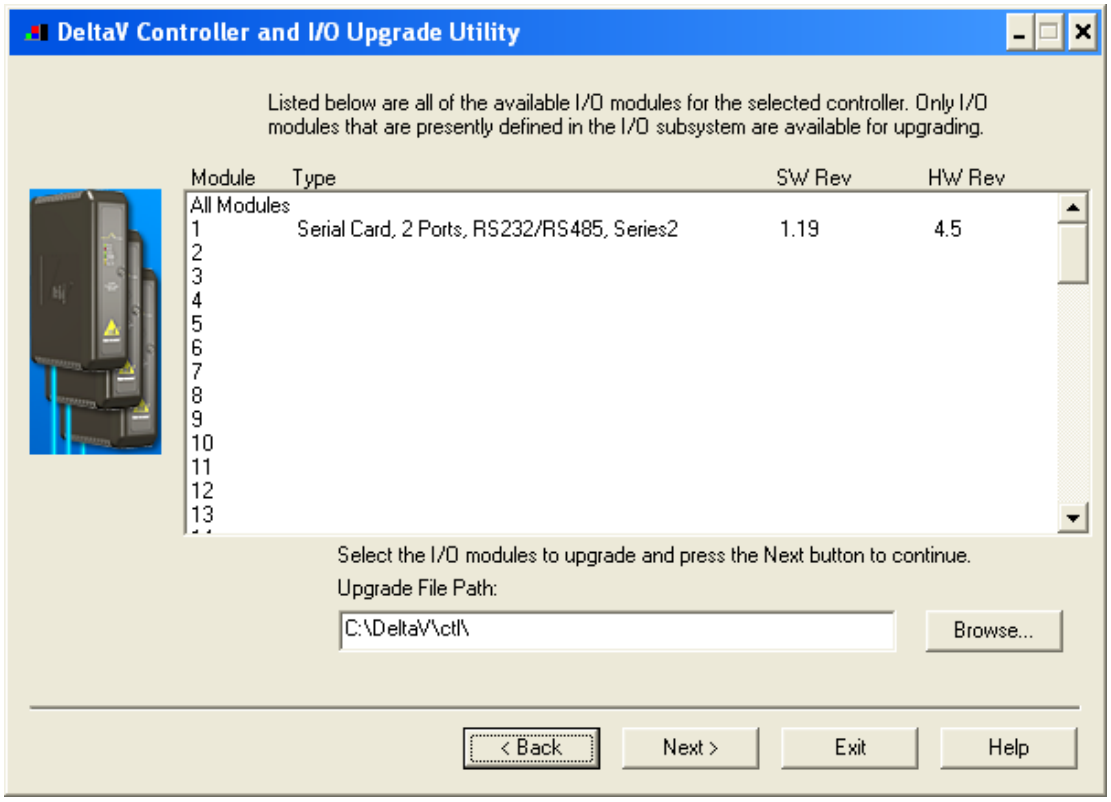


2. Choose Upgrade I/O Modules from the drop down menu and click Next. The following dialog will appear, listing all the available Controllers in your network. From this dialog, select the appropriate Controller and then Click Next.

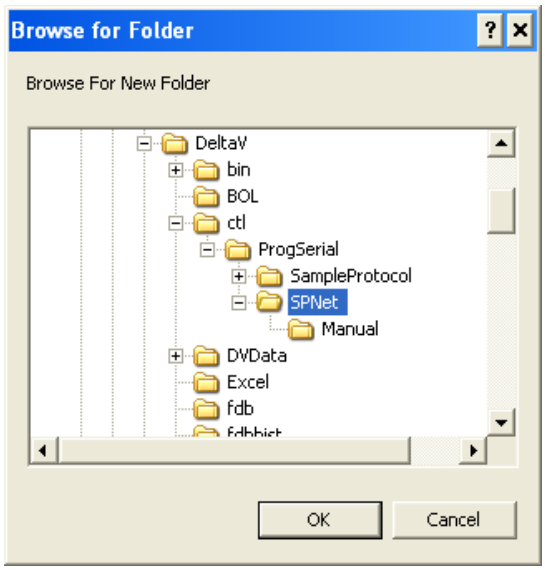


Flashing a Standard Serial Card

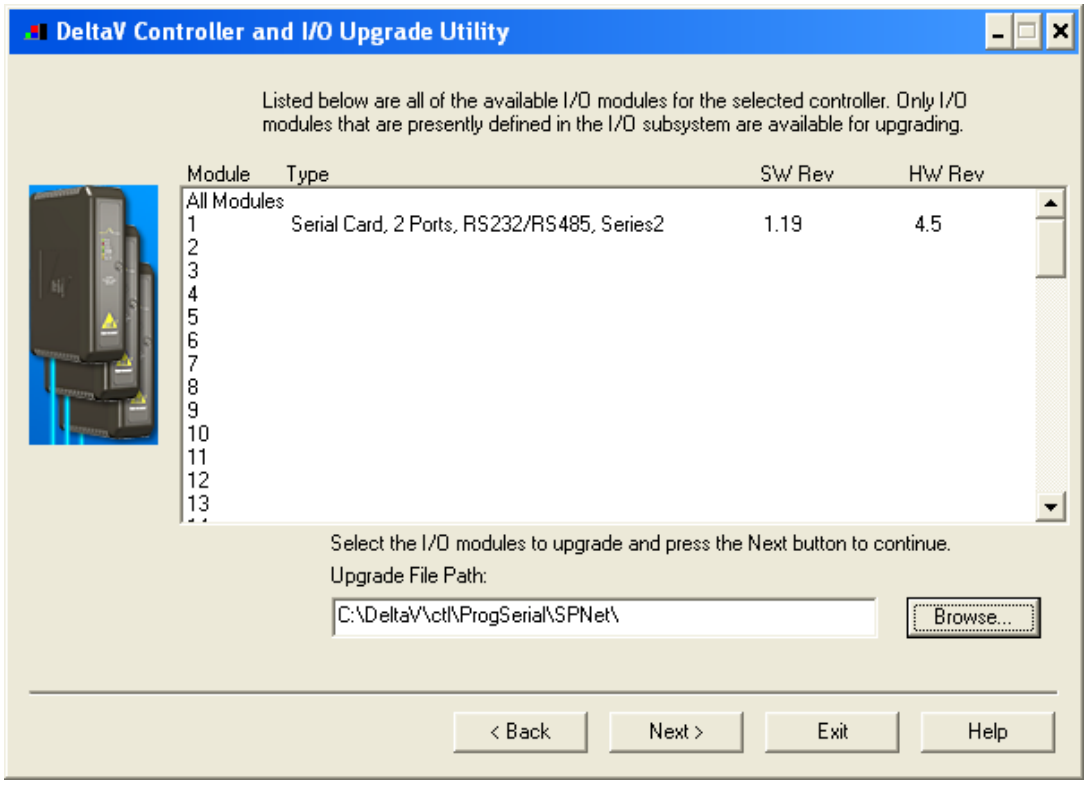
1. The following dialog lists all I/O modules in your selected Controller. The shown list of I/O modules is an example only. Your list will be different. The following screen shows a standard serial card.



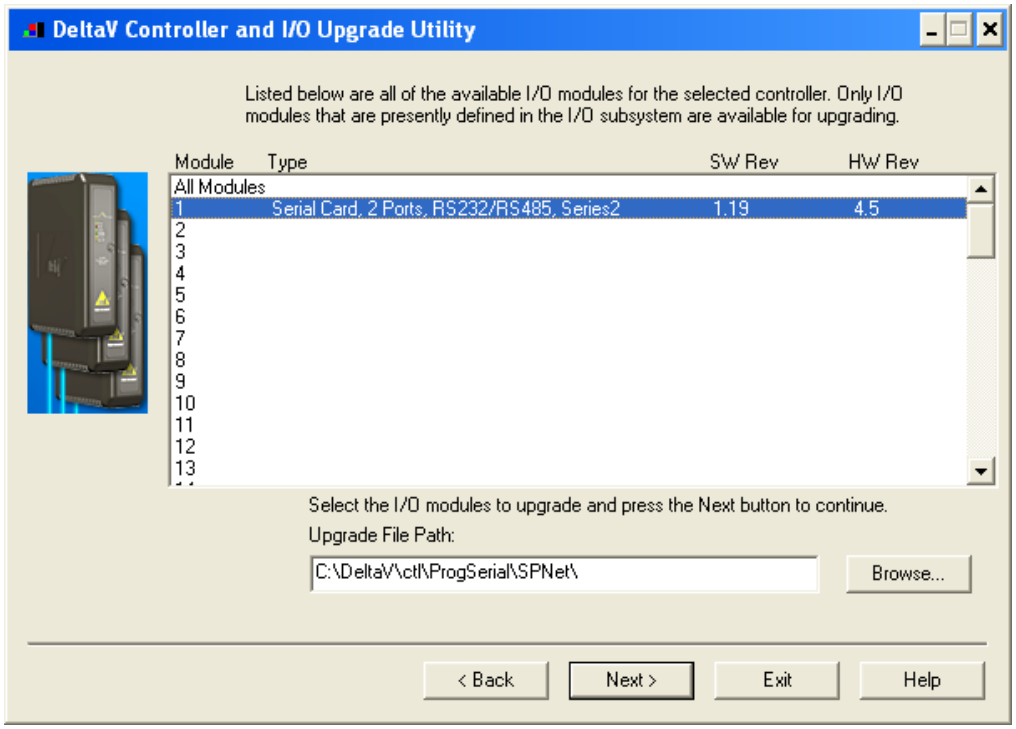
2. Select Card 1. Click Browse and select the DeltaV path as shown below, then click OK.



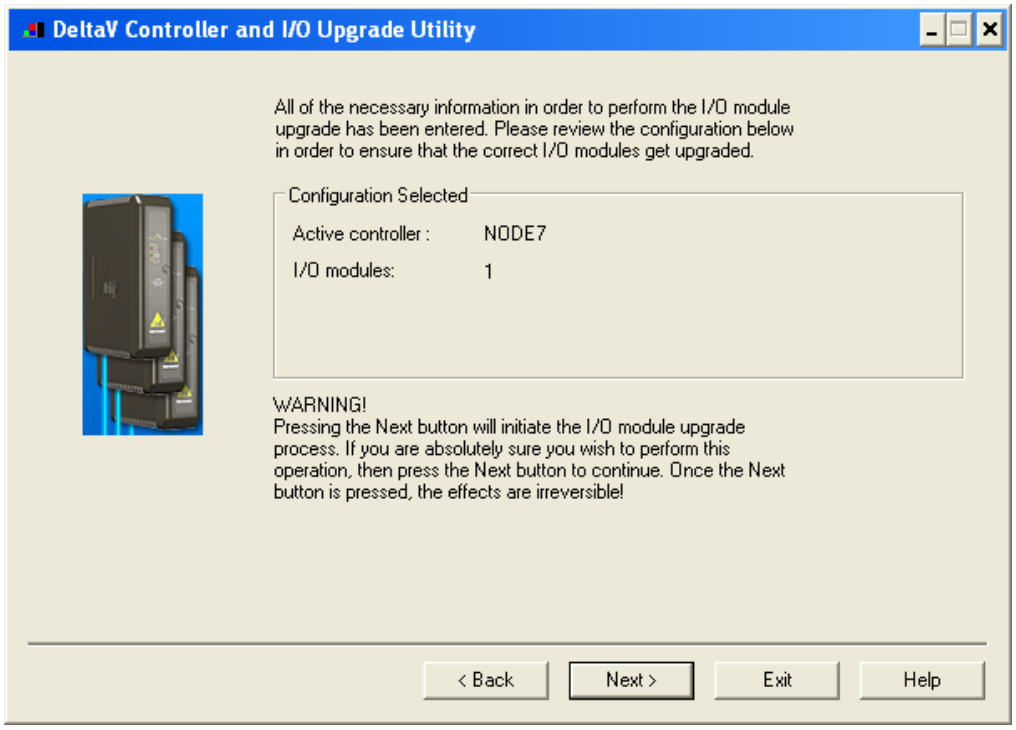
The following dialog will be displayed, showing the selected location of the serial card driver.



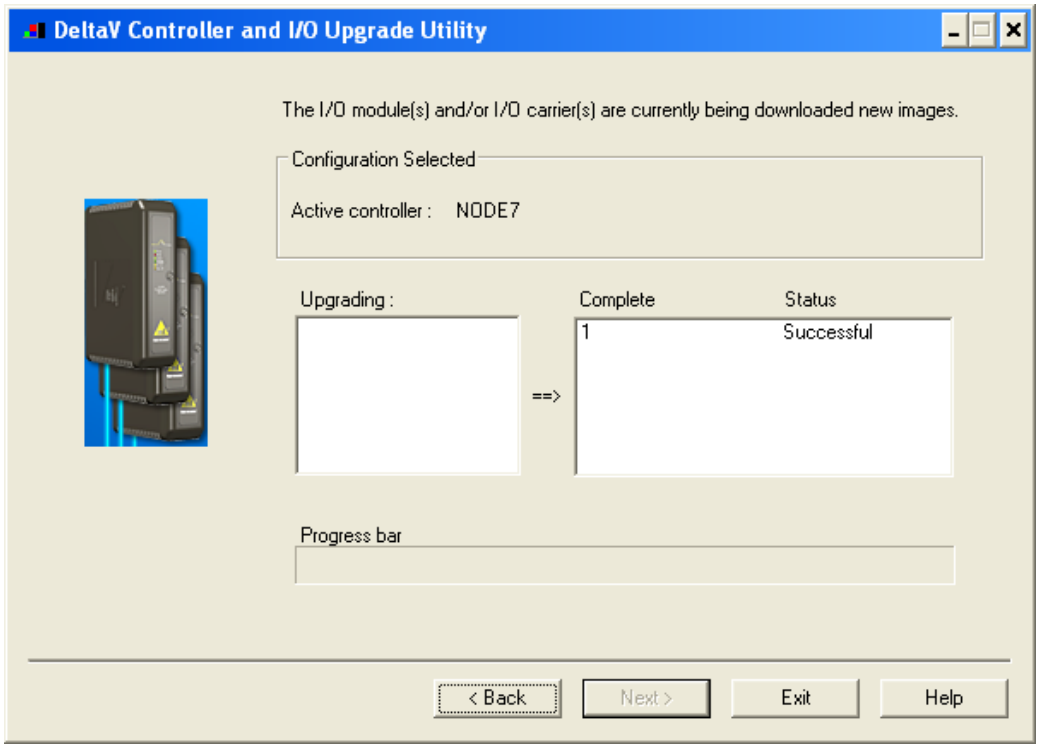
3. Select the I/O module again as shown below, and then click Next.



4. The following dialog will appear. Click Next again to start the flash process.

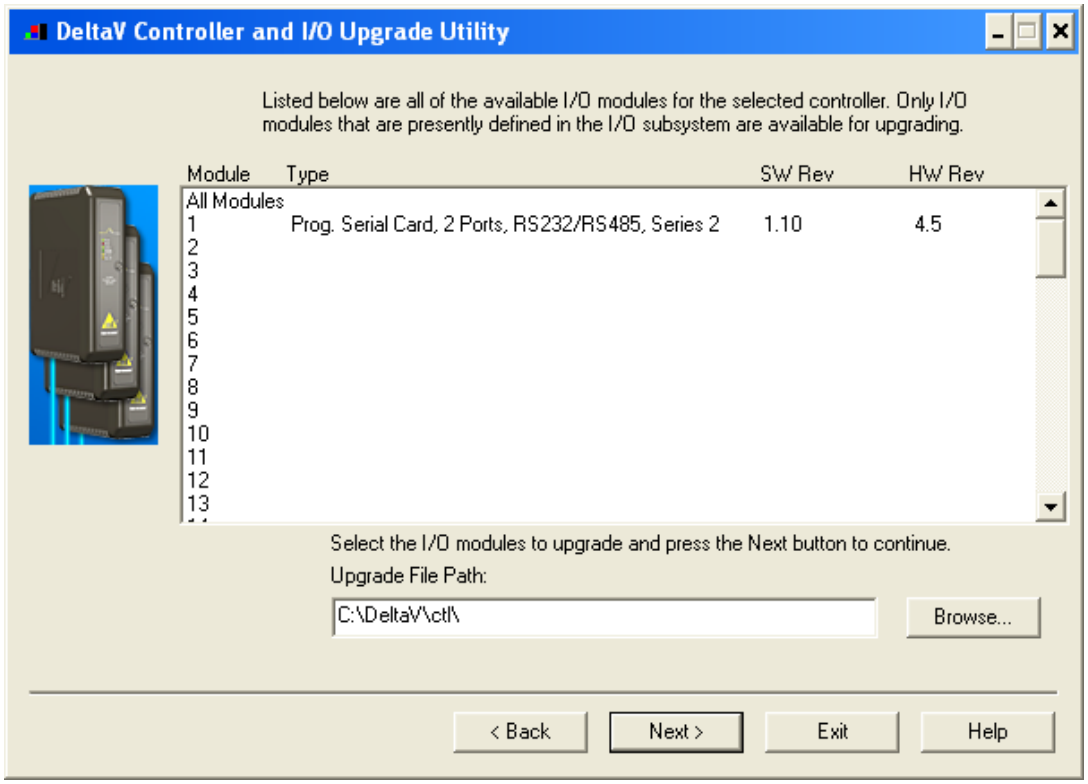


5. After flash completion, the following dialog will show the status as Successful.

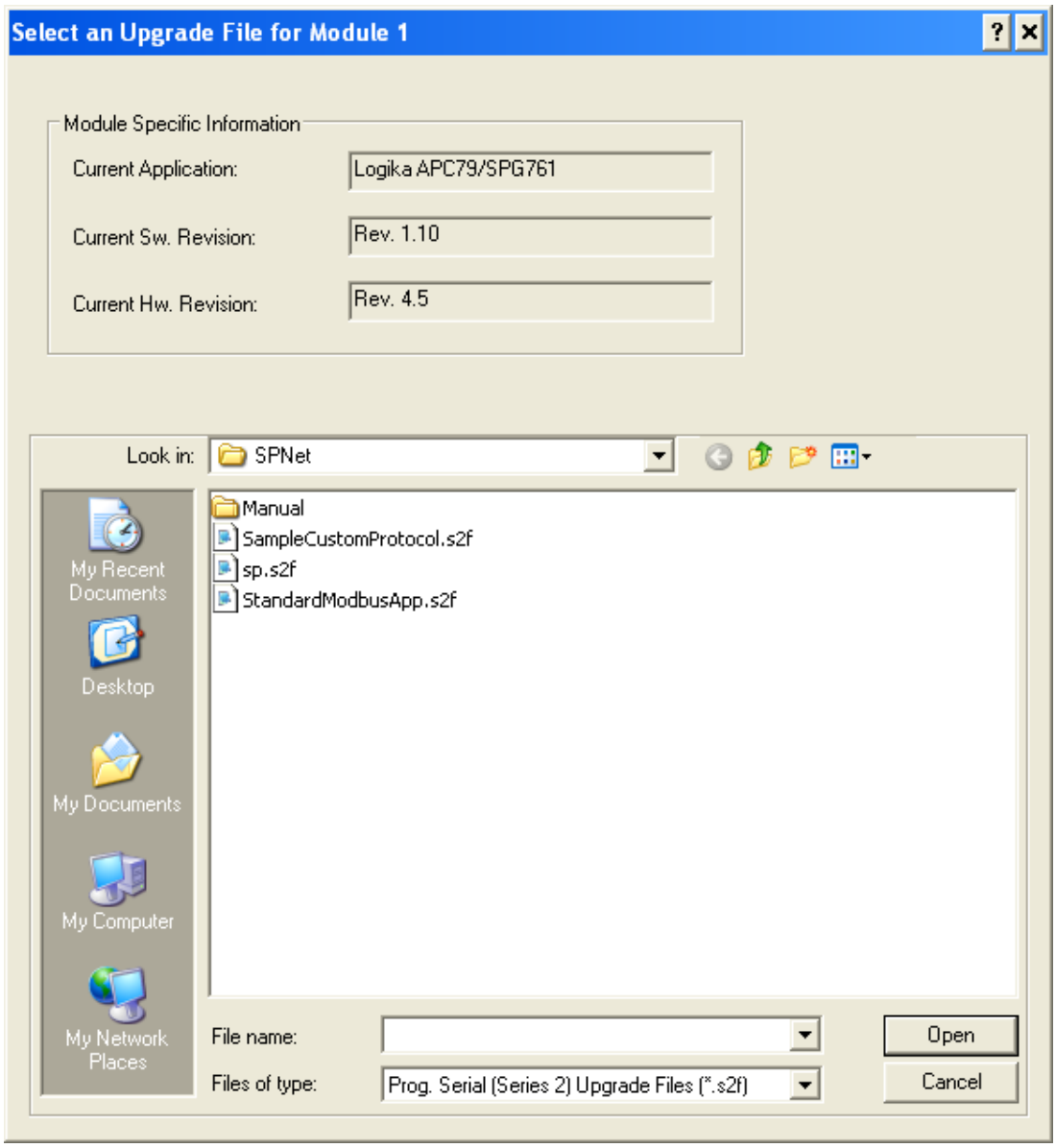


Flashing a Programmable Serial Card

1. 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, select Card 1. This will display the following dialog. Select the serial driver location and click Open.



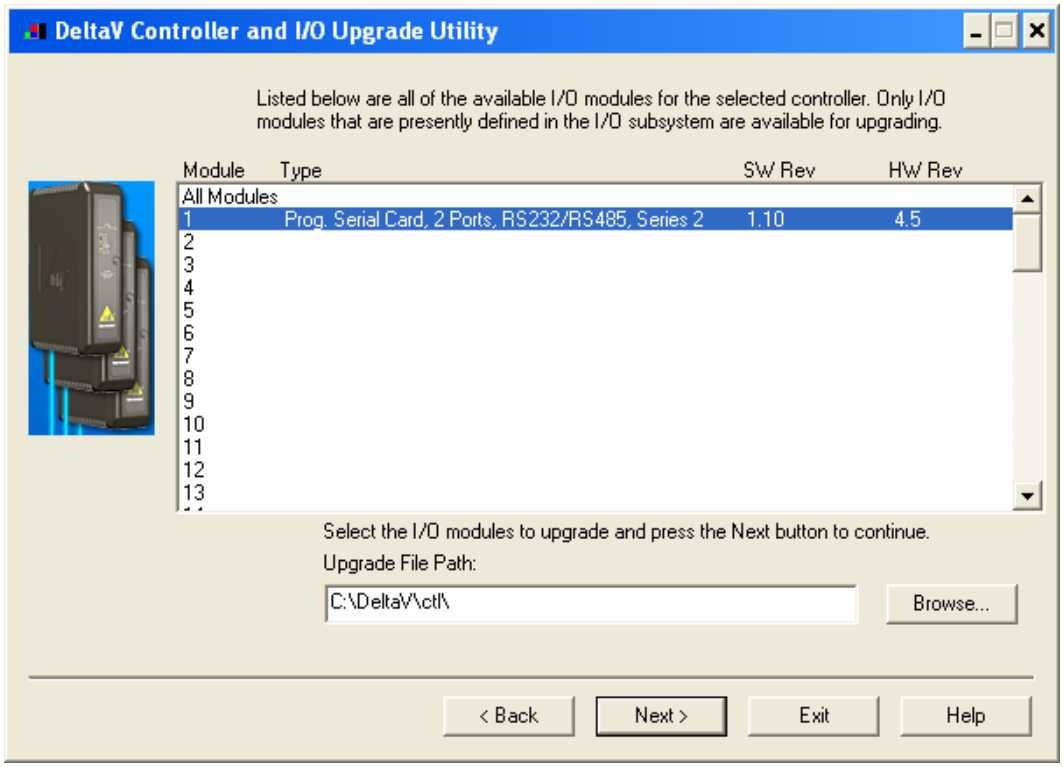
This path will be:

\DeltaV\ctl\ProgSerial \SPNet

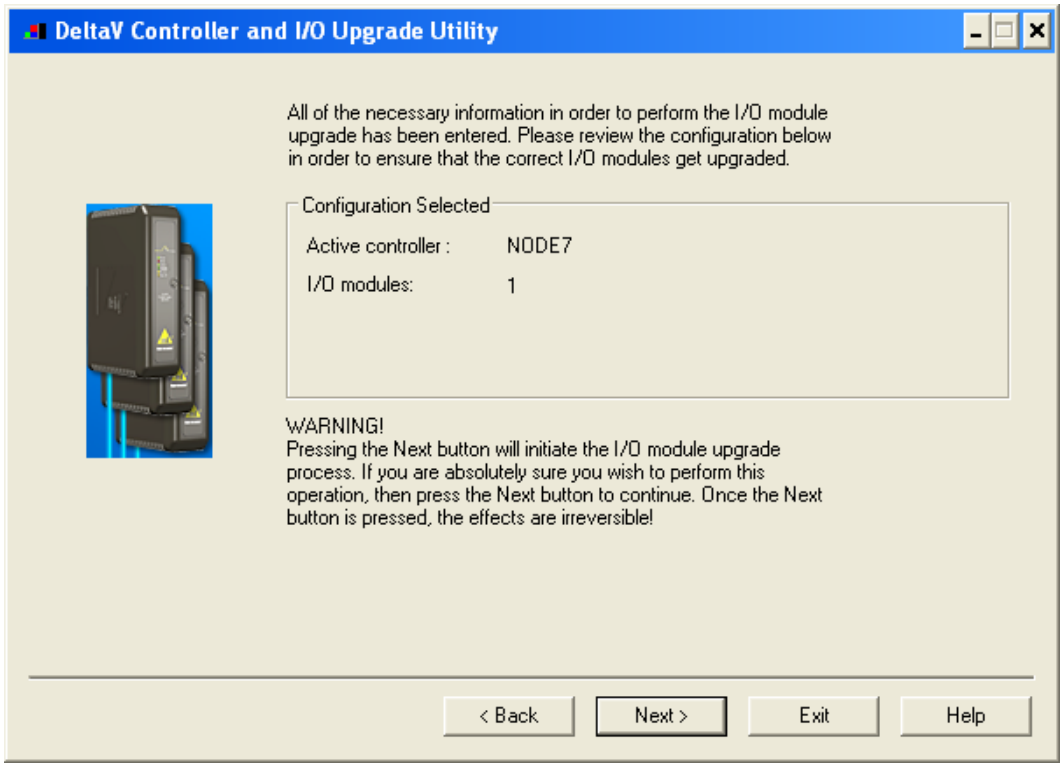
Once you are in the specified directory, you will need to select the following file:

SP.S2F

2. The following dialog will be displayed, showing the selected I/O module. Click Next to start the flash process.

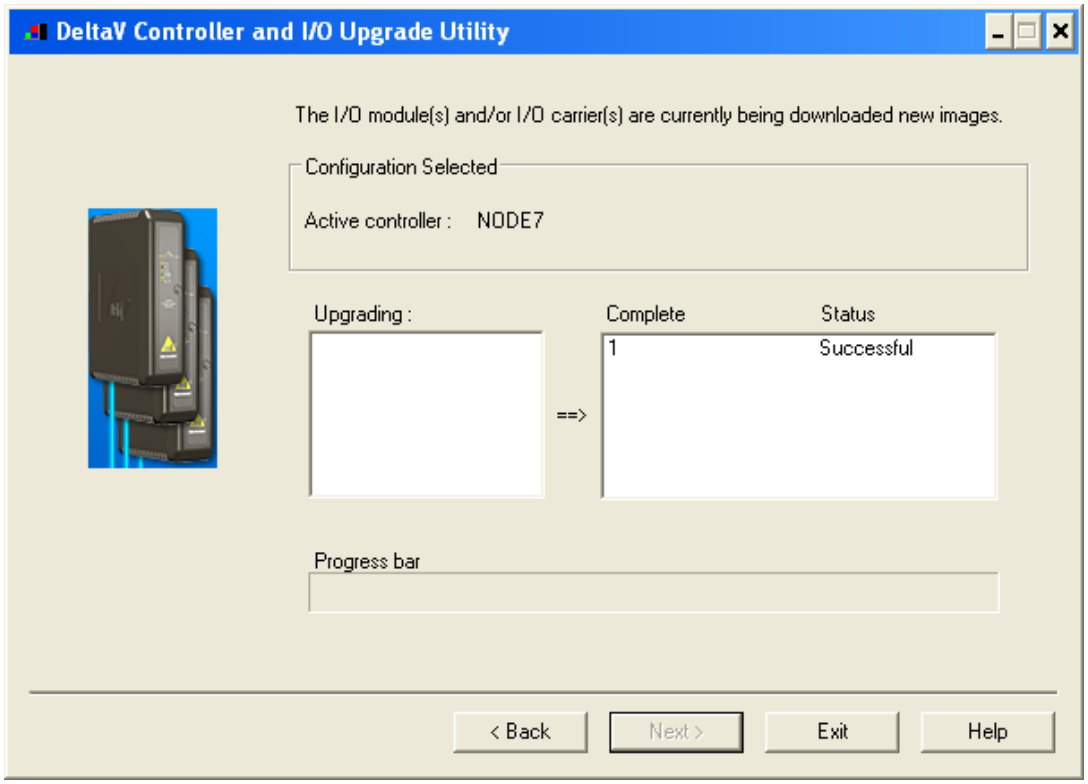


3. You will get the following dialog, confirming the Controller and serial card to flash.



4. Click Next, and the I/O module upgrade process will begin.

5. After completion, you will receive the following dialog, displaying Successful.



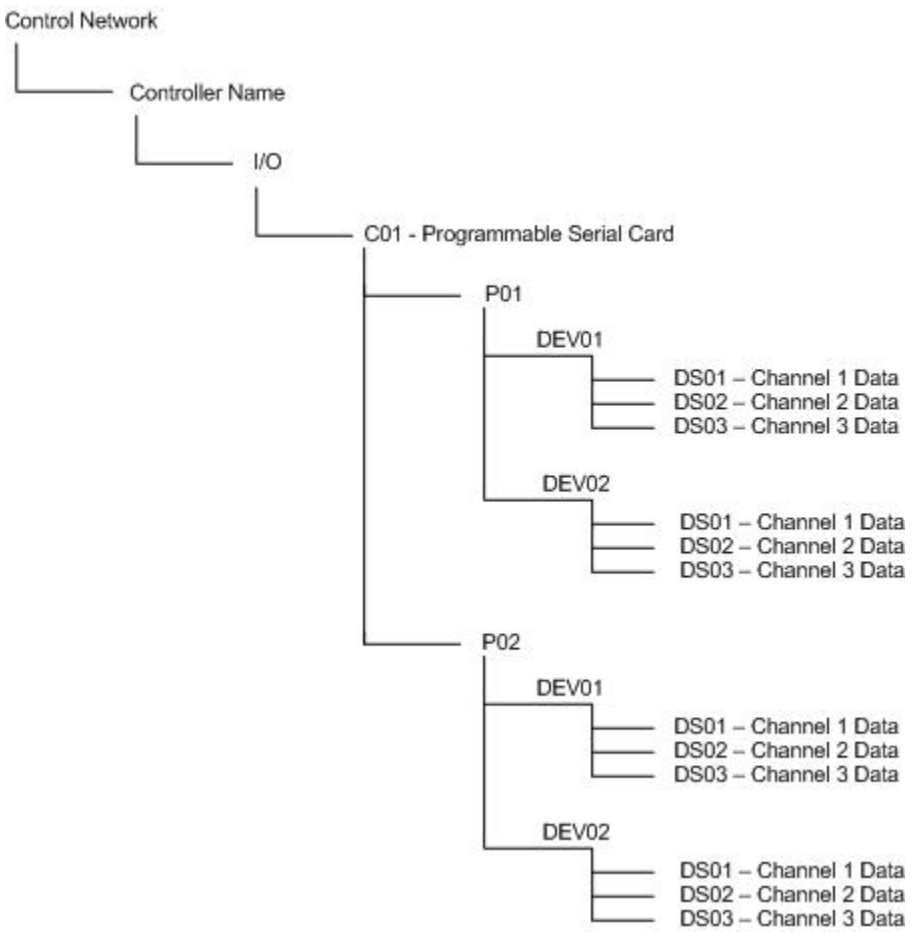
This completes the I/O module upgrade process.

4 CONFIGURATION INFORMATION

The DeltaV Explorer view of a configuration containing a Programmable Serial Card will be as follows, where C01 has a card type of Programmable Serial Card, P01 and P02 are the ports on the card. The following is the default configuration for use with this driver. Each port will contain 1 device with 2 defined dataset.

Dataset Configuration
Table 2

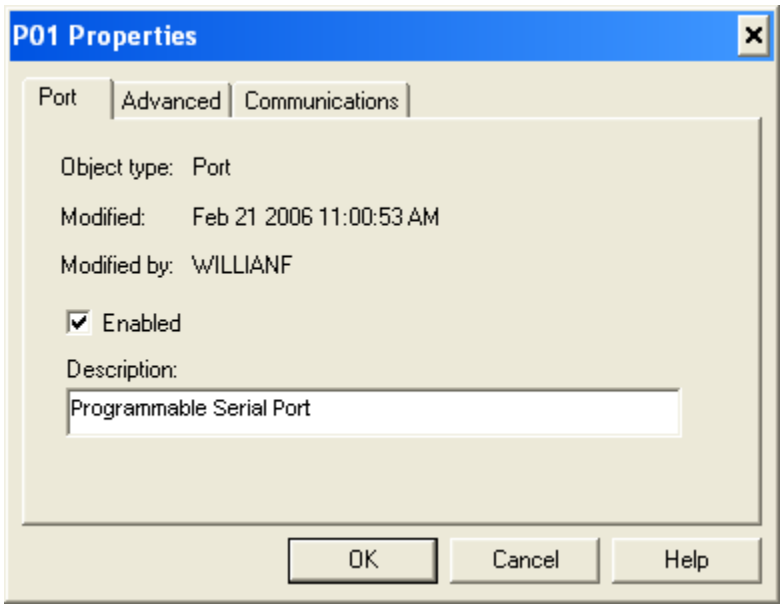
Port	Devices	Dataset	Mode	Type and Number of Values	Description
P01					
	DEV01				SPG761 Device Address 1
		DS1	Input	Floating Point,14 Values	Channel 1 data storage
		DS2	Input	Floating Point, 14 Values	Channel 2 data storage
		DS3	Input	Floating Point, 14 Values	Channel 3 data storage
	DEV02				SPG761 Device Address 2
		DS1	Input	Floating Point,14 Values	Channel 1 data storage
		DS2	Input	Floating Point, 14 Values	Channel 2 data storage
		DS3	Input	Floating Point, 14 Values	Channel 3 data storage
P02					
	DEV01				SPG761 Device Address 3
		DS1	Input	Floating Point,14 Values	Channel 1 data storage
		DS2	Input	Floating Point, 14 Values	Channel 2 data storage
		DS3	Input	Floating Point, 14 Values	Channel 3 data storage
	DEV02				SPG761 Device Address 4
		DS1	Input	Floating Point,14 Values	Channel 1 data storage
		DS2	Input	Floating Point, 14 Values	Channel 2 data storage
		DS3	Input	Floating Point, 14 Values	Channel 3 data storage

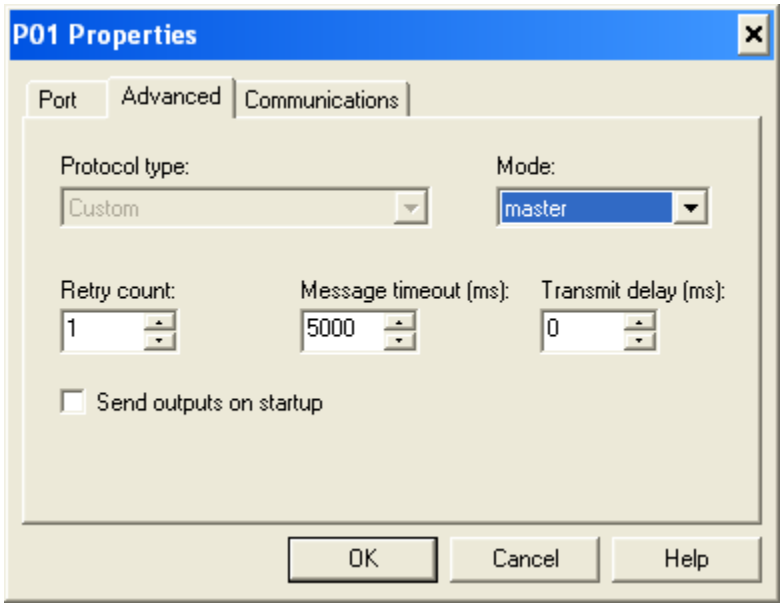


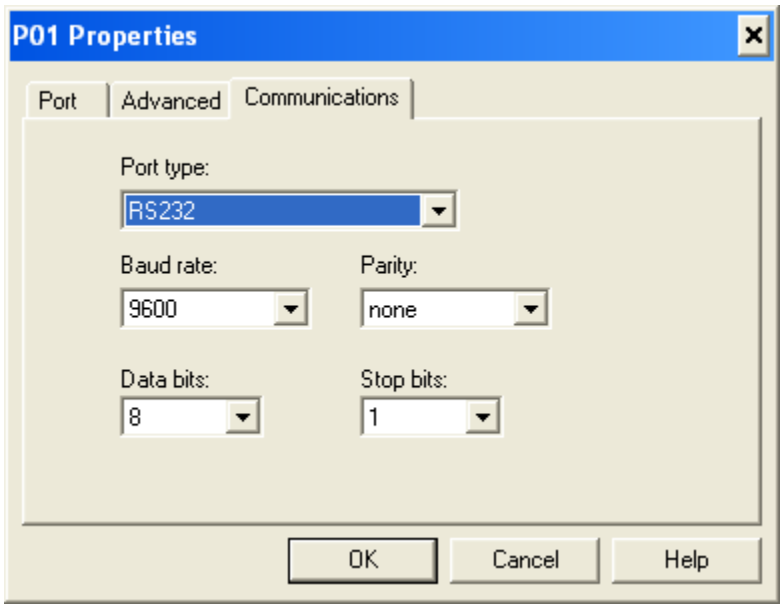
4.1 Port Configuration

First, enable the port. Then, click on the Advanced Tab and choose Master mode. Specify Retry count value, and Message timeout value. Next, click on the Communications Tab and specify the Port type as RS-232. Lastly, select the Baud rate, Parity, Data bits and Stop bits parameters; these must match the APC79 adapter settings. Please see Section 4.4 on how to configure the APC79 adapter.

The following dialogs show the port configuration steps:


P01 Properties
Port
Advanced
Communications
Object type: Port
Modified: Feb 21 2006 11:00:53 AM
Modified by: WILLIANF
Enabled
Description:
Programmable Serial Port
OK
Cancel
Help

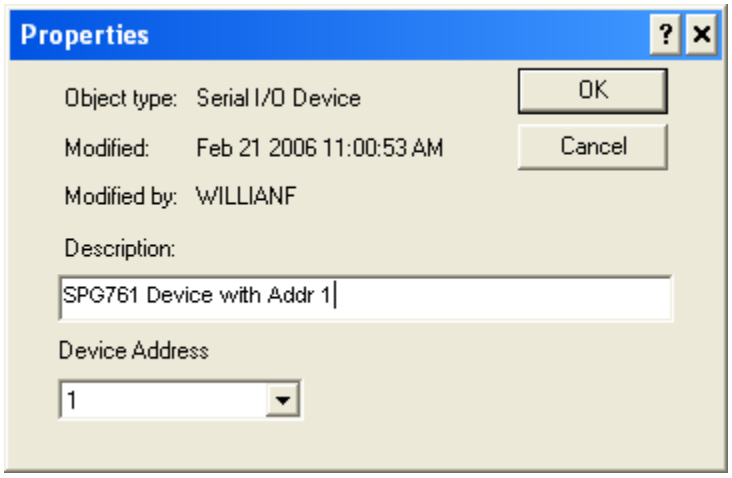

P01 Properties
Port
Advanced
Communications
Protocol type:
Custom
Mode:
master
Retry count:
1
Message timeout (ms):
5000
Transmit delay (ms):
0
Send outputs on startup
OK
Cancel
Help



4.2 Device Configuration

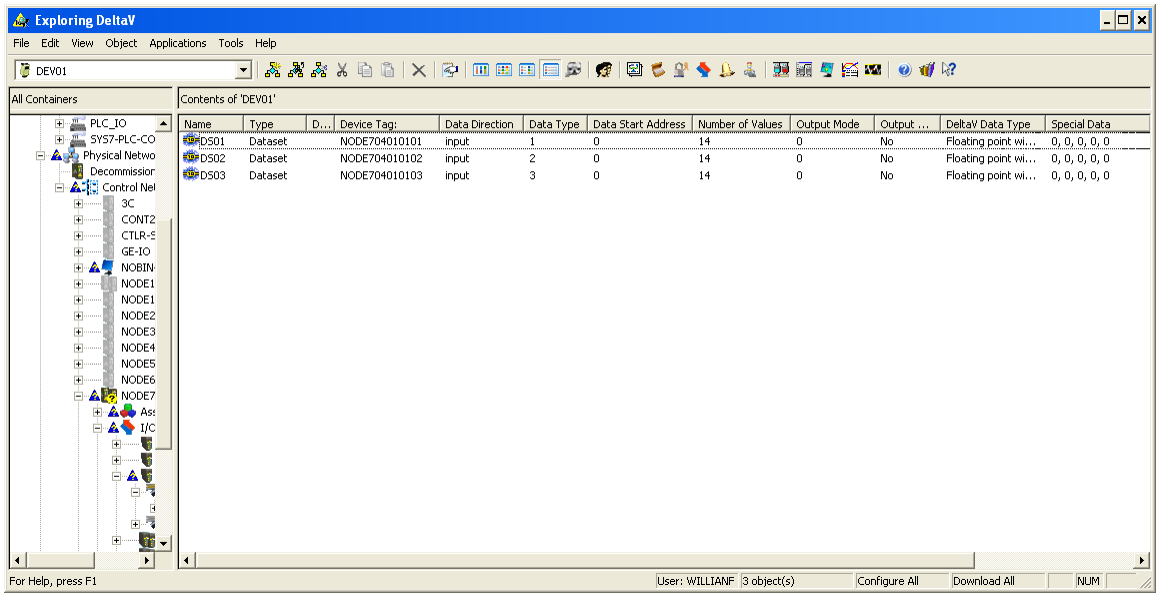
Specify devices, as shown above. A maximum of 5 SPG761 devices can be configured under each port. Each device represents a single SPG761. The SPG761 bus address must be known and configured in the range 1-29. Any address above 29 is considered an error. Device address 0 is reserved for the adapter APC79. The PSIC assumes this address. When using this driver, the adapter APC79 must be configured at address 0. See Section 4.5 for SPG761 configuration.

The following dialog shows an SPG761 device configuration with address 1. Create a separate device for each SPG761.



4.3 Dataset Configuration

Each device configured can have one, two or three datasets. Each dataset will contain data read from the SPG761, corresponding to a specific channel. The data read is pre-configured and cannot be changed without modification to the driver. The following screen capture shows three datasets.



The following table describes the data and its location in each dataset.

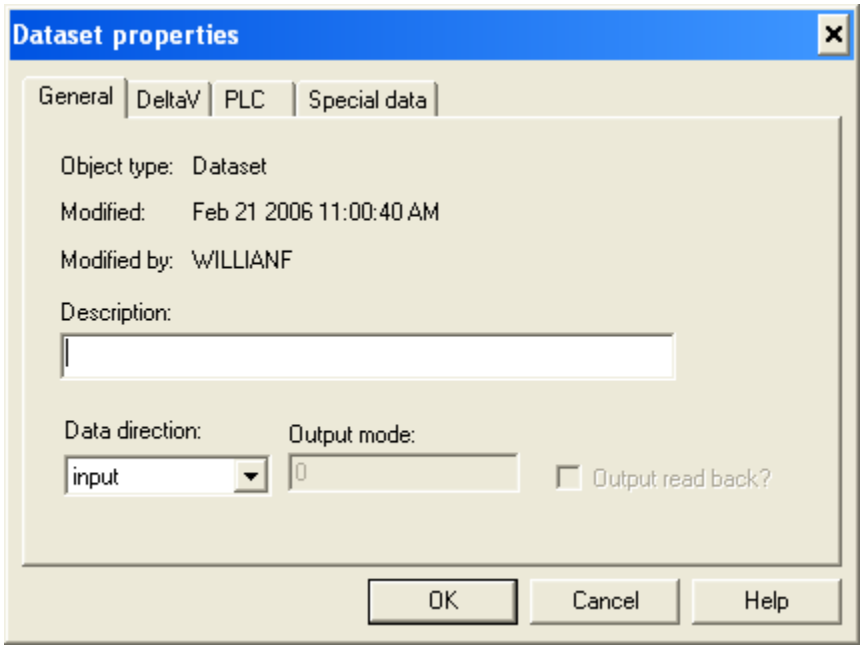
SPG761 Channel Data
Table 3

Dataset Register	Description	SPG761 Parameter
R1	Pressure Drop (kPa)	150
R2	Measured Value of Pressure (MPa)	154
R3	Absolute Value of Pressure (MPa)	155
R4	Temperature of Gas (^{o}C)	156
R5	Mass flow of Gas (t/hr)	157
R6	Volume flow of Gas with working environment conditions (m^3/hr)	158
R7	Volume flow of Gas with standard environment conditions (m^3/hr)	159
R8	Mass of Gas (Ton)	160
R9	Volume of Gas with standard environment conditions (m^3)	162
R10	Volume of Gas with working environment conditions (m^3)	163
R11	Volume of Gas for running day (km^3)	Array 211.0
R12	Volume of Gas for previous day (km^3)	Array 211.1
R13	Mass of Gas for running day (Ton)	Array 221.0
R14	Mass of Gas for previous day (Ton)	Array 221.1

Note: The user must configure SPG761 parameter 030 (Measured Units). It is expected that the Measured Units are appropriate for application. The PSIC driver does not perform any recalculation of data based on parameter 030 configuration. The data read from the network is passed on to DeltaV without modification.

4.3.1 Data Direction

All datasets should always be defined as Input.

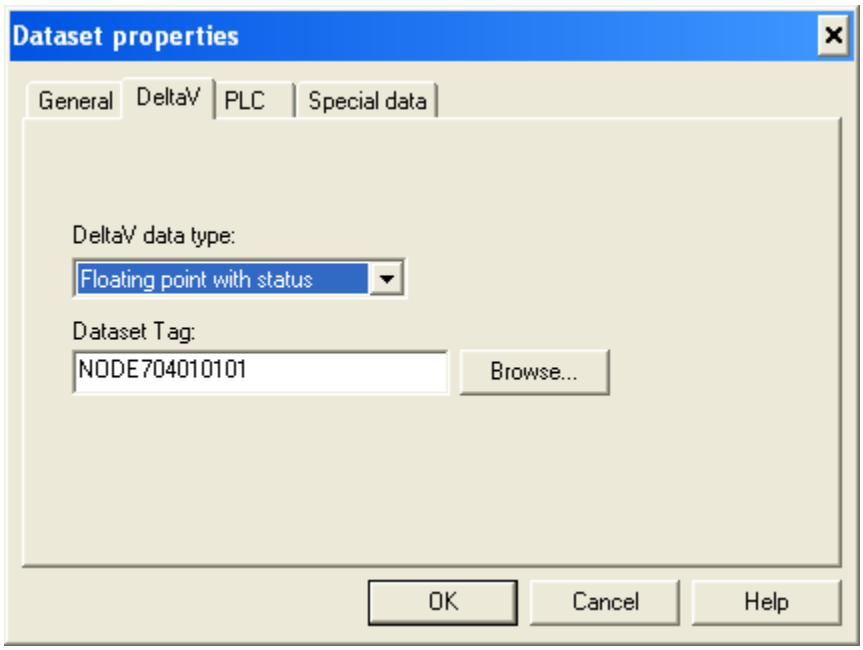


4.3.2 Output Mode and Readback

Not used by this driver.

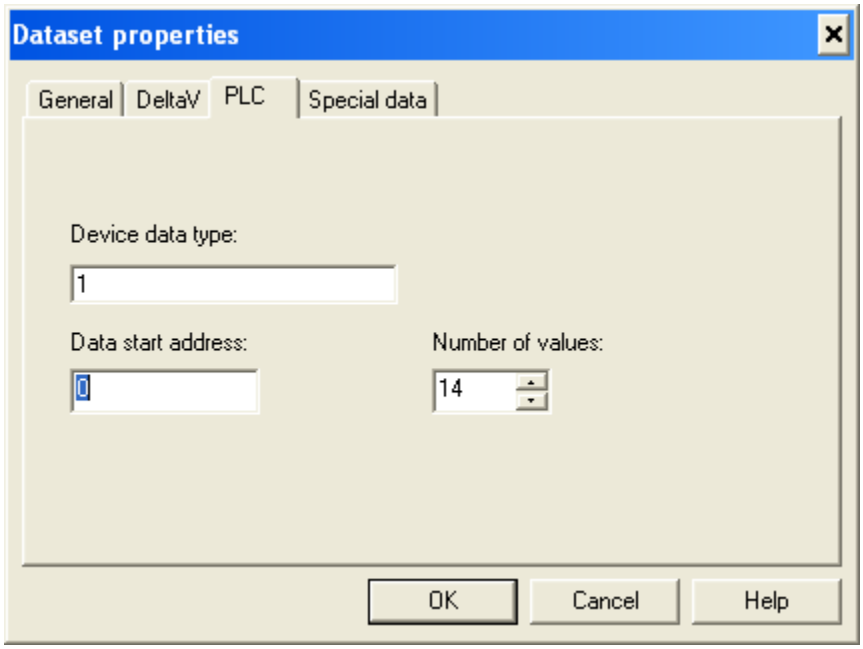
4.3.3 DeltaV Data Type

The DeltaV data type should be set as Floating Point for all datasets.



4.3.4 Device Data Type

The Device data type is used to indicate the SPG761 channel number. The only valid values are 1, 2 and 3. All other values will be considered as errors.

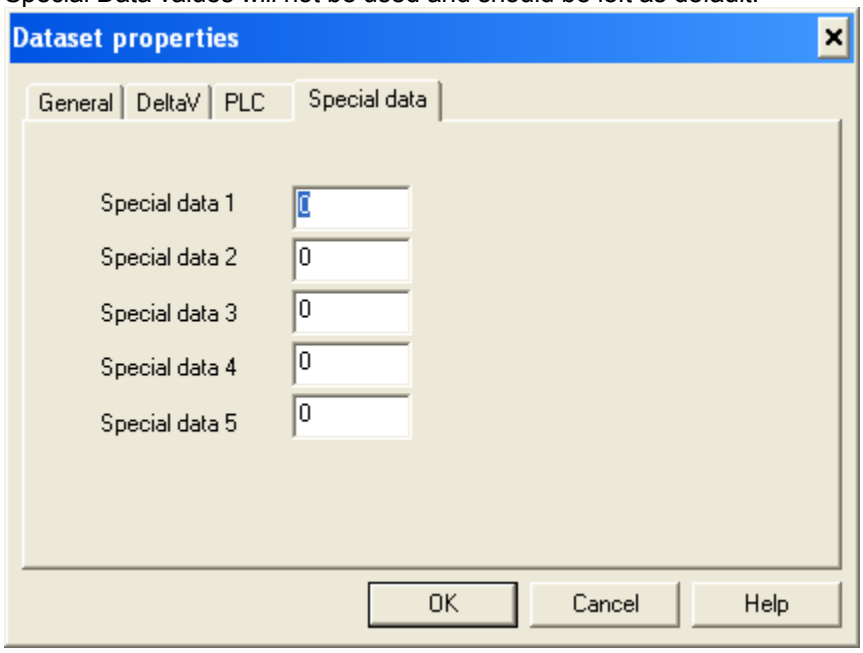


4.3.5 Data Start Address and Number of Values

Data Start Address should always be configured as 0, and the Number of values should be 14.

4.3.6 Special Data

Special Data values will not be used and should be left as default.



4.4 APC79 Adapter Configuration

User must use Logika software, ***Merit79***, to configure the APC79 adapter. The parameter to configure is 003. Parameter 003 has the following format:

PESLRAAHHV

Component	Description
P	1 = Protocol RS232
E	0 = Computer; 1 = Modem
S	Baud rate, bits/s: 2=1200; 3=2400; 4=4800; 5=9600; 9=115200; S=4 is recommended.
L	RS232 Hardware Handshake: 0=No Handshake
R	0 = Number of Modem rings
AA	Address for Adapter in range 00 to 29
HH	Highest address on SP Bus: 00 to 29
V	SP Bus Baud rate, bits/s: 0=300; 1=600; 2=1200; 3=2400; 4=4800. V=4 is recommended.

For example, set parameter 003 = 1040000014

Here 00 is the Adapter address, and 01 is the highest SPG761 device address on the SP bus. The SP Bus baud rate is 4=4800 bits/s.
After you configure the APC79 adapter, you must cycle power on it. After power up, the RS485 LED will have a continuous blink. This means that it is communicating on the SP Bus.

4.5 SPC761 Device Configuration

Use the front panel menu of the SPG761 device to configure each SPG761. Each SPG761 device must be configured with specific address. If there are 2 SPG761 devices on the network, configure the first with address 1 and the second with address 2. The parameter to configure is 003. Parameter 003 has the following format:

PESLRAAHHV

Component	Description
P	1 = Protocol RS232
E	0 = Computer; 1 = Modem
S	Baud rate, bits/s: 2=1200; 3=2400; 4=4800; 5=9600; 9=115200; S=4 is recommended.
L	RS232 Hardware Handshake: 0=No Handshake
R	0 = Number of Modem rings
AA	Address for this SPG761 on SP Bus in range 00 to 29
HH	Highest address of SPG761 device on SP Bus: 00 to 29
V	SP Bus Baud rate, bits/s: 0=300; 1=600; 2=1200; 3=2400; 4=4800. V=4 is recommended.

For example, set parameter 003 = 1040001014

Here 01 is the SPG761 address, and 01 is the highest SPG761 address on the SP bus. The SP Bus baud rate is 4=4800 bits/s.

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 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. The user needs to make sure communication settings such as baud rate, parity, and the 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

The user can create I/O modules in the control studio to verify the correct values are being written out. An example module is shipped with the distribution. This module shows methods for writing text to the datasets and also how to handle time.

5.5 Using Diagnostics

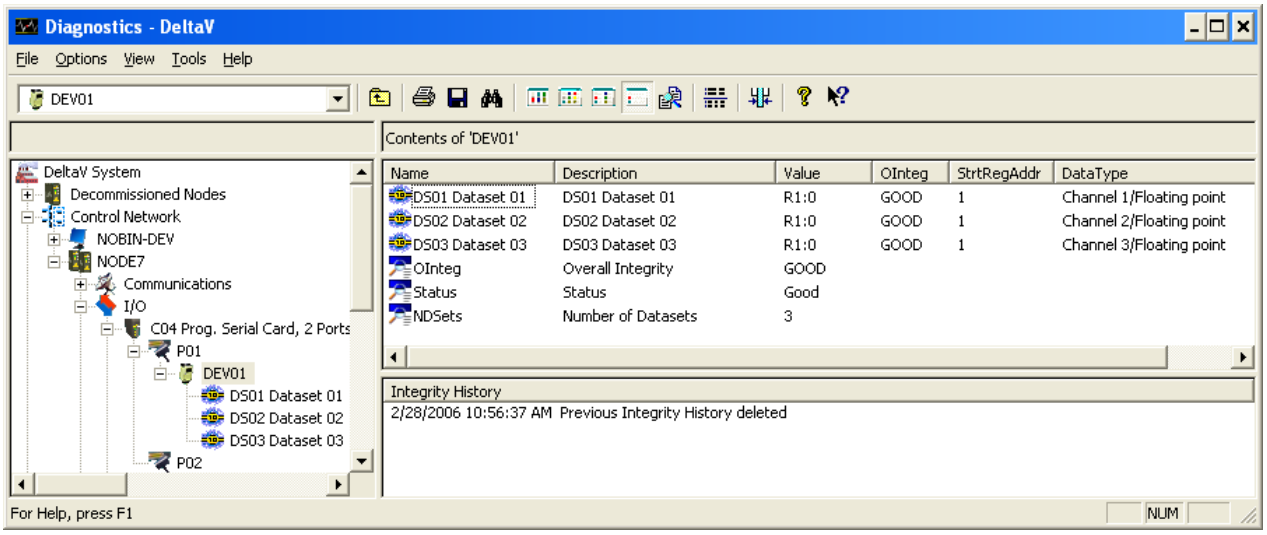
- **Verify PSIC Communication:** Select the PSIC on Diagnostics and press the right mouse button. Select Display Real-Time Statistics from the drop down menu. If the Programmable Serial Interface Card is functioning, then the user will see the Valid

Responses counter and the Async and/or Sync Transactions counters incrementing. There will not be any error counting up.

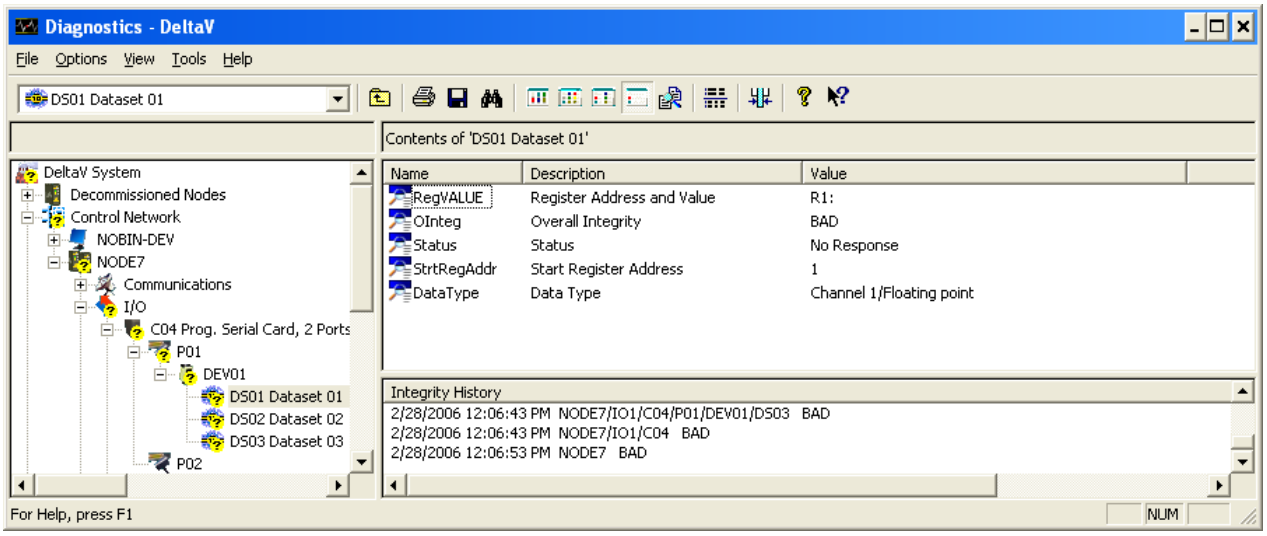
- **Verify port statistics.** Select the Port on the Programmable Serial Interface Card and press the right mouse button. Then, select Display Port Statistics form the drop down menu. Verify that the port communications statistics are being displayed properly and are counting as expected for the protocol's 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.

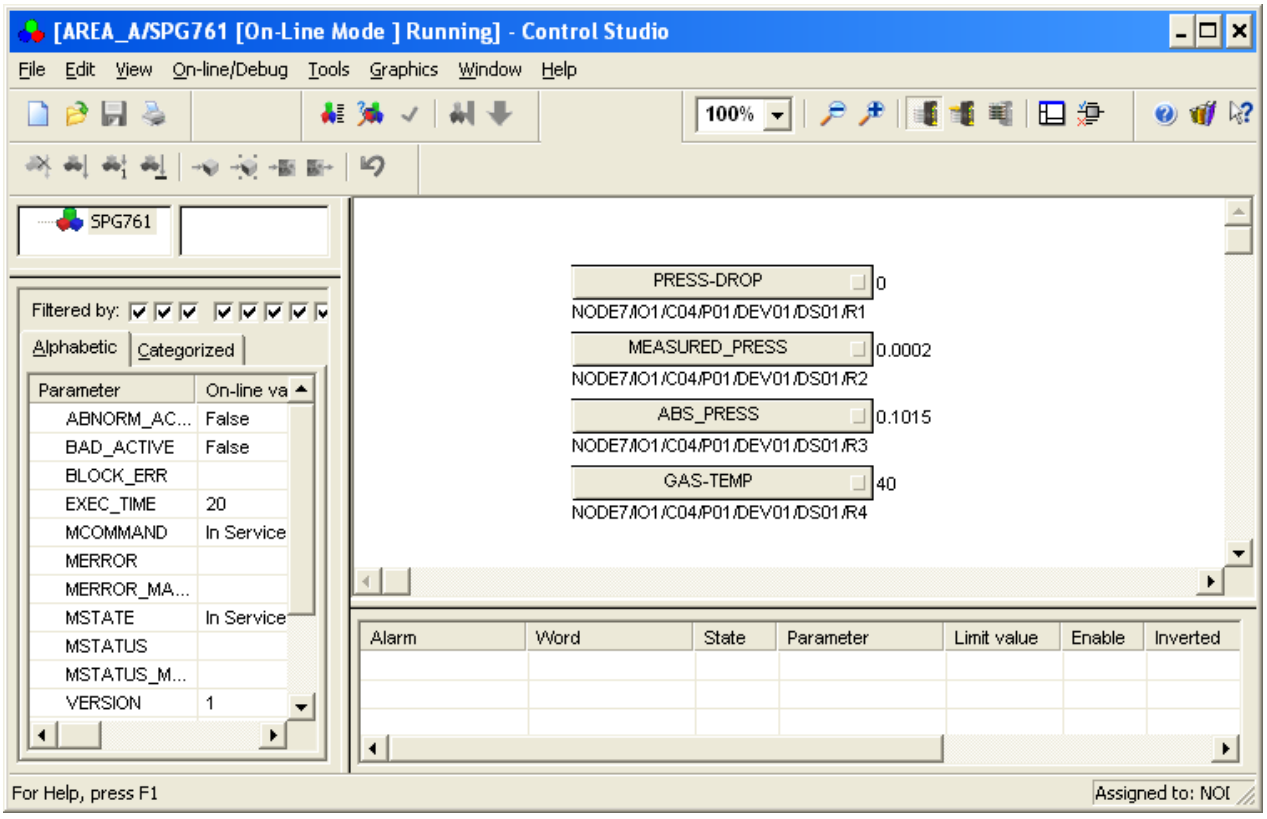
The following screen capture shows good communications with one SPG761 device:



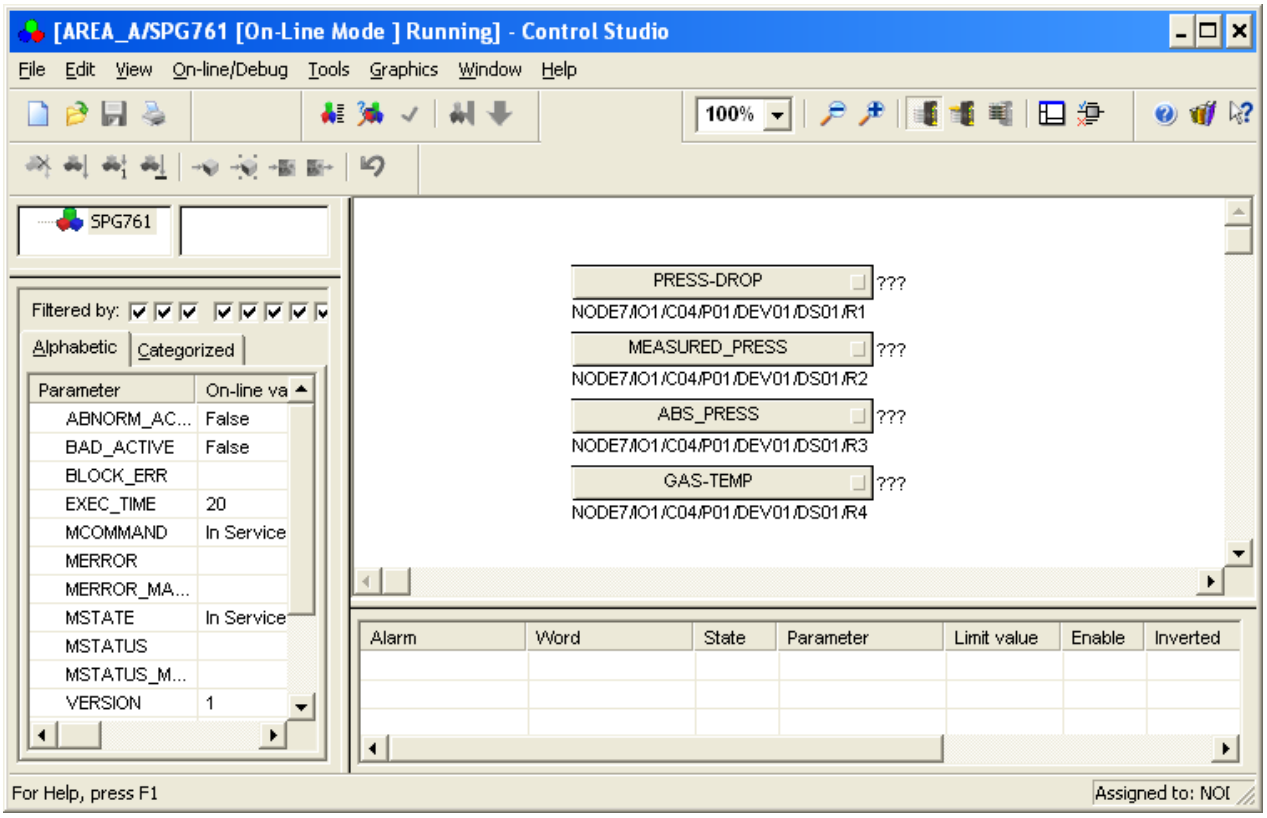
If there is a loss of communications with an SPG761 device, the DeltaV Diagnostics at the dataset level will be as shown below:



When the system is online and communications are active with an SPG761 device, the DeltaV Control modules will have values are shown below:



Upon communications failure, the status of referenced values will change to Bad, as shown below:



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, which function independently. The distance between the serial card and the field device can be as much as 1200 meters, per the RS-422/485 standard. When using RS-232, the distance is limited to 15 meters. Section 6.1 shows the pin assignments for the PSIC serial terminal block.

6.1 Pin Assignments for DeltaV PSIC

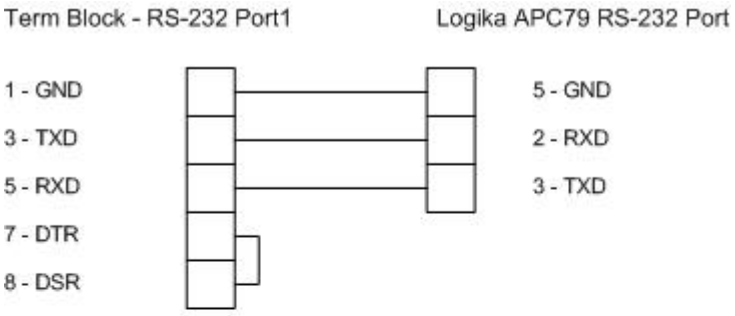
RS-232 Standard

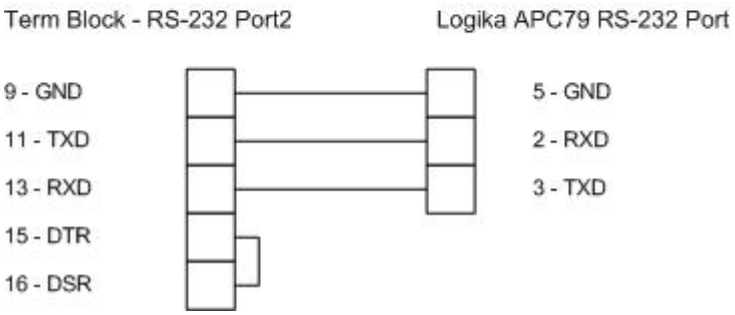
Table 4

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 – Data Set 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 1 – Data Set Ready (DSR)

6.2 Wiring Connections

For additional DeltaV cabling information, please refer to the DeltaV Books online documentation. For additional Logika APC79 cabling information, see the appropriate APC79 documentation. If hardware handshake is enabled in the APC79 adapter, then use jumper pins 4 to 6, and 7 to 8 on the APC79 side.





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.