MYNAH℠

Robert Shaw Reeltape Model 185A Programmable Serial Interface Card Series 2

USER MANUAL

Rev. P1.10

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1 INTRODUCTION

1.1 Scope

This document is the Design Document for the Robert Shaw Reeltape 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 Robert Shaw Reeltape devices.

1.2 Document Format

This document is organized as follows:

Table 1 – Document Format

Introduction	Describes the scope and purpose of this document.
Theory of Operation	Provides a general functional overview of the Robert Shaw Reeltape 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 Robert Shaw Reeltape 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:

Table 2 – System Requirements

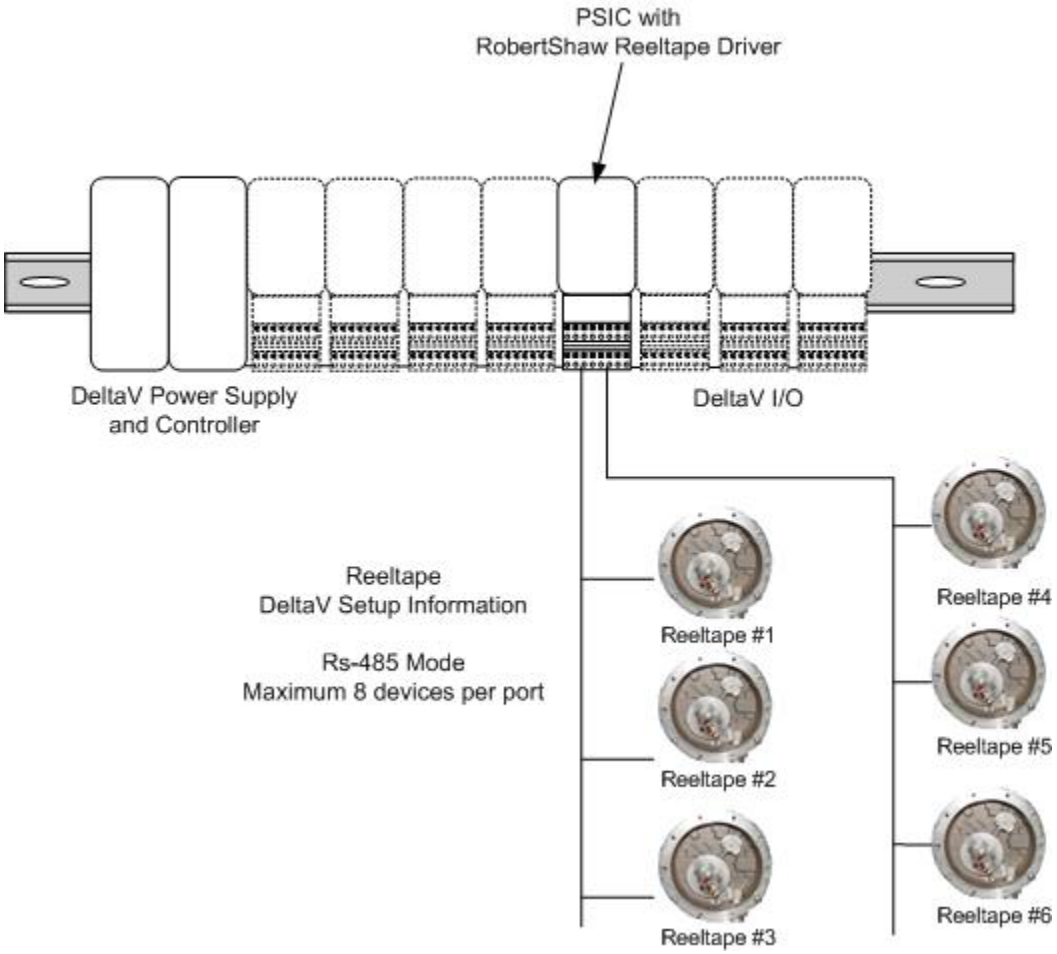
Protocol Compatibility and Reference documents	The communication protocol used will be the Robert Shaw Reeltape RS485 Communication Protocol described in Robert Shaw Reeltape manual: 909GF276D
Software Requirements	DeltaV System Software (Release 6.3.2 or later) installed on a hardware-appropriate Windows 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

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 driver will run in simplex, master mode only. Redundant communications and slave mode are not supported. As part of its normal operation, the driver will perform a continuous scan of the configured Reeltape devices. The data read back will be stored in the corresponding device datasets. The normal scan is continuous, executed as fast as responses are received from the Reeltape devices. In case of communication errors, the driver will perform retries based on configured port parameters. If a Reeltape device does not respond, i.e., time out, the driver will mark it as bad and continue on to the next configured device. The timed out device will be retried later as part of the driver's round-robin scan. If it responds, the device status is restored and a complete scan is performed for it.

Physically, the PSIC will connect to the RS485 port located on the right side of the Reeltape electronics enclosure according to section 6.1 of the Robert Shaw Reeltape manual. The driver will utilize one or both ports for communications, as configured. Up to 8 multi-dropped devices can be connected to each port. This is illustrated below.

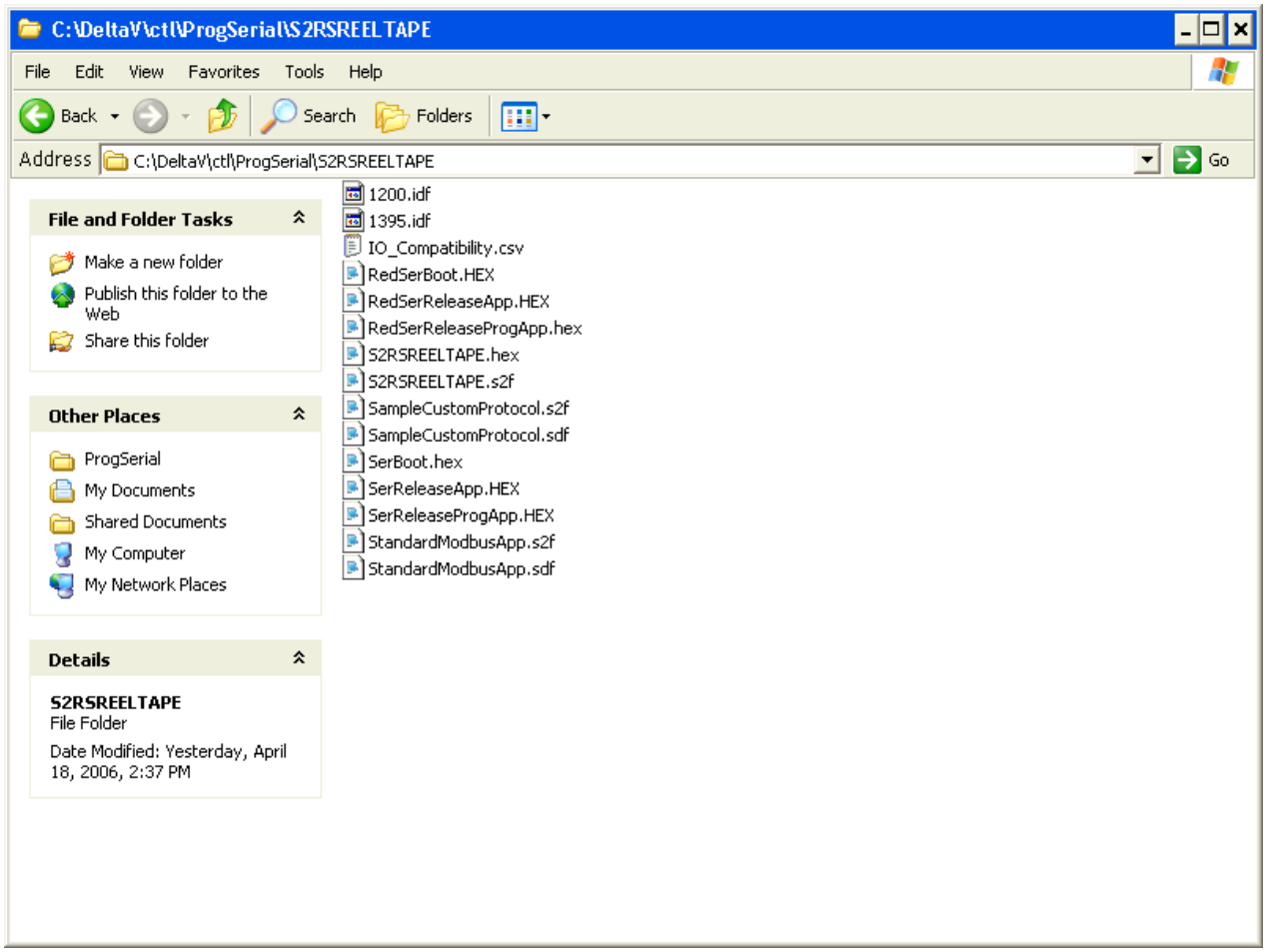


3 Downloading the firmware

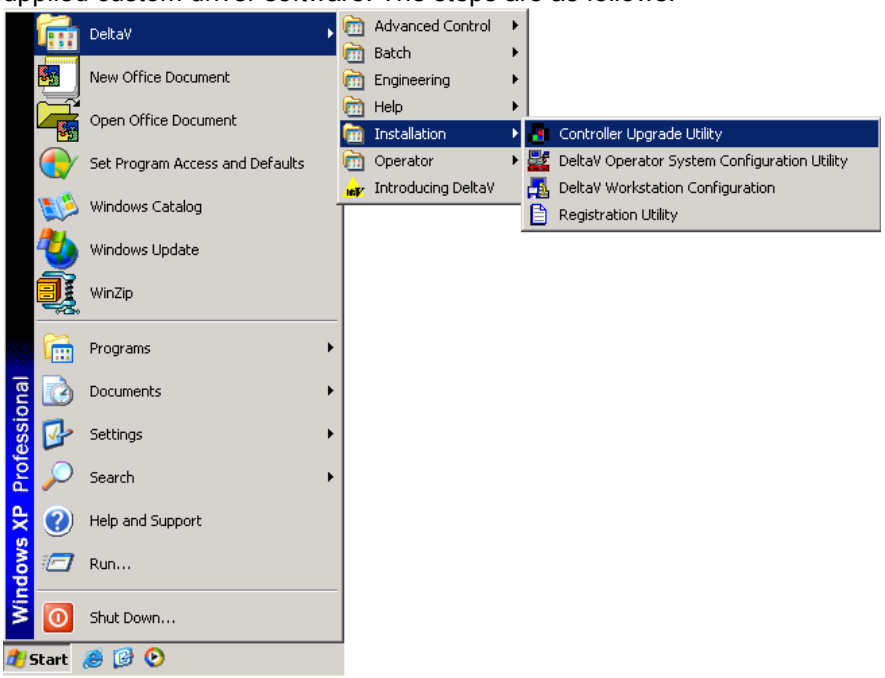
The driver software distribution comprises 14 files, distributed on a CD. These files must be copied to the DeltaV directory on your ProPlus Workstation. The path is:

\DeltaV\ctl\ProgSerial\S2RSREELTAPE

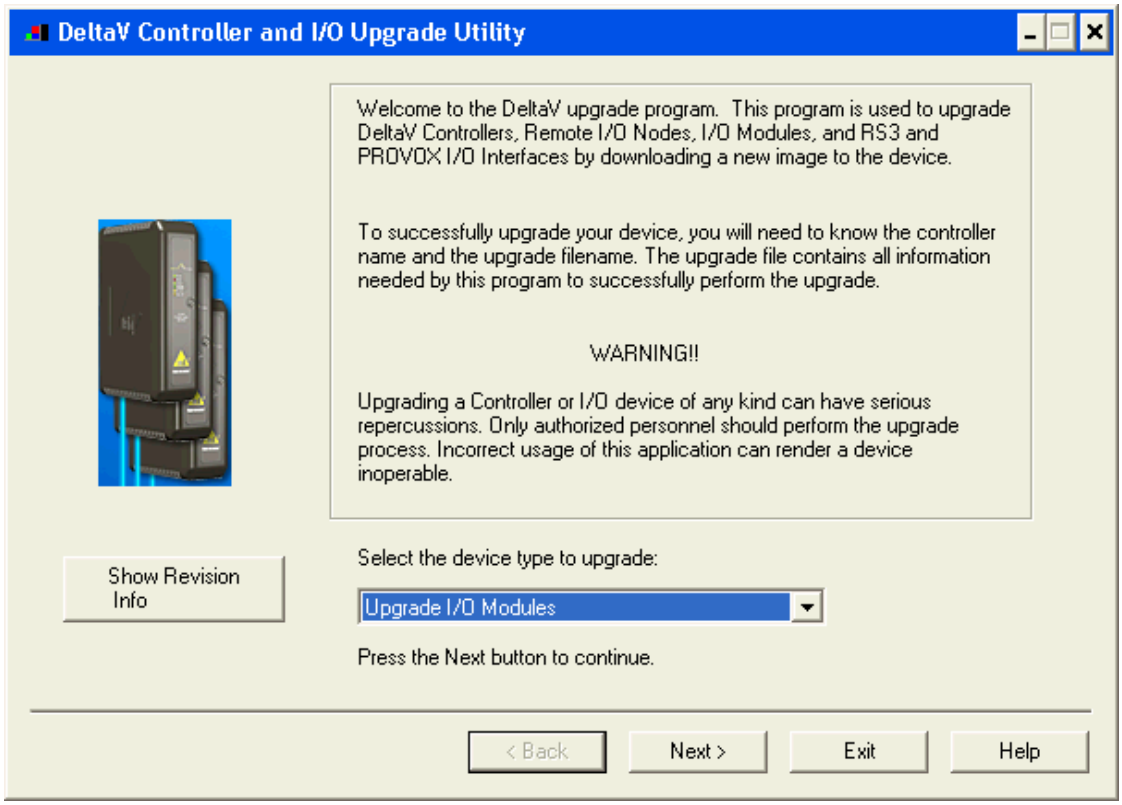
Note that you will have to create the \S2RSREELTAPE subdirectory. The following files will be copied:



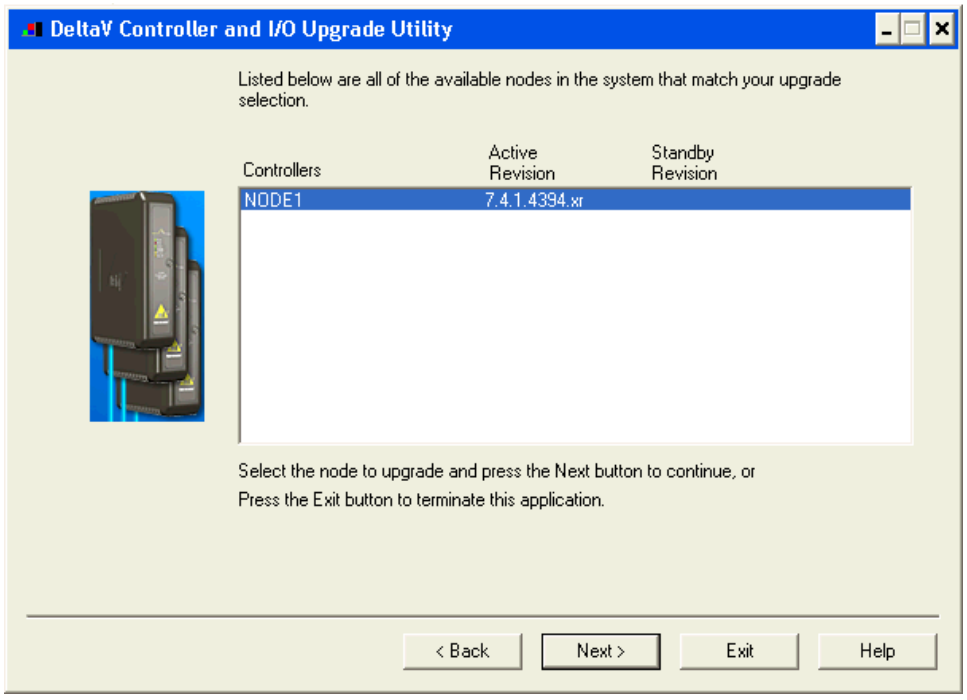
After copy completion, you are ready to program (or upgrade) the Programmable Serial Card with the supplied custom driver software. The steps are as follows:



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

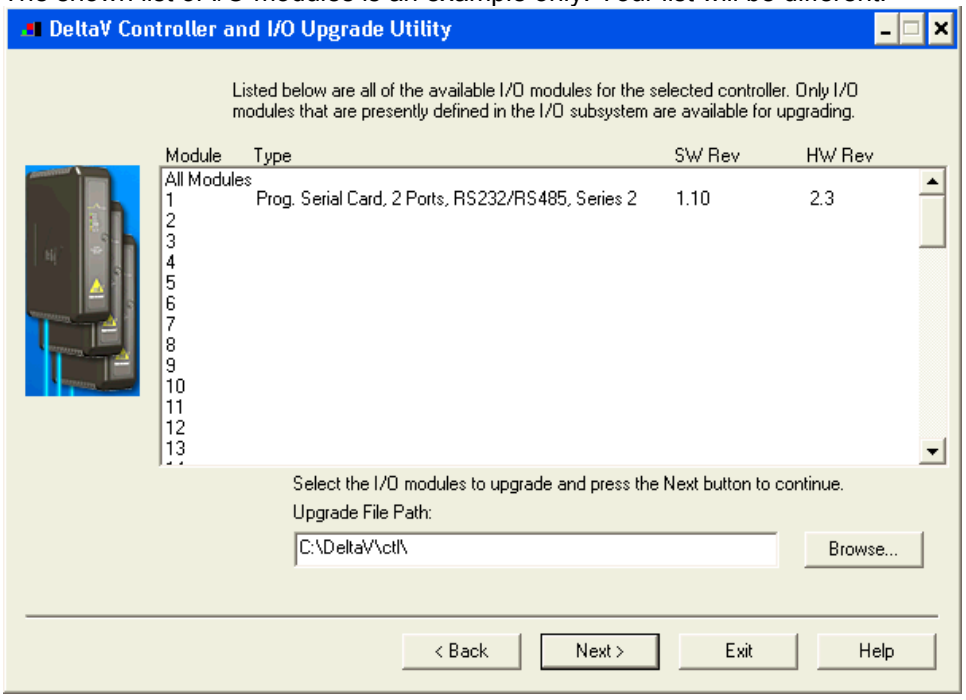


2. Choose Upgrade I/O Modules from the drop down menu and click Next.

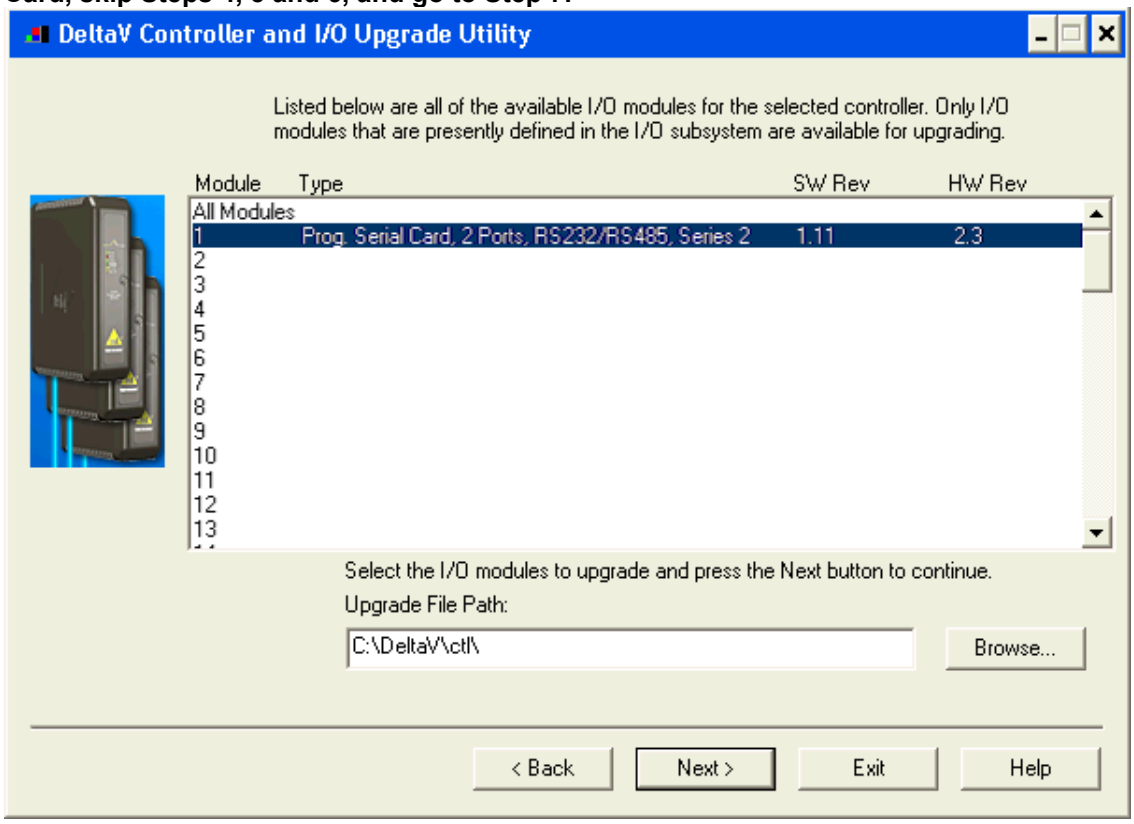


3. The above dialog will appear, listing all the available Controllers in your network. From this dialog, select the appropriate Controller and then Click Next.

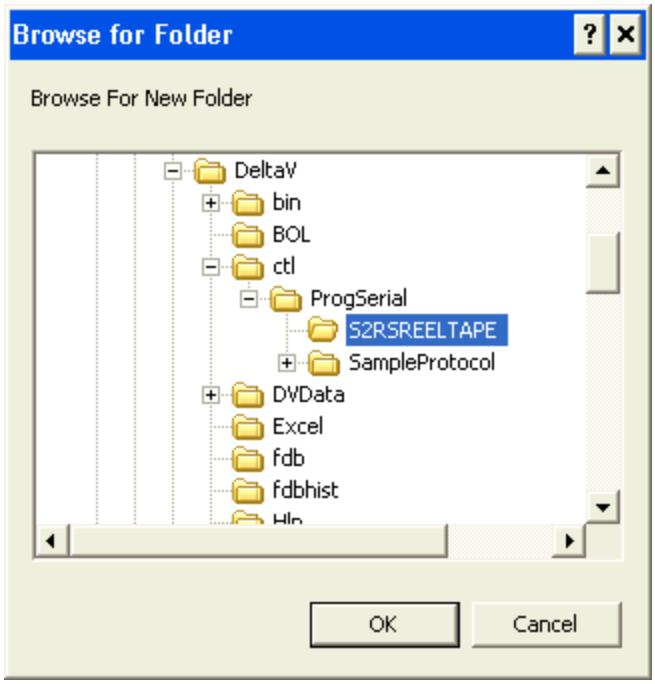
4. The following dialog will appear, listing all the I/O modules in your selected Controller. The shown list of I/O modules is an example only. Your list will be different.



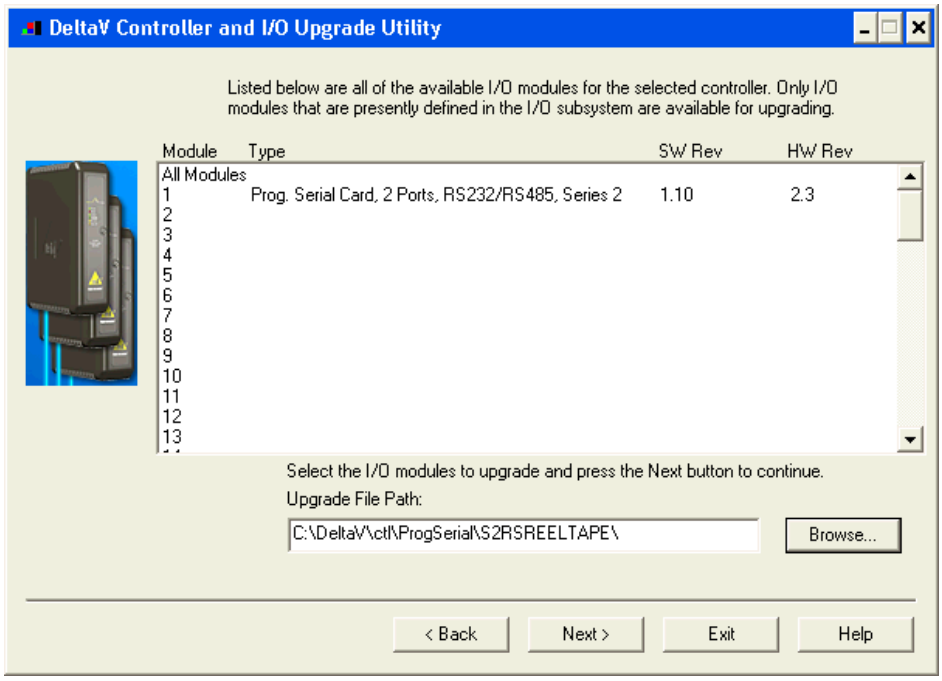
Note: The first time a standard Serial card is upgraded to the ControlNet Driver, the dialog will be as shown below. When upgrading an existing Programmable Serial Card, skip Steps 4, 5 and 6, and go to Step 7.



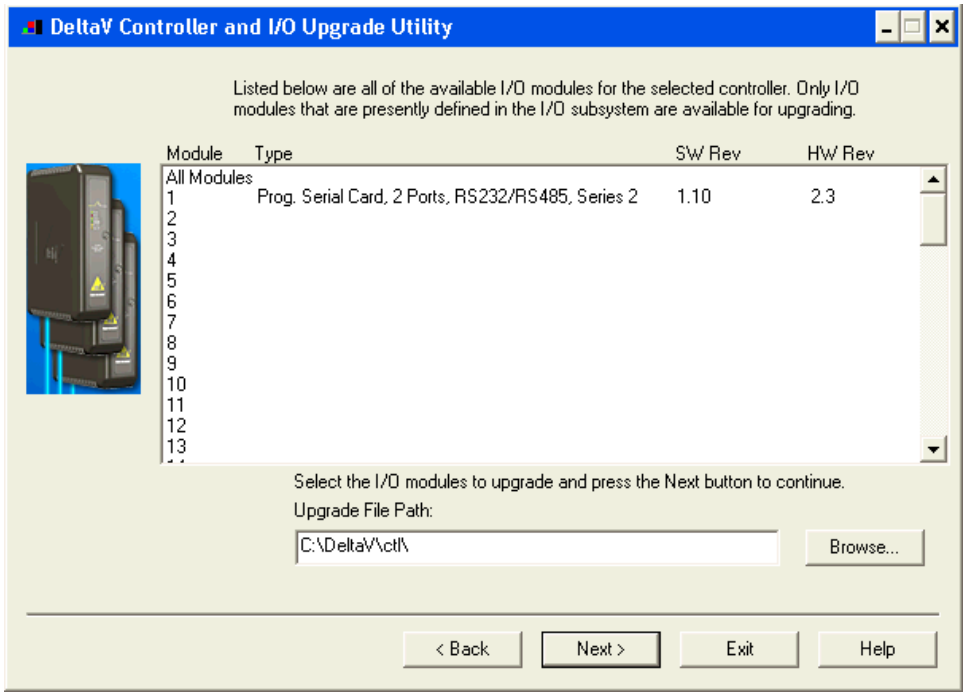
5. Click the Browse button and select the DeltaV path as shown below, and then click Ok. Note that the disk drive could be C or D.



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.



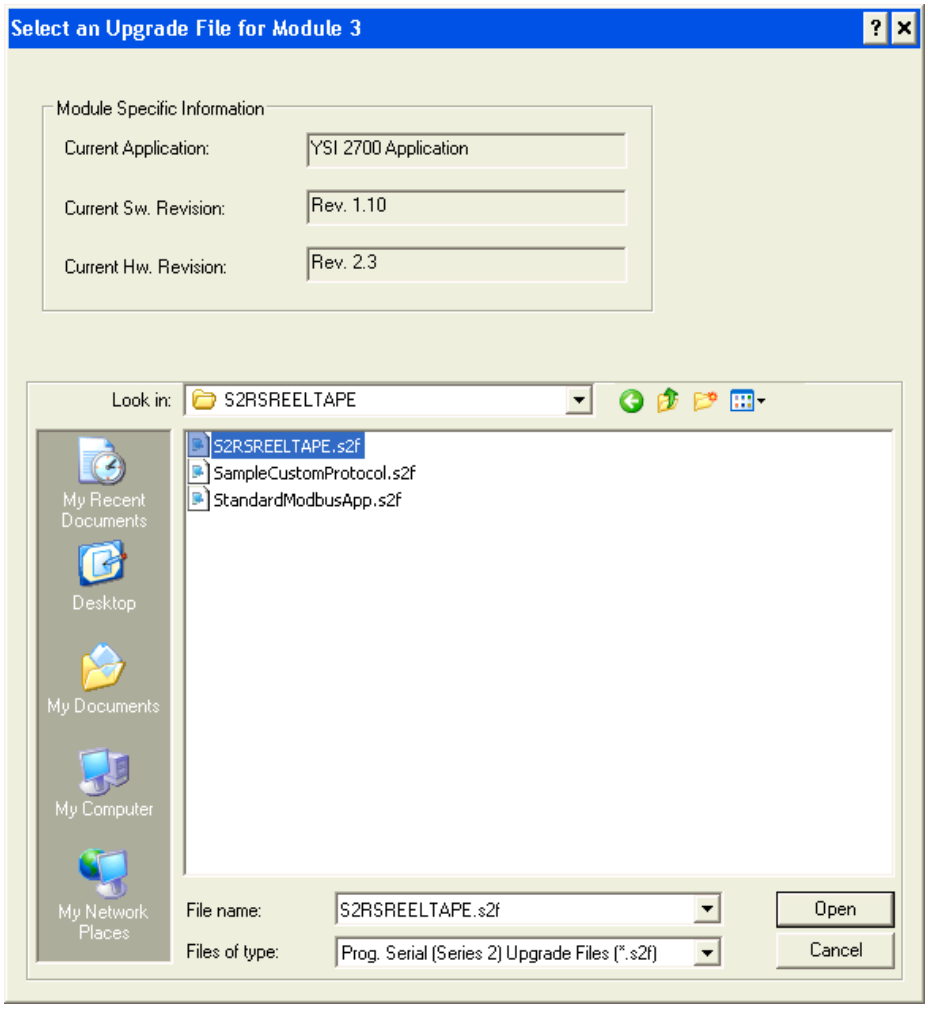
For example, we will select I/O Module 1. This will give you a dialog, from which you will select the file path to where the driver software is located. This path will be:

\DeltaV\ctl\ProgSerial\S2RSREELTAPE

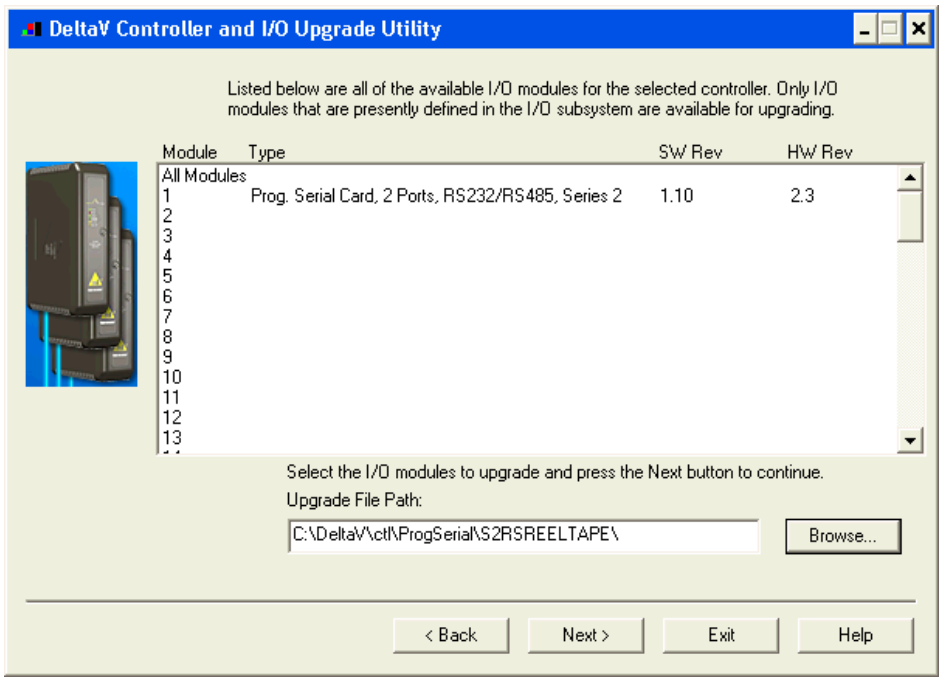
Once you are in the specified directory, you will need to select the following file:

S2RSREELTAPE.S2F

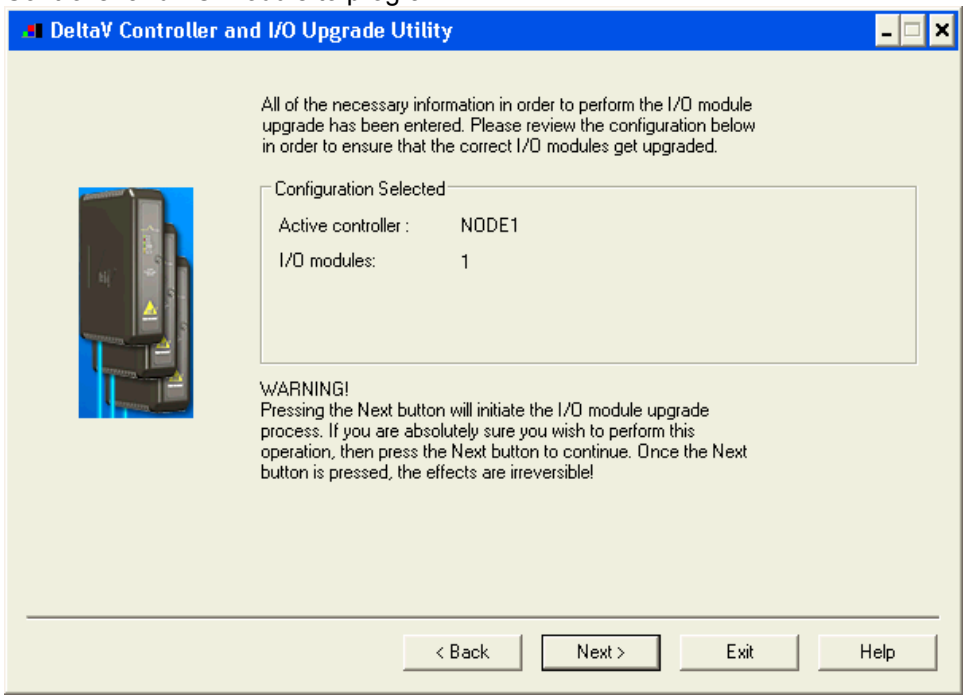
This is shown in the following dialog.



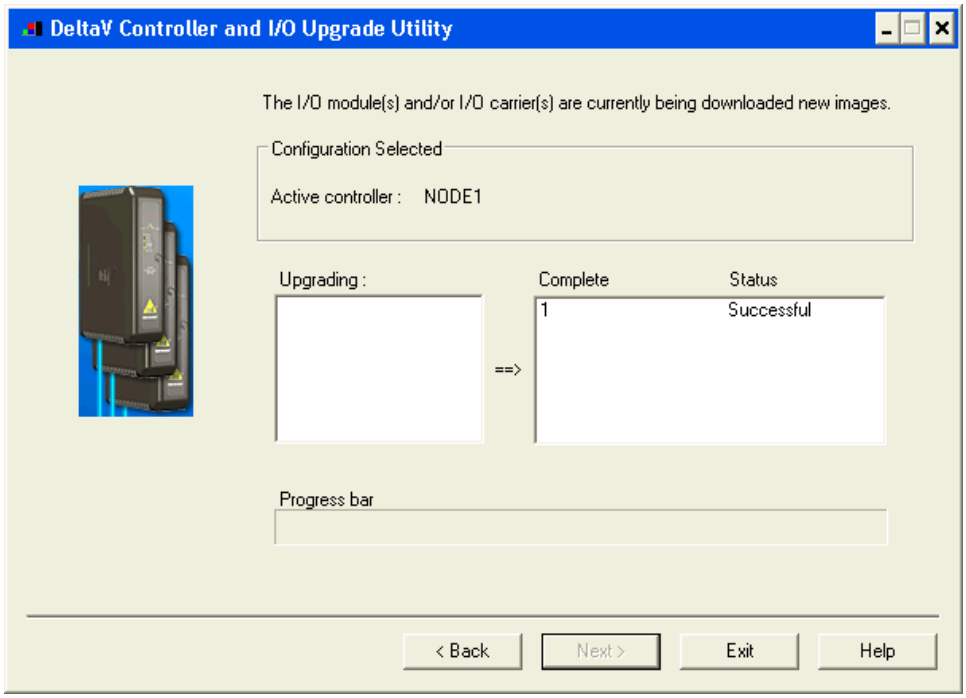
8. After selecting the .S2F file, Click on Open. This dialog will close and you will be back to the following:



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.

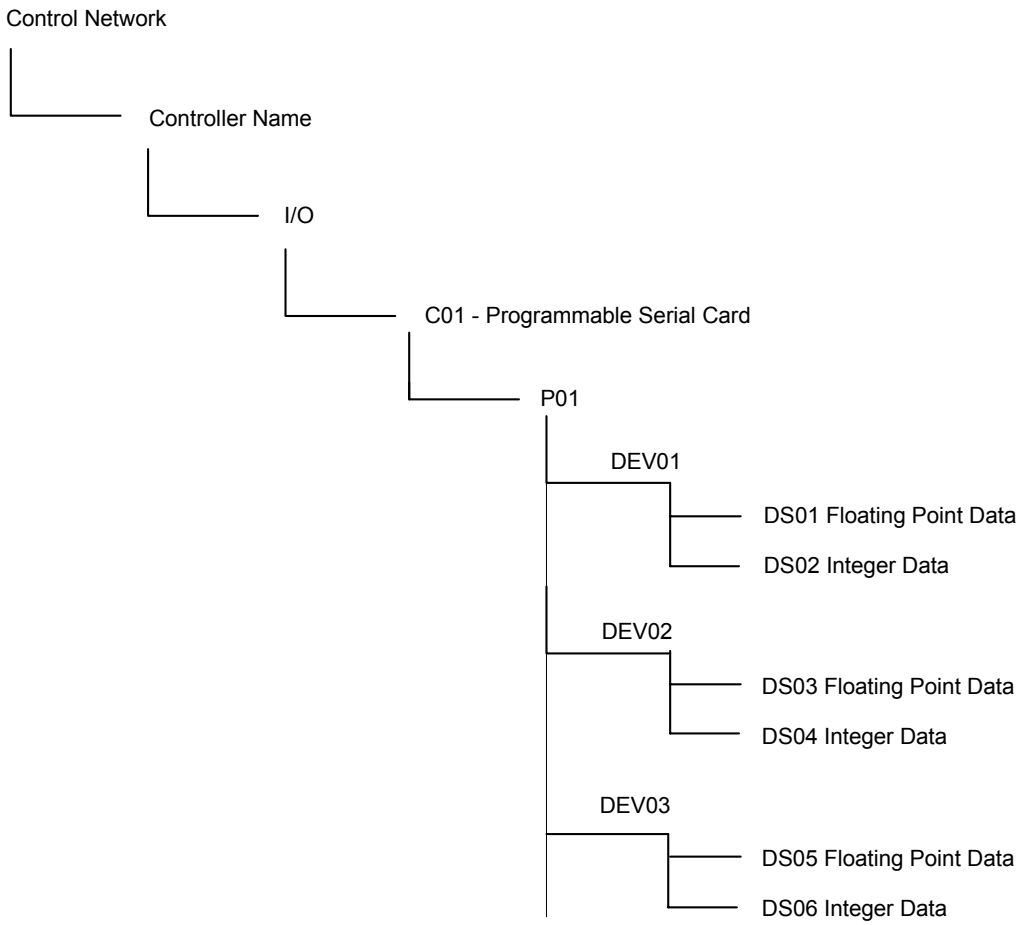


11. This completes the I/O Module upgrade process.

4 CONFIGURATION INFORMATION

Under each port, there exist 16 datasets. Each attached Robert Shaw Reeltape will need 2 datasets for operation. This allows for up to 8 level gauges per port. Under the port a Device will be created for each attached level gauge. The device address should match the Digital Address assigned to Robert Shaw Reeltape. Under each device, 2 datasets will be defined that will store runtime values read from the device.

The figure below shows and example Robert Shaw Reeltape setup:



4.1 Port Configuration

The port should 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 RS485 Half-Duplex. The Robert Shaw Reeltape does not support full Duplex RS-485. RS-232 is supported via a RS485 to RS232 media converter. The Baud Rate and Stop Bits should match the settings in the Robert Shaw Reeltape devices. Parity should be set to “None” and Data Bits to “8”.

4.2 Device Configuration

One device should be configured for each Robert Shaw Reeltape connected to a given port. The PSIC device address must match the Reeltape device address you wish to communicate with. Up to 8 Reeltape devices may be configured per port for a total of 16 per PSIC.

4.3 Dataset Configuration

4.3.1 Data Direction:

Two datasets will be defined under each device. Both datasets will be Input Datasets.

4.3.2 Output Mode and Readback:

Output mode will not be used in this driver and can be left as default. Readback mode will also not be used and should not be checked.

4.3.3 DeltaV Data Type:

See below.

4.3.4 Device Data Type and Number of Values

Table 3 – Dataset Configuration

DATASET	DeltaV DATA TYPE	DEVICE DATA TYPE	DATA START ADDRESS	NUMBER OF VALUES
1	Float	0	0	18
2	16-Bit UINT	0	0	8

4.3.5 Special Data

The Special Data values (1-5) are not normally used in this driver and can be left as default of 0. By default, the driver performs scaling of certain values (see Table 5 below). The Special Data 5 value is used as an option flag. If a value of 1 is configured for Special Data 5, the driver will bypass automatic scaling of runtime data. Instead, the un-scaled, raw data value read from the Reeltape device will be stored in the dataset registers.

4.3.6 Register Mappings

Table 4 – Dataset 1 Register Mapping for Time Data

REGISTER	DESCRIPTION
1	Product (Overall) Level Measurement (SPL) Scaled units for the level are Inches, Feet, or Meters. The scale is configured in the Reeltape device.
2	Interface Level Measurement (SIL)
3	Project (Overall) Volume Measurement (SPV)
4	Interface Volume Measurement (SIV)
5	Temperature Measurement (STM)
6	High Level Alarm Setting (SHI Every 5 minutes) This value has the same scale as the level (Register 1).
7	Low Level Alarm Setting (SLO Every 5 minutes) This value has the same scale as the level (Register 1).
8	High-High Level Alarm Setting (SHH Every 5 minutes) This value has the same scale as the level (Register 1).
9	Low-Low Level Alarm Setting (SLL Every 5 minutes) This value has the same scale as the level (Register 1).
10	High Limit Setting (SHM Every 5 minutes) This value has the same scale as the level (Register 1).
11	Low Limit Setting (SLM Every 5 minutes) This value has the same scale as the level (Register 1).
12	Update Time (SUT)
13	Sensor Position (SPO)
14	Low (4ma) Analog Output Point (SLA)
15	High (20ma) Analog Output Point (SHA)
16	Product (Overall) Offset for Proximity Sensor Calibration (SOO)
17	Interface Offset for Proximity Calibration (SIO)
18	Dielectric Change for Proximity Sensor Measurement (SDK)

Table 5 – Scaled Values

REGISTER	DESCRIPTION
1	Level Measuresment
6	High Level Alarm
7	Low Level Alarm setting
8	High-High Level Alarm setting
9	Low-Low Level Alarm setting
10	High Limit setting
11	Lo Limit setting

Note: Scaling is performed by default, based on Level Units read from the Reeltape device and stored in Dataset 2, Register 6. Since the level units are scanned later than the above values, the first scan after PSIC reboot leaves these values un-scaled.

Table 6 – Dataset 2 Register Mapping for Date Data

REGISTER	DESCRIPTION
1	Software Revision Date (SRV Every 5 minutes) The format for this value is MMDDYY.
2	Gauge Status – Alarm Bitmask (STA) This value is a bitmask containing 6 bits. The bit order is as follows: Bit 5 – High Limit Bit 4 – Low Limit Bit 3 – High-High Alarm Bit 2 – High Alarm Bit 1 – Low Alarm Bit 0 – Low-Low Alarm A bit value of 0 implies OK, and 1 implies alarm. For example, for a value in High Alarm and High-High Alarm, the register value will be 12.
3	Gauge Status – Gauge Status (STA) This register will have values as follows: 1 – Measuring Product Level 2 – Measuring Interface Level 3 – Sensor Moving Up 4 – Sensor Moving Down 5 – Sensor Stopped
4	Gauge Status – Error Code (STA) This register will have values as follows: 0 – No Error 1 – Encoder Error 2 – Tape Motion Error 3 – Proximity Sensor Error 4 – Temperature Input Error 5-9 Reserved.

Table 6 Continued – Dataset 2 Register Mapping for Date Data

5	Gauge Units – Innage/Ullage Indicator (SUN) This register has the following values: 0 – Innage 1 – Ullage
6	Gauge Units – Level Units (SUN) This register has the following values: 0 – Feet – The raw data is multiplied by 0.001 1 – Inches – The raw data is multiplied by 0.01 2 – Meters – The raw data is multiplied by 0.001 3. Feet in 1/16th – The raw data is scaled to feet and inches
7	Gauge Units – Volume Decimal Location (SUN) This value is the number of digits to the right of the decimal point. The driver does not use this value.
8	Gauge Units – Temperature Units (SUN) This register has the following values: 0 – Off – No temperature reading is performed by the gauge 1 – ^{o}F – The gauge reads the temperature in Fahrenheit 2 - ^{o}C – The gauge reads the temperature in Celsius

5.0 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 Robert Shaw Reeltape 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 Robert Shaw Reeltape settings.

- Verify device configuration: User must check for the proper device address is entered. The Robert Shaw Reeltape number should match the Device Address.

- Verify Dataset configuration: The first Dataset should be defined as Input, Floating Point, with 18 values. The second should be Input, unsigned 16 bit integer, with 8 values.

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 Robert Shaw Reeltape operates in RS485 Half-Duplex mode only. If RS232 is desired, the appropriate converter must be used.

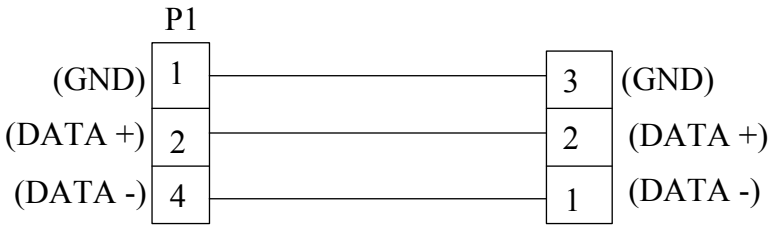
6.1 Pin Assignments for DeltaV PSIC

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

6.2 Wiring Connections

The figure below shows the connections between the Robert Shaw Reeltape RS485 port and Port 1 on the Serial Card Termination Block.



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.

For Product functionality questions, ask for the people in the following order:
1. David Story
2. Adisa Shaljani

For Commercial issues, ask for people in the following order:
1. Martin Berutti
2. Todd Anstine

You can also send us your questions via e-mail. Our address is:

support@mynah.com

Thank you for using DeltaV.