



M Y N A HSM

Programmable Serial Interface Card Driver Bell-Ennum 7785-P2005 Magnetic Plate Stirrer

USER MANUAL

Rev. P1.55

May 2010

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1 INTRODUCTION

1.1 Scope

This document is the User Manual for the Bell-Ennium (Bellco) 7785-P2005 Magnetic Plate Stirrer 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 Stir Plates.

The section *Document Format* briefly describes the contents of each section of this manual. *System Specifications* outlines hardware and software requirements for the Stir Plate Driver 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 Stir Plate Driver.
Flashing Firmware	Describes flashing procedures for the Stir Plate 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 PSIC and the Stir Plate Device. Also describes the cable pin assignments for RS-422/485 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 Stir Plate Driver:

Table 1: System Specifications

Firmware	Stir Plate Driver Firmware v1.55 or later
Protocol Compatibility	Communications with the Stir Plate are based on the following document: OMRON E5CN Manual <ol style="list-style-type: none">1. Section 1 – Communications Methods2. Section 2 – CompoWay/F Communications Procedures3. Section 3 – Communications Data for CompoWay/F and SYSWAY
Software Requirements	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.
Minimum DeltaV Hardware Requirements	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
Other Optional Hardware	N/A



2 THEORY OF OPERATION

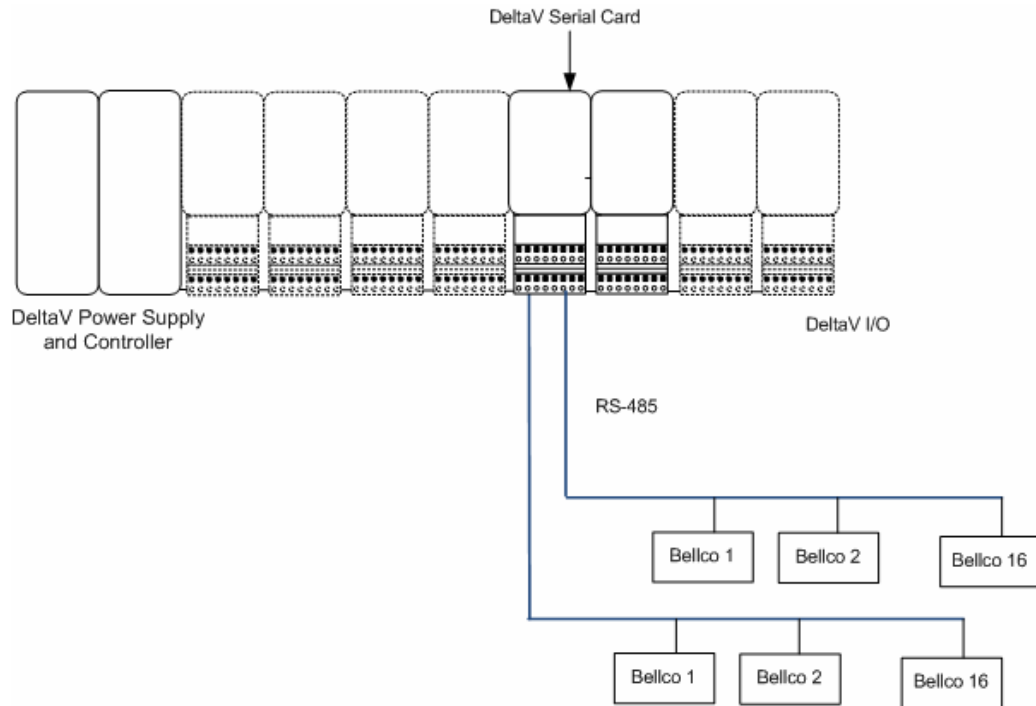
DeltaV comprises an I/O sub-system, in which the PSIC is one type of card. The purpose of the PSIC is to serially integrate third-party devices, allowing data to be read into and written out from DeltaV. Each PSIC has 2 communication ports that can be configured as Master or Slave, using RS-232, RS-485 (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 Stir Plate functions as the communications Slave. On power-up, the PSIC driver receives its configuration from the DeltaV Controller. The driver then continuously polls Stir Plate. The data is retrieved from the response messages and reported up to the DeltaV Controller in dataset registers.

The Stir Plate communicates using RS485 (Half Duplex). Furthermore, each Stir Plate has a unique address, allowing multiple Stir Plates to be multi-dropped from the same serial port in the PSIC. The Stir Plate address and other communications parameters are configured via the front display panel. Please refer to the OMRON E5CN Advanced Digital Controller manual for a complete description of the configuration options.

The driver capacity is limited to a maximum of 16 Stir Plates per port, where each Stir Plate is uniquely identified by the configured Device Address. Each Stir Plate is assigned a single dataset which contains the run time data.

The physical architecture will be as follows:



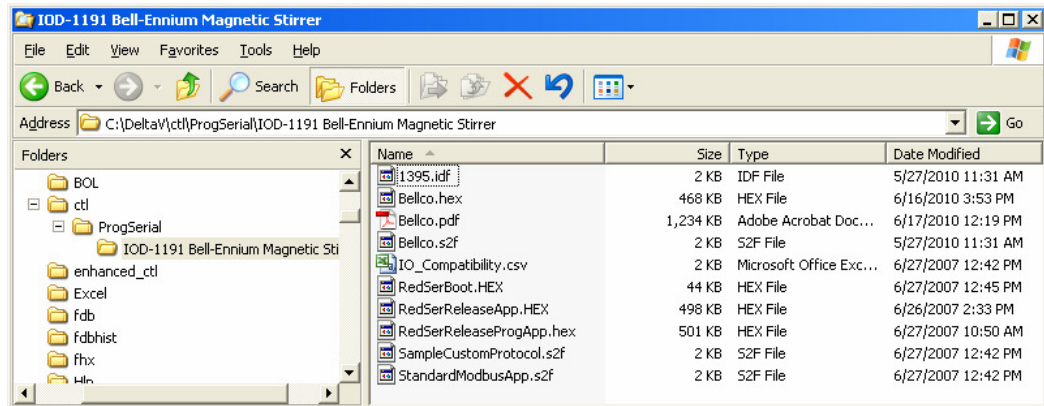


3 Flashing the firmware

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-1191 Bell-Ennium Magnetic Stirrer

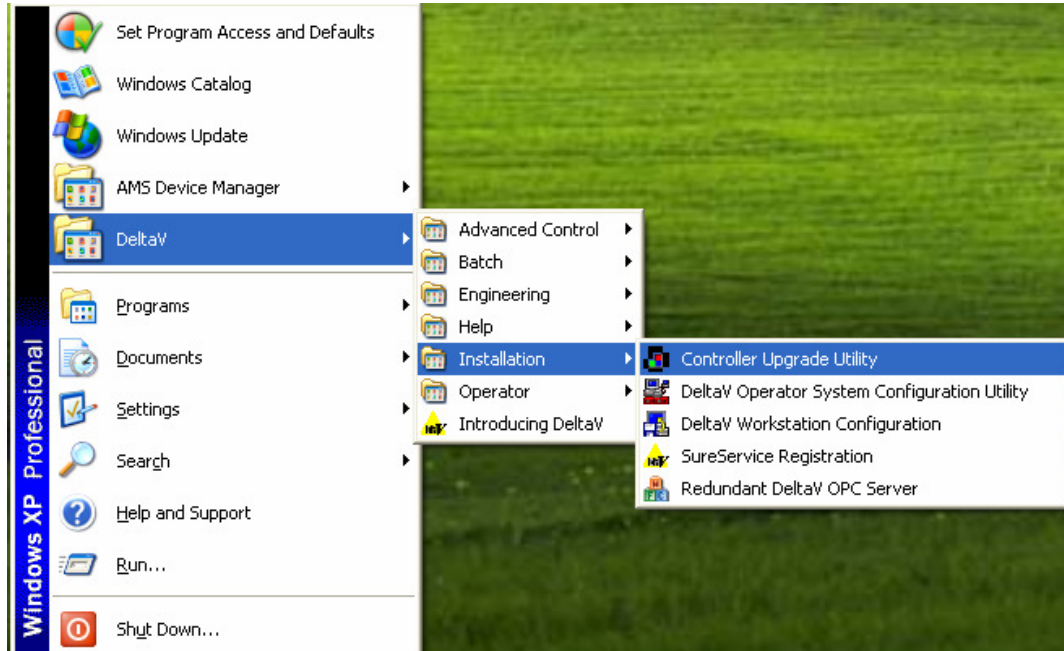
Note that you will have to create this subdirectory. The following shows a completed copy operation:



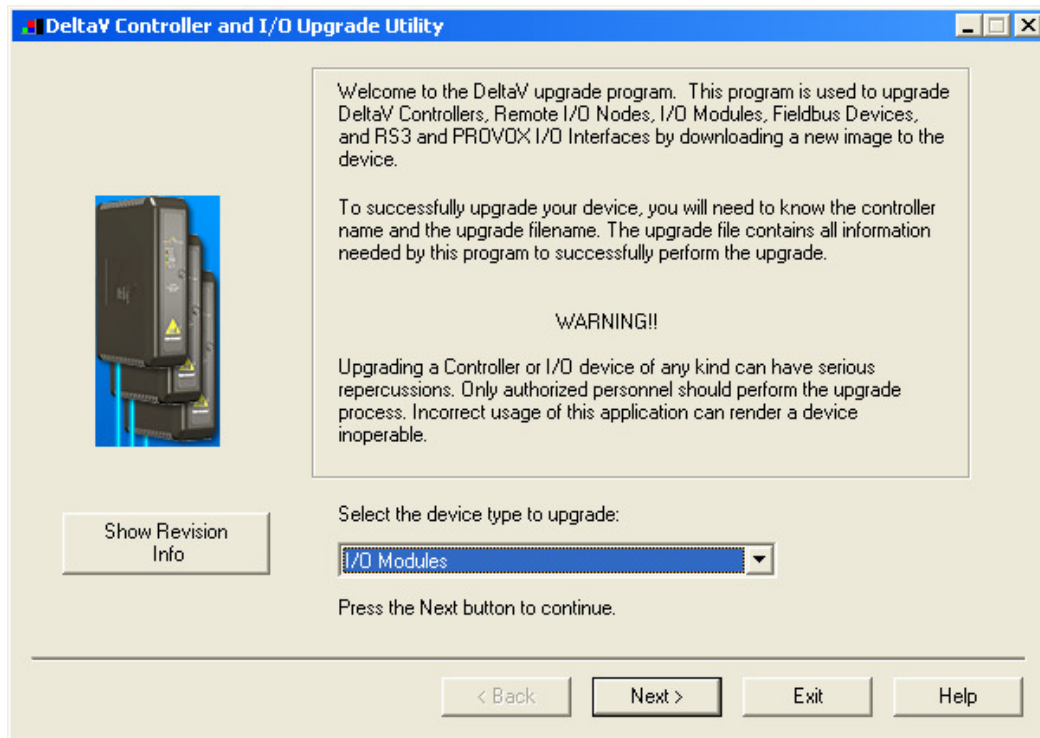
After copy completion, you are ready to program (or upgrade) the Programmable Serial Card with the supplied custom driver software. The steps are as follows:

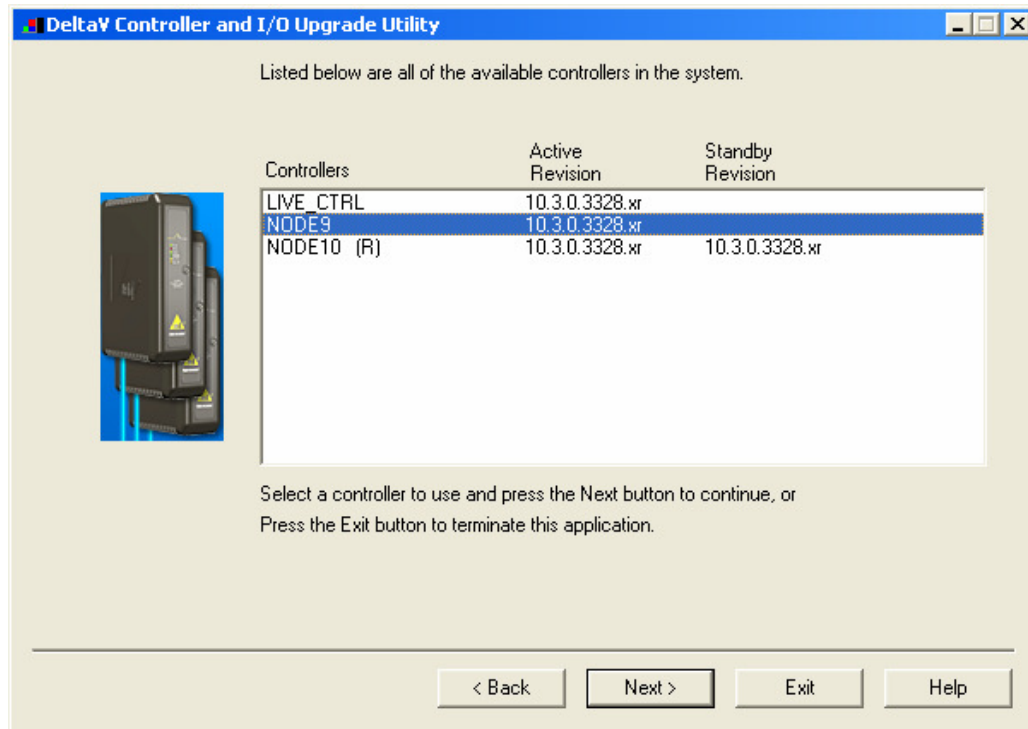


1. Click on the Start button and select DeltaV-> Installation-> Controller Upgrade Utility as shown below, and the following dialog will appear:



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

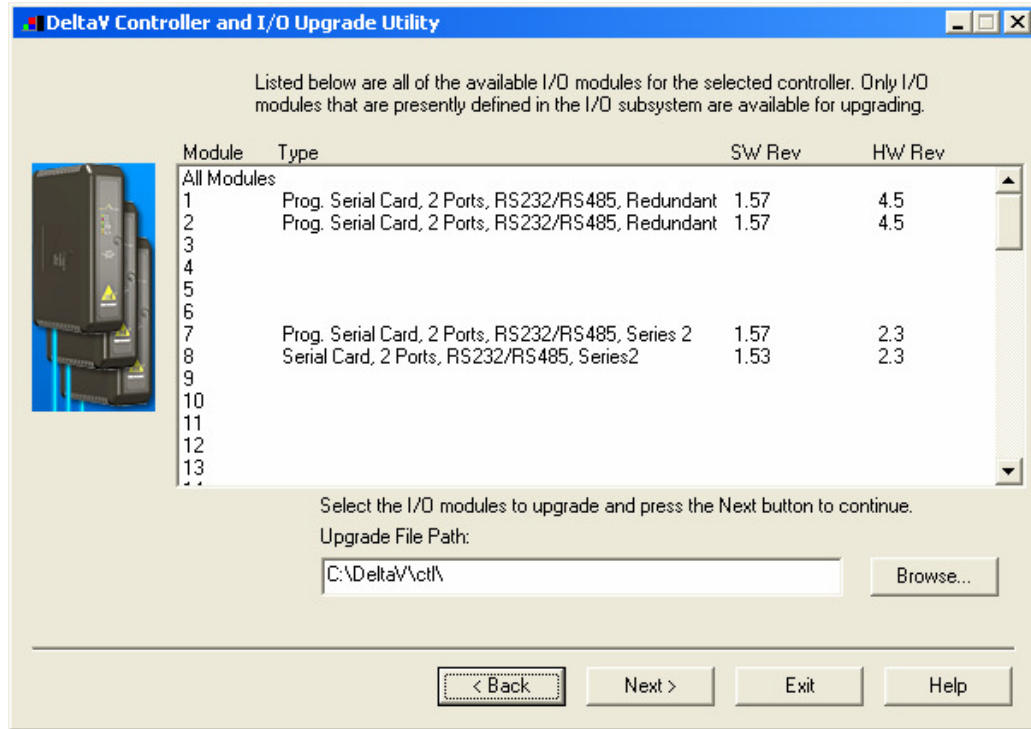




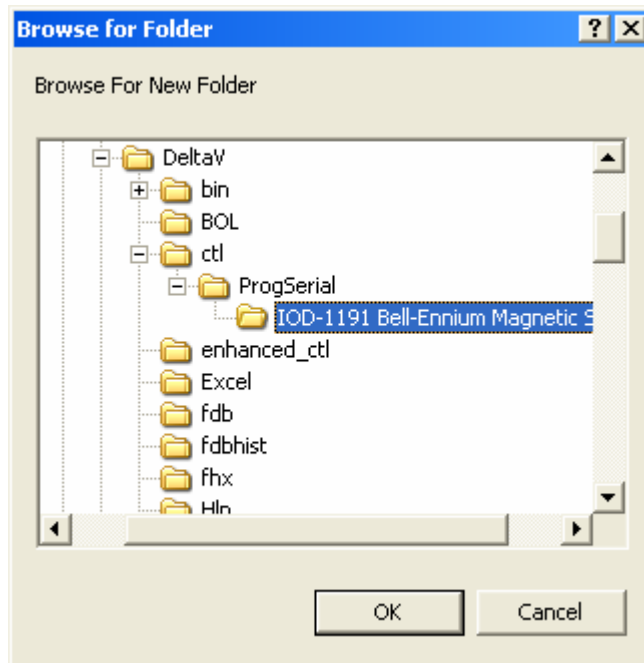
3. The above dialog will appear, listing all the available Controllers in your network. From this dialog, select the appropriate Controller and then Click Next.

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 Bellco 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.

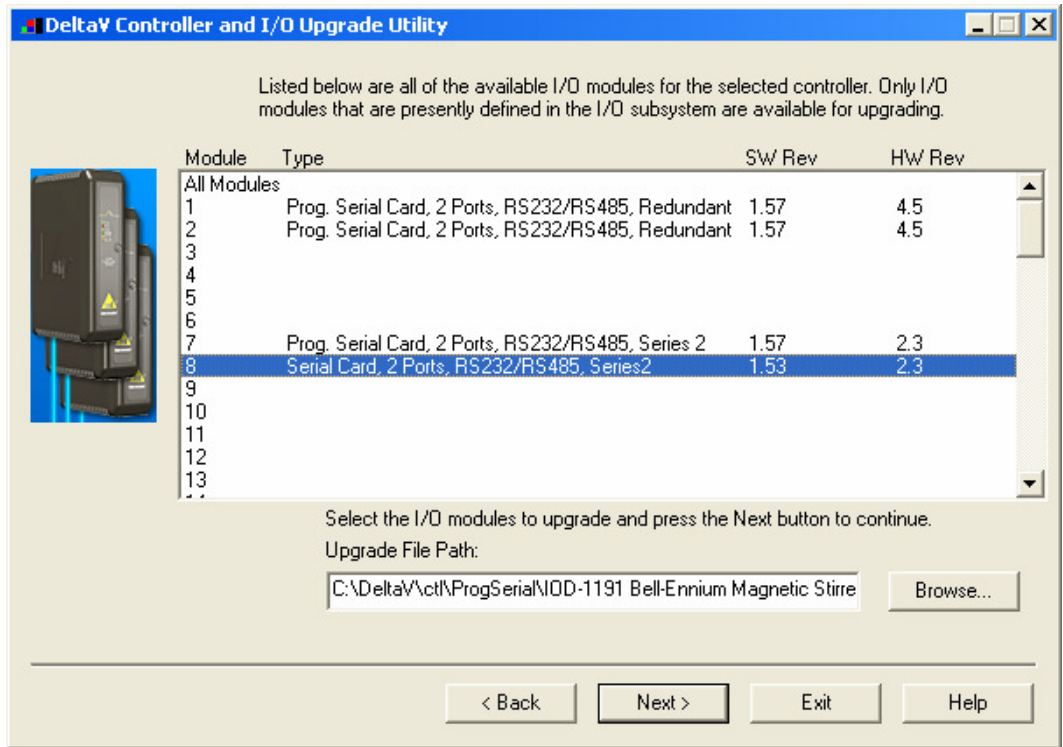


5. Click the Browse button and select the DeltaV path as shown below, and then click Ok. Note that the disk drive could be C or D.



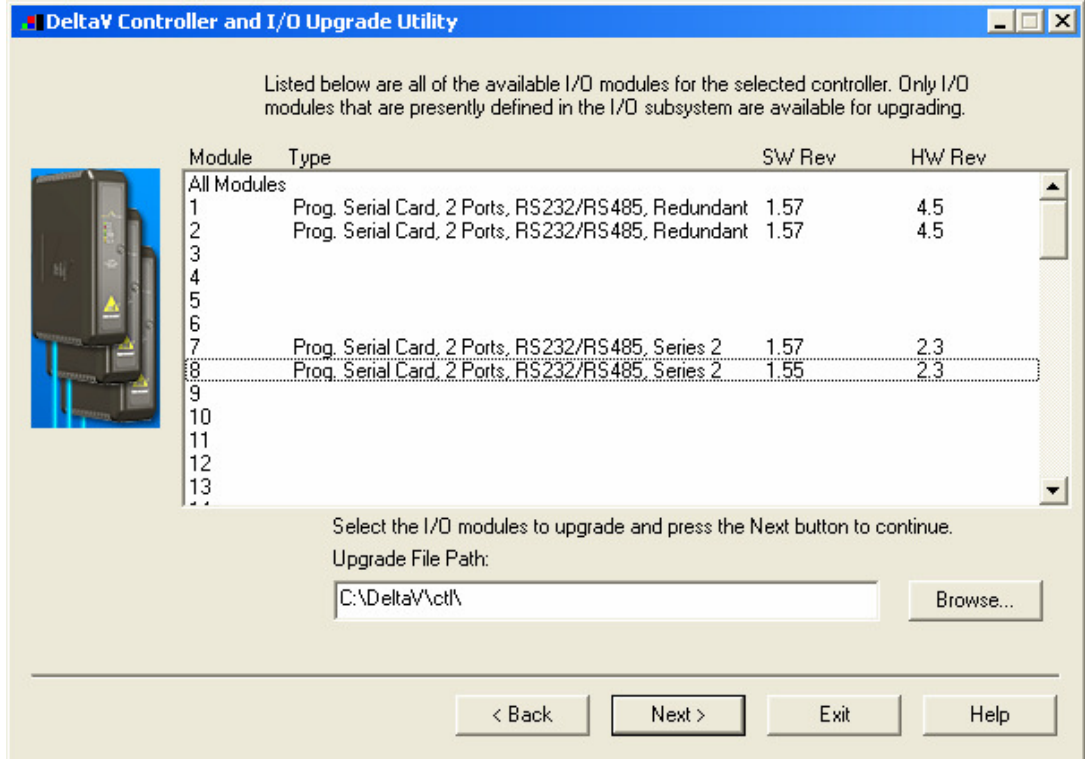


6. Select the I/O module again as shown below and then click Next. Go to Step 9.





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.



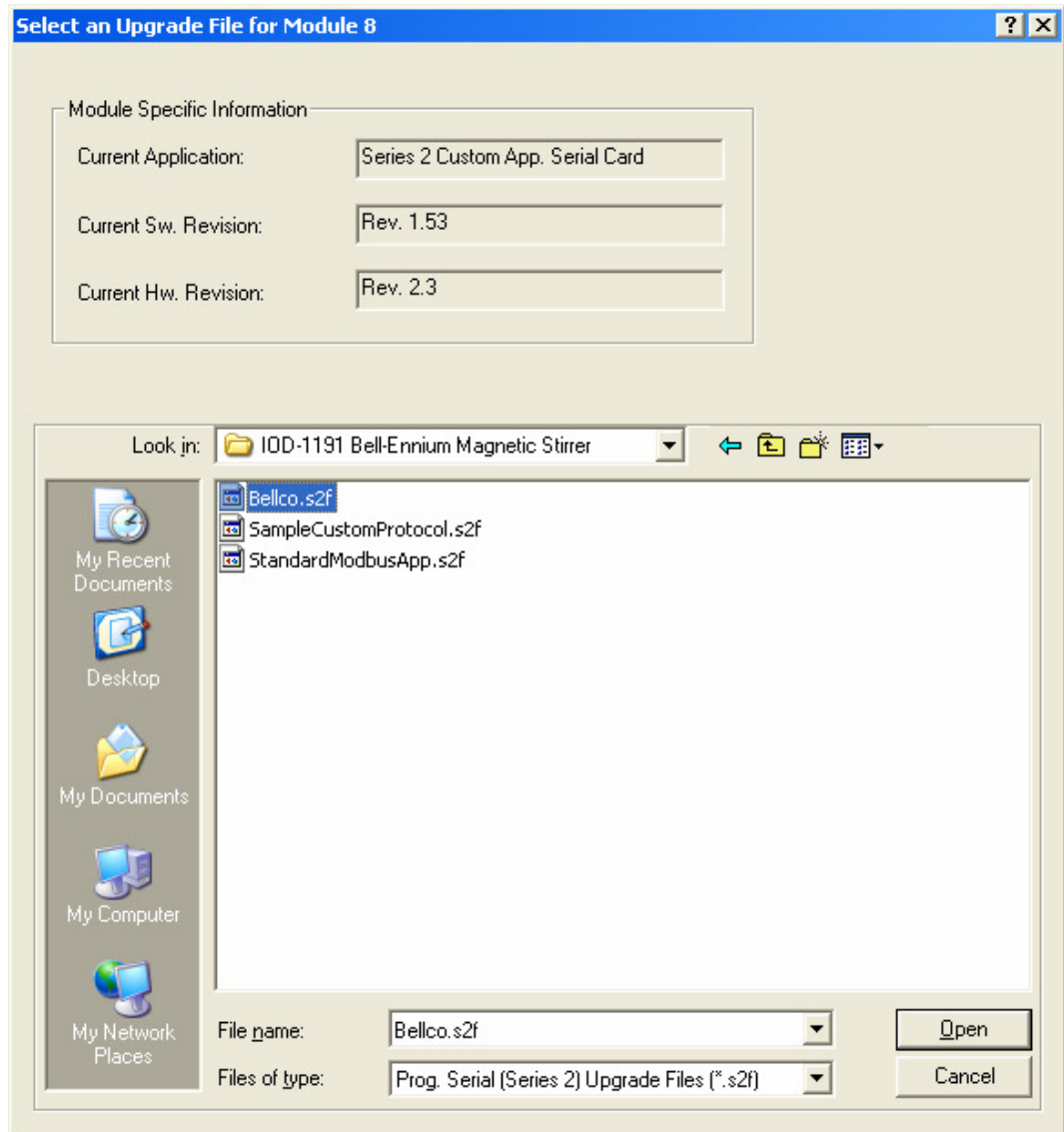
For example, we will select I/O Module 8. This will give you a dialog, from which you will select the file path to where the driver software is located. This path will be:

\\DeltaVctl\ProgSerial\IOD-1191 Bell-Ennium Magnetic Stirrer

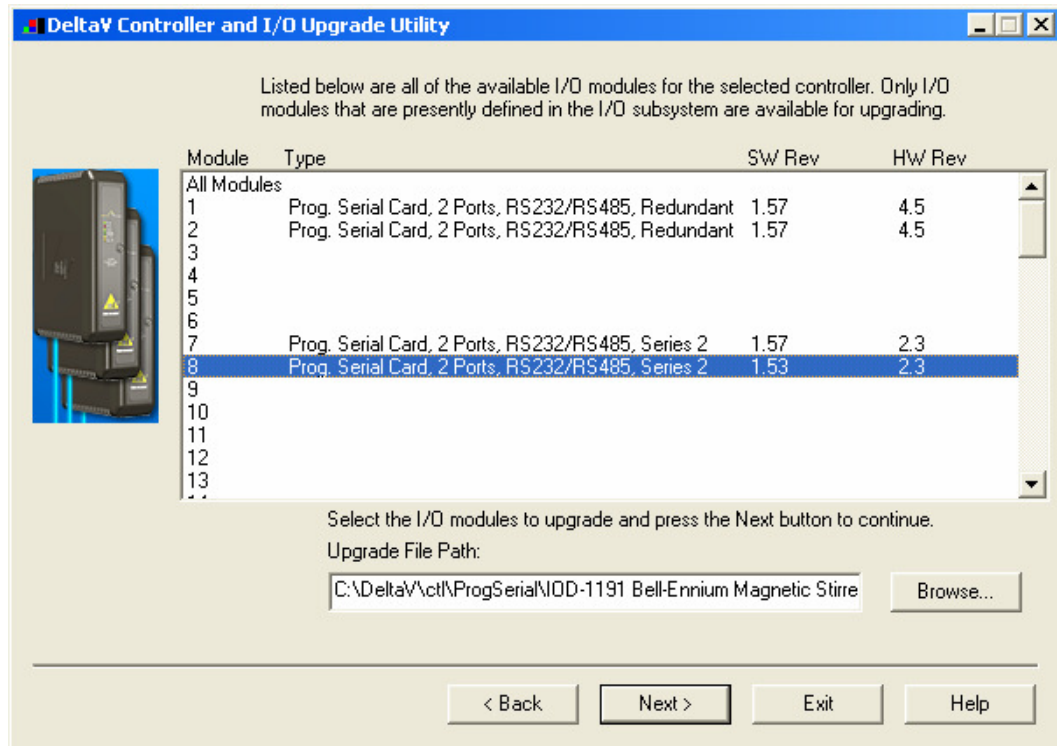
Once you are in the specified directory, you will need to select the following file:

Bellco.S2F

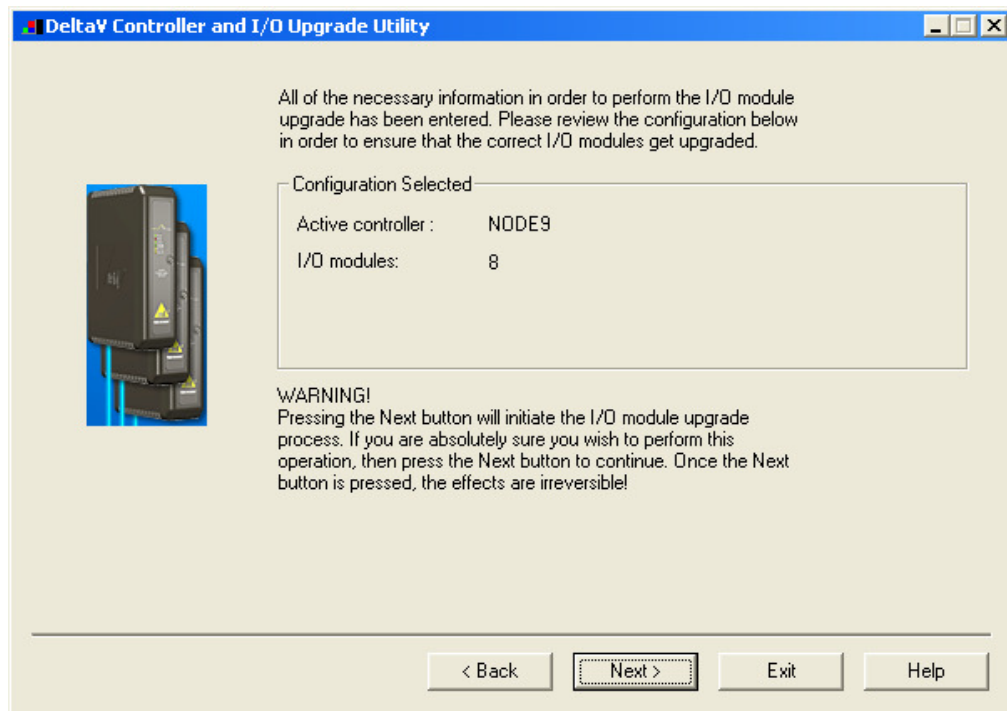
This is shown in the following dialog.



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

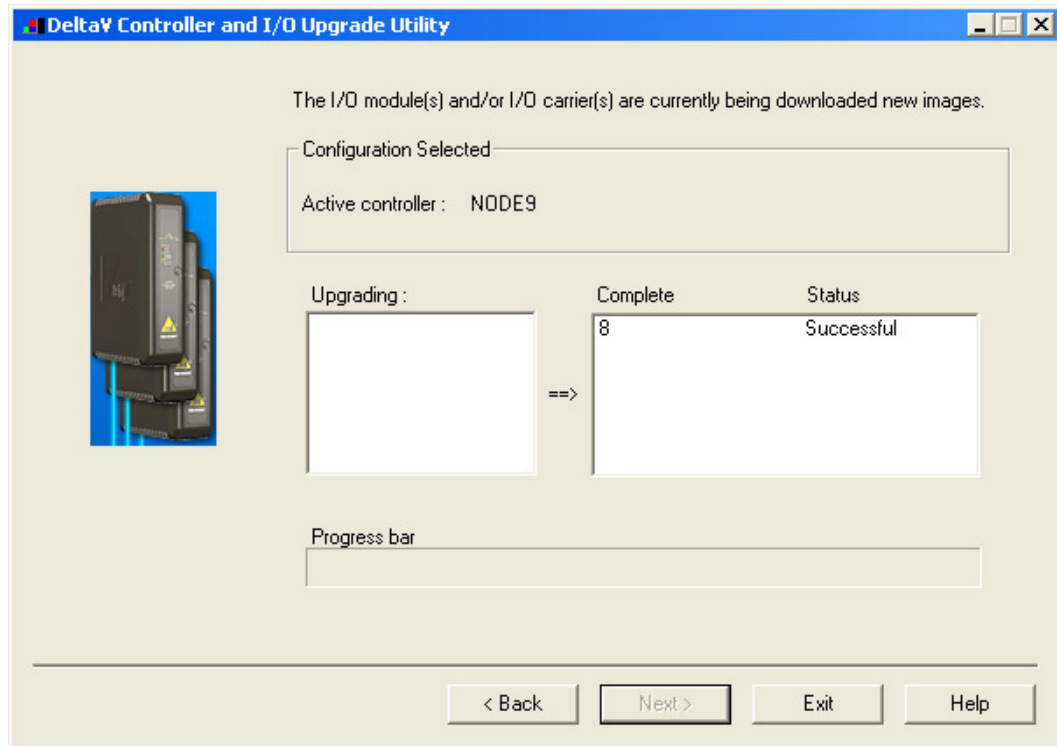


9. In this dialog, Click Next again. You will get the following dialog, confirming the Controller and I/O Module to program.





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



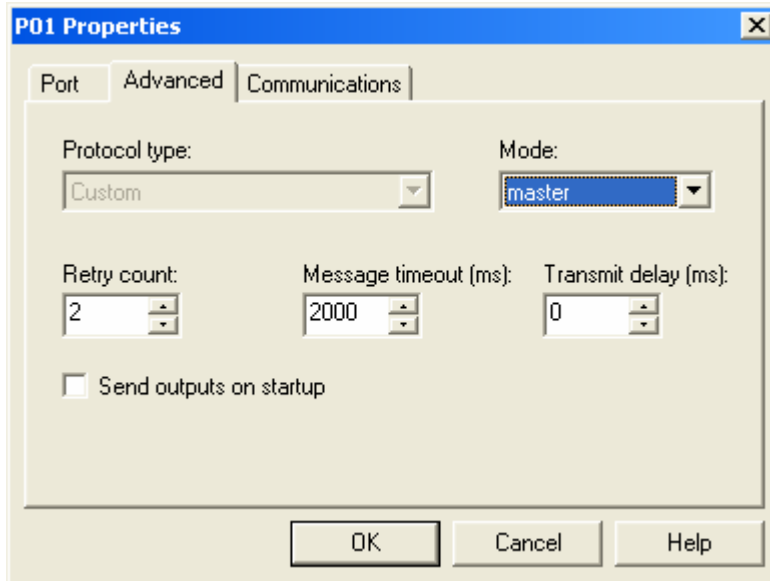
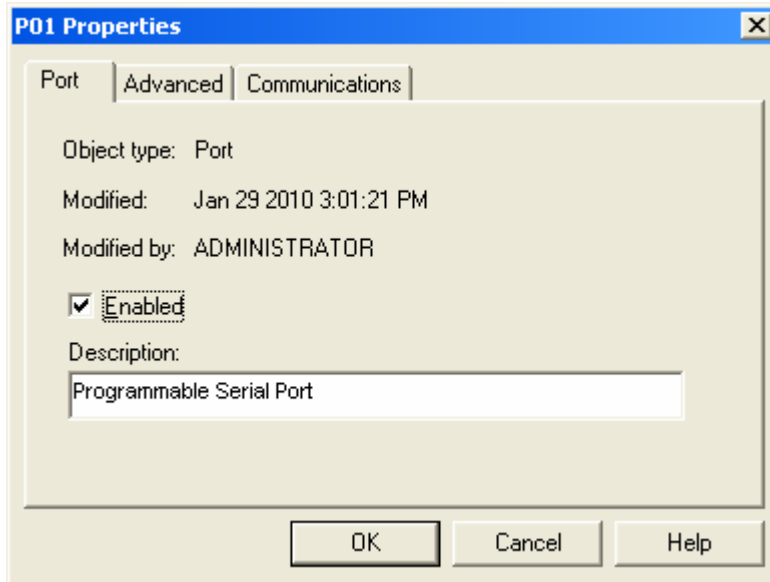
11. This completes the I/O Module upgrade process.

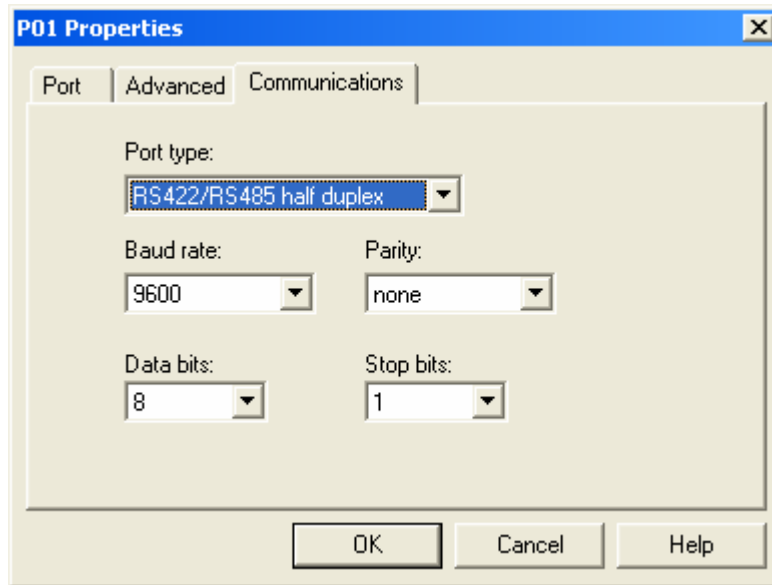


4 CONFIGURATION INFORMATION

4.1 Port Configuration

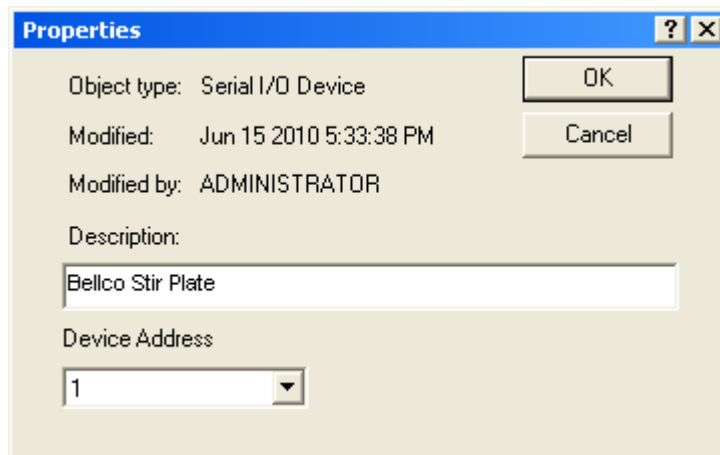
First, enable the port. Then click on the Advanced Tab and select Master. Next, click on the Communications Tab and specify the Port type. The Port type will be RS-422/485 Half Duplex (2 wire). Lastly, select the Baud rate, Parity, Data bits and Stop bits parameters; these must match the Bellco Stir Plate configuration. The following screen shots show the configuration:





4.2 Device Configuration

Specify a device corresponding to each connected Bellco Stir Plate. The device address must match the Stir Plate unit Id. A maximum of 16 Stir Plates may be configured under a single PSIC port.





4.3.1 Dataset Configuration:

Configure the dataset as follows:

Direction	Output with Readback; Output Mode is 0.
DeltaV Data Type	16-bit UINT w/status
Device Data Type	0
Start Address	0
Number of Values	11
Special Data 1	0
Special Data 2	0
Special Data 3	0
Special Data 4	0
Special Data 5	0

The data values read from the Stir Plate are stored in this dataset as follows:

Register Number	Value
R1	PV
R2	SP
R3	Status – most significant 16 bits (see below)
R4	Status – least significant 16 bits
R5	End code – received from Stir Plate (see below)
R6	Response code – received from Stir Plate (see below)
R7-R9	Unused
R10	Command code (see below)
R11	Command status



4.3.2 Stir Plate Status:

The Stir Plate returns a 32-bit status, comprising a bit map of its internal state. The bits are as follows:

Least Significant 16-Bits

Bit position	Description
1	Heater overcurrent (CT1)
2	Heater current hold (CT1)
3	A/D converter error
4	HS Alarm (CT1)
5	Always 0
6	Display range exceeded
7	Input error
8	Always 0
9	Control output (heating)
10	Control output (cooling)
11	HB (heater burnout) alarm (CT1)
12	HB (heater burnout) alarm (CT2)
13	Alarm 1
14	Alarm 2
15	Alarm 3
16	Program end output

Most Significant 16-Bits

Bit position	Description
1	Event Input 1
2	Event Input 2
3	Event Input 3
4	Event Input 4
5	Write Mode
6	EEPROM
7	Setup area
8	AT execute cancel
9	RUN/STOP
10	Communications writing
11	Auto/Manual switch
12	Program start
13	Heater overcurrent (CT2)
14	Heater current hold (CT2)
15	Always 0
16	HS alarm (CT2)



4.3.3 End and Response Codes:

The Stir Plate returns error codes in response to read and write messages, indicating any abnormal situation. In general, receipt of any error codes is not expected.

These End Codes are as follows:

0	Normal Completion
15	FINS – Command Error. The command could not be executed.
16	Parity Error
17	Framing Error
18	Overrun Error
19	BCC Error
20	Format Error – The command is formatted incorrectly or has invalid characters
22	Sub-address Error – illegal or unsupported sub-address
24	Frame length Error

These Response Codes are as follows:

0	Normal Completion
4097	Command is too long.
4098	Command is too short.
4353	Area type error, ie, variable type is wrong
4355	Read start address is out of range
8707	EEPROM error

4.3.4 User Command Codes:

The driver supports sending the following commands to the Stir Plate. In DeltaV Control Modules, Commands may be written only to register 10. Writes to all other registers are ignored. On command completion, register 10 is cleared, and 100 plus the command code is written to register 11. This indicates that the driver is ready for the next command.


The valid command codes are as follows:

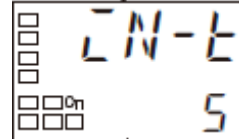
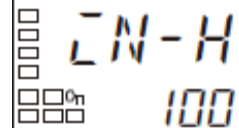
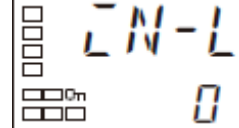
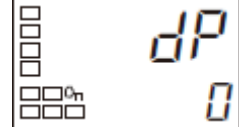
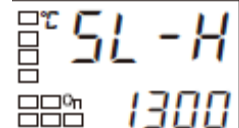
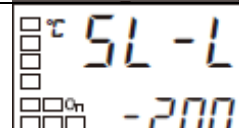
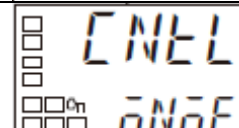
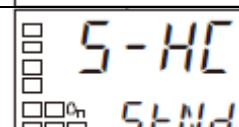
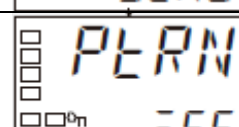
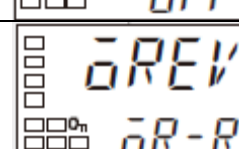
1	Disable Communication writing
2	Enable Communication writing
3	Send RUN to the Stir Plate motor
4	Send STOP to the Stir Plate motor



4.3.5 Stir Plate Configuration:

The following Stir Plate configuration parameters should be selected via the front panel:

Menu when  pressed for 3+ Seconds from main screen

Parameter Symbol	Parameter Name	Value
	Input Type	2
	Scaling Upper Limit	500
	Scaling Lower Limit	0
	Decimal Point	0
	SP Upper Limit	500
	SP Lower Limit	0
	PID ON/OFF	oNoF
	Standard or Heating/Cooling	SeNd
	Program Pattern	CoNe
	Direct/Reverse Operation	oR-R



Menu when pressed for <3 Seconds from previous screen

Parameter Symbol	Parameter Name	Value
	Protocol Setting	CWF
	Communications Unit Number	2
	Communications Baud Rate	9.6
	Communications Data Length	8
	Communications Stop Bits	1
	Communications Parity	NoNE
	Send Data Wait Time	20

*Hold to reboot and return to main screen



Menu when and are pressed for 3+ seconds from main screen

Parameter Symbol	Parameter Name	Value
	Operation/Adjustment Protect	0
	Communications Protect	1
	Setting Change Protect	oFF
	Password Setting	0

*Hold and to go back to main screen



Menu when is pressed for <3 seconds from main screen

Parameter Symbol	Parameter Name	Value
	Communications Writing	oN
	Hysteresis (heating)	0.10
	Soak Time	1
	Wait Band	oFF
	SP Ramp Set Value	1000



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 Stir Plate 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.



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- 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.

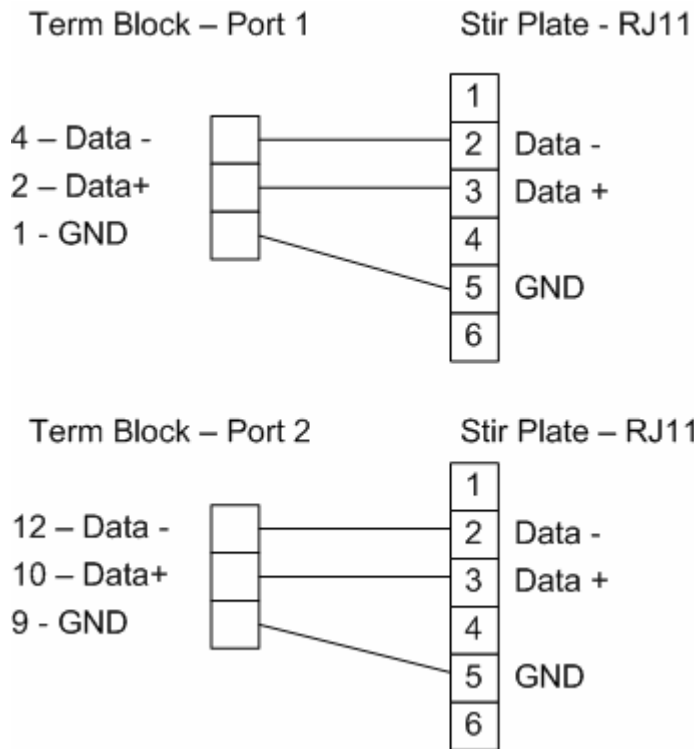


6 Connecting DeltaV PSIC to the Stir Plate

The electrical interface between DeltaV and the Stir Plate conforms to the RS-422/485 standards. The Stir Plate uses a RJ-11 connector with the following pinout.

Pin Number	Color	Description
1	White	Unused
2	Black	Data -
3	Red	Data +
4	Green	Unused
5	Yellow	Gnd
6	Blue	Unused

The following diagram shows the cable connected to the DeltaV PSIC.





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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

Thank you for using DeltaV.