



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

**Sartorius Weigh Scale Driver for DeltaV  
Programmable Serial Interface Card  
Series 2**

**USER MANUAL**

**Rev. P1.57**

**August 2011**

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# **1 INTRODUCTION**

## **1.1 Scope**

This document is the User Manual for the Sartorius serial communication driver firmware for the Emerson DeltaV Control System; it provides information required to install, configure, and maintain the Sartorius 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 Sartorius Equipment. Specific equipment supported is Sartorius scales which communicate using the ASCII SBI and Binary xBPI interface protocols.

The section *Document Format* briefly describes the contents of each section of this manual. *System Specifications* outlines hardware and software requirements for the Sartorius Driver (P1.57) 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 Sartorius Driver.
<b>Downloading Firmware</b>	Describes downloading procedures for the Sartorius Driver firmware on to the DeltaV PSIC.
<b>PSIC Configuration</b>	Describes procedures and guidelines for configuring the DeltaV PSIC.
<b>Driver Communications</b>	Describes Sartorius commands used and DeltaV Registers containing Weight data.
<b>Operational Check</b>	Provides tips and assistance to ensure PSIC is properly setup and configured.
<b>DeltaV - Sartorius Electrical Interface</b>	Describes the electrical interface between DeltaV and the Sartorius Equipment. 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 Sartorius Driver:

**Table 1: System Specifications**

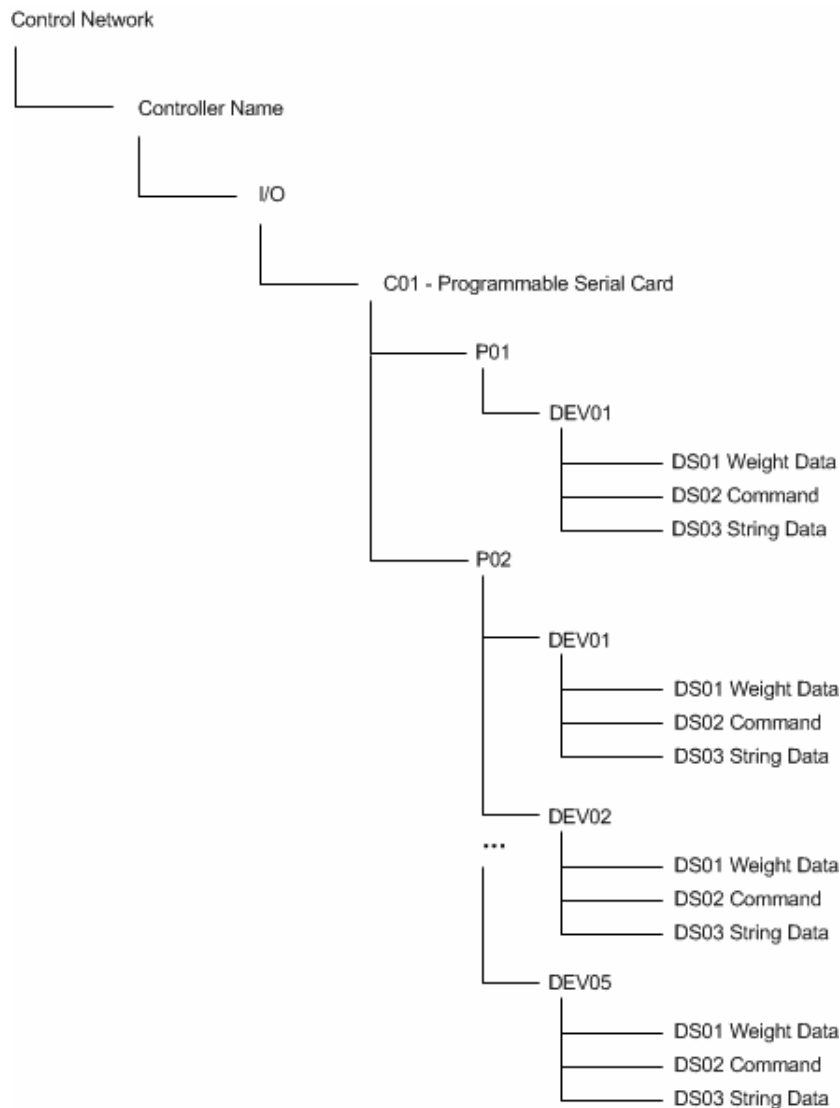
<b>Firmware</b>	Sartorius Driver Firmware (P1.57)
<b>Protocol Compatibility</b>	Sartorius Protocol as defined in the document listed below: <ol style="list-style-type: none"> <li>1. Sartorius Description of Protocols and Functions in the Weighing Platform; and</li> <li>2. Sartorius Description of the Protocols and Functions of the xBPI Interface for the isi Industrial Terminal.</li> </ol>
<b>Software Requirements</b>	DeltaV System Software (Release 6.3 or later) installed on a hardware-appropriate Windows NT workstation configured as a ProPlus for DeltaV Serial Interface Port License (VE4102) if required.
<b>Minimum Hardware Requirements</b>	FRSI DeltaV Serial Interface Series 2, Hardware PN: 12P2506X022 FRSI DeltaV M3, M5, MD/MDPlus or MX Controller, Power Supply and 2 wide controller carrier FRSI 8 wide I/O card carrier Sartorius devices



## 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 Sartorius protocol before operation. This driver functions only in Master mode and supports both the SBI and the xBPI protocols. Configure RS-232 or RS-422/485 communication settings appropriately to ensure accurate communication between the PSIC and Sartorius devices. In general, the SBI interface uses RS-232, while the xBPI interface uses RS485.

When using the SBI interface, only one scale may be connected to the PSIC port. Multi-dropped scales using RS-485 are supported only under the xBPI interface. Both interfaces are available under both PSIC ports. The following architecture illustrates the connectivity with SBI under Port 1 and xBPI under Port 2.





The driver will provide the following Master Mode commands:

**SBI Commands:**

P	Print Scale Data. The scale will respond by sending the current scale data. The response message will be parsed, validated, and the data will be written into the PSIC dataset.
T	Zero/Tare Scale. The Tare command will be sent to the scale.

**xBPI Commands:**

Read Net Weight	Read measured value – Net
Read Gross Weight	Read Measured value – Gross
Read Tare Weight	Read Measured value – Tare
Tare Scale	Initiate the Tare function
Zero Scale	Initiate the Zero function
Tare and Zero	Initiate combination Tare and Zero functions
Read Scale Status	Read scale status
Read Scale Model ID	Read scale Model ID
Read Scale Serial Number	Read scale serial number
Read User ID	Read scale user ID
Read Scale Manufacturer	Read scale Manufacturer

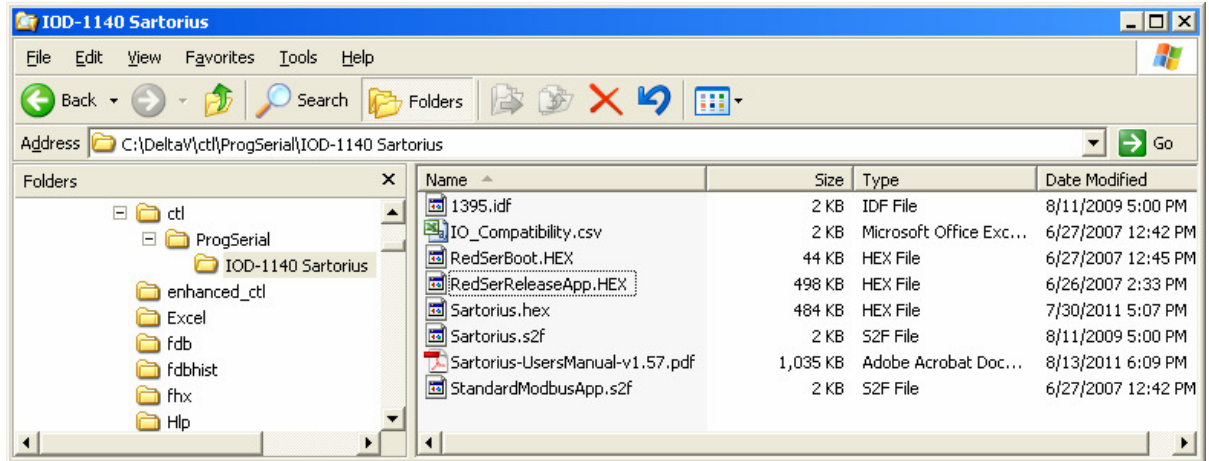


### 3 Downloading the firmware

The driver software comprises 8 files. These files must be copied to the DeltaV directory (you must create the directory first) on your ProPlus Workstation. The path is:

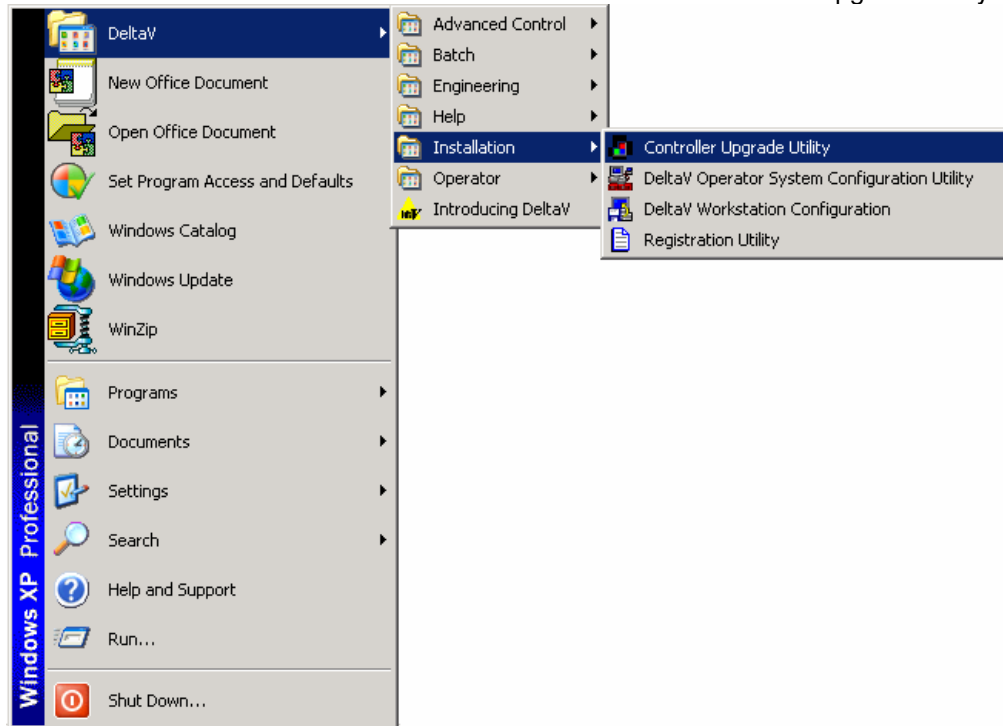
**\\DeltaV\ctl\ProgSerial\IOD-1140 Sartorius**

The following shows a completed copy operation:

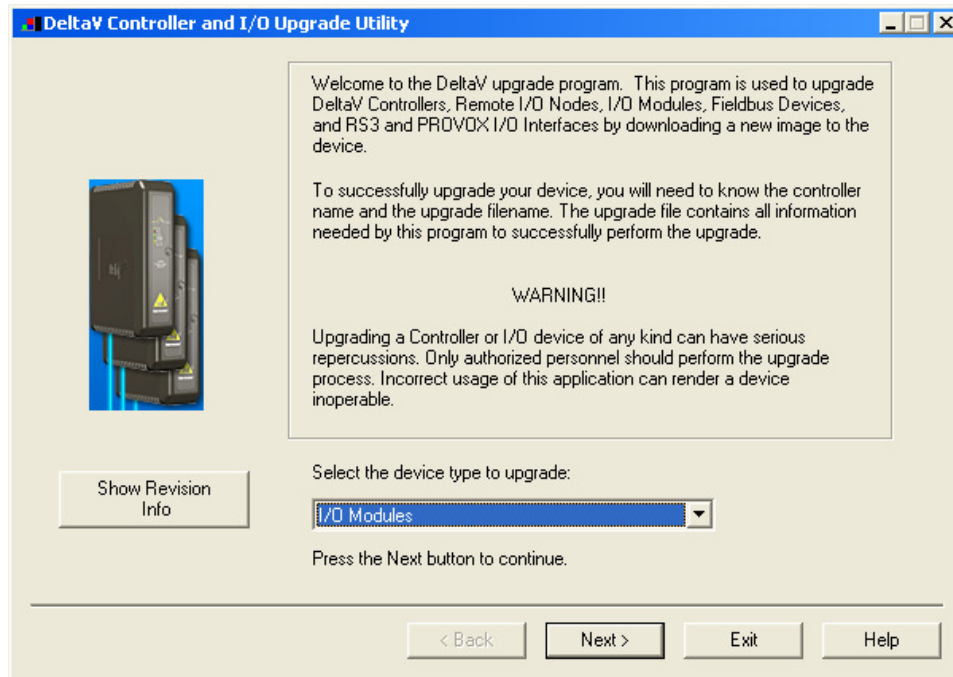


After copy completion, you are ready to program (or upgrade) the Programmable Serial Card with the supplied custom driver software. The steps are as follows:

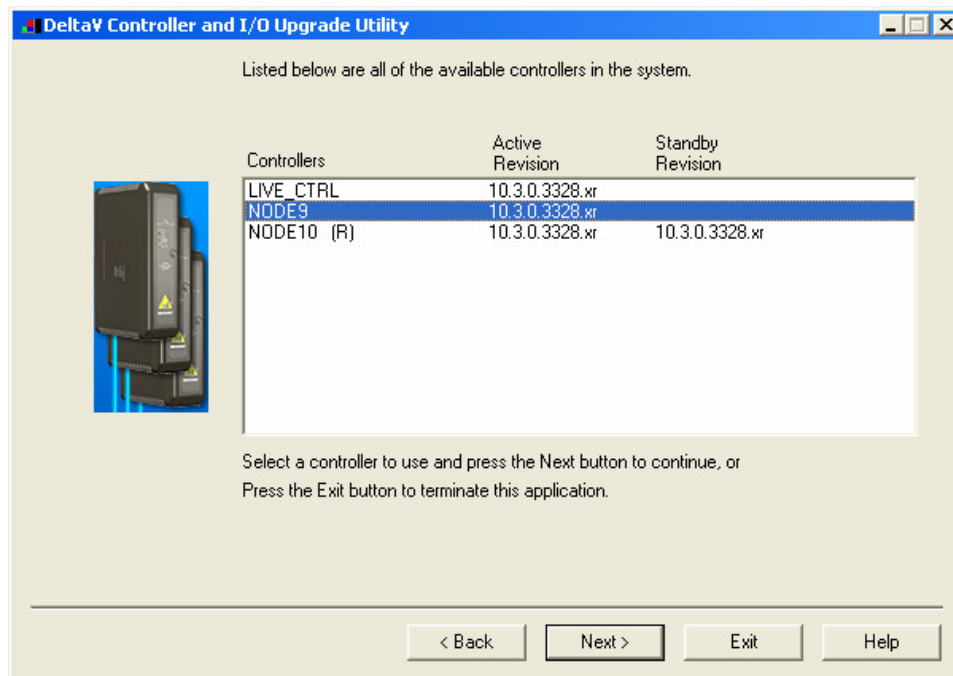
1. Click on the Start button and select DeltaV-> Installation ->Controller Upgrade Utility.



The following dialog will appear:



Choose Upgrade I/O Modules from the drop down menu as shown, and click Next.

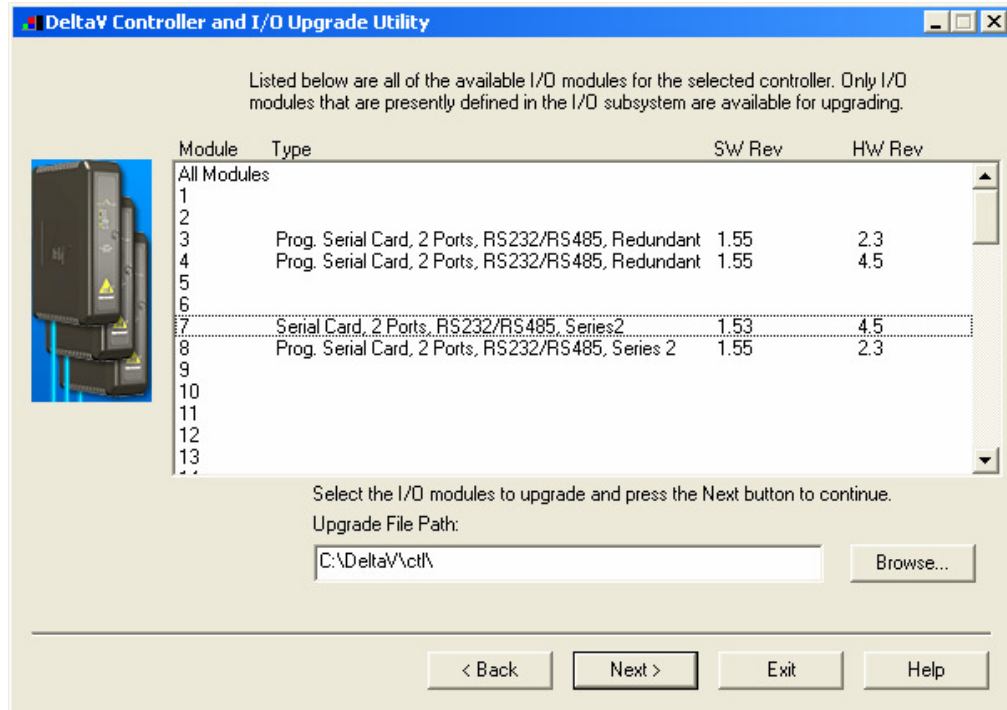


The above dialog will appear, listing all the available Controllers in your network. From this dialog, select the appropriate Controller and then Click Next

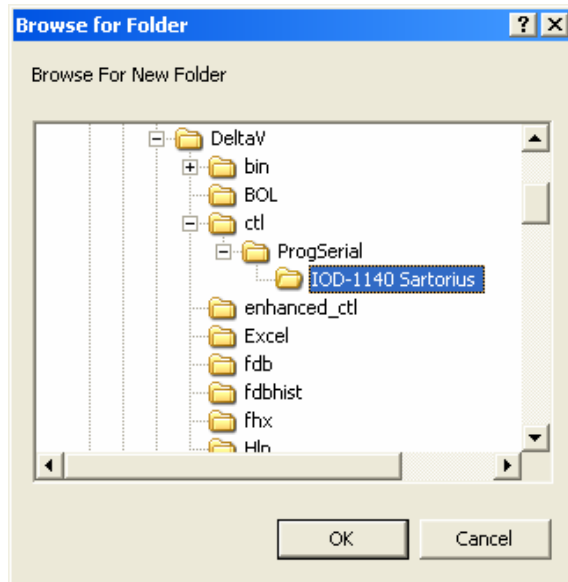
4. The following dialog will appear, listing all the I/O modules in your selected Controller. The shown list of I/O modules is an example only. Your list will be different.



**Note: The first time a standard Serial card is upgraded to the Sartorius 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.**

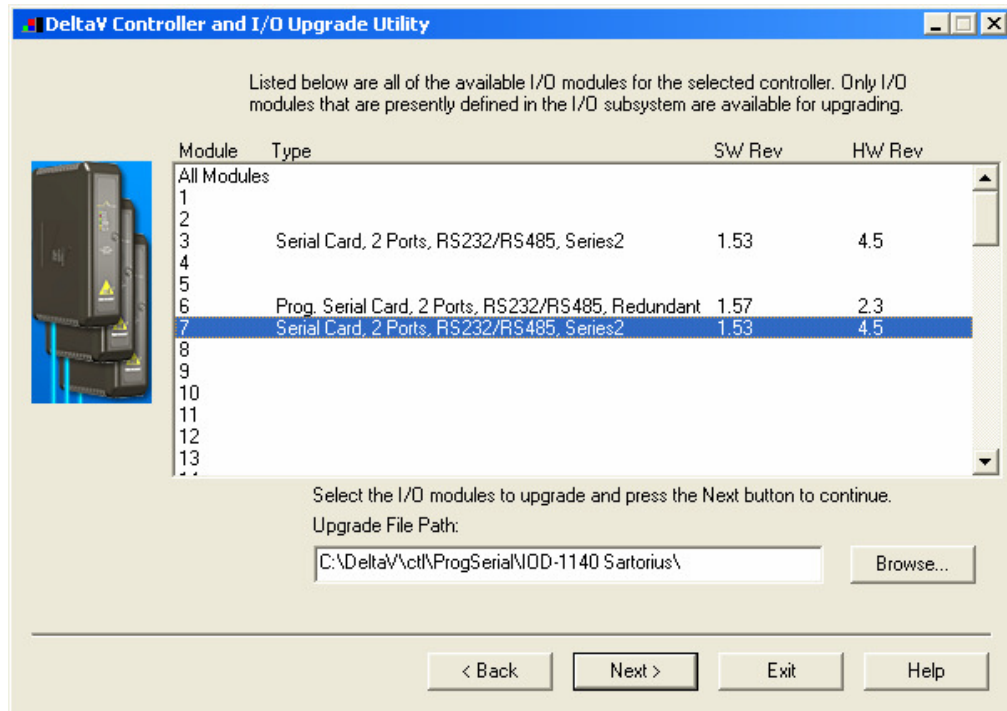


5. Click the Browse button and select the DeltaV path as shown below, and then click Ok. Note that the disk drive could be C or D.

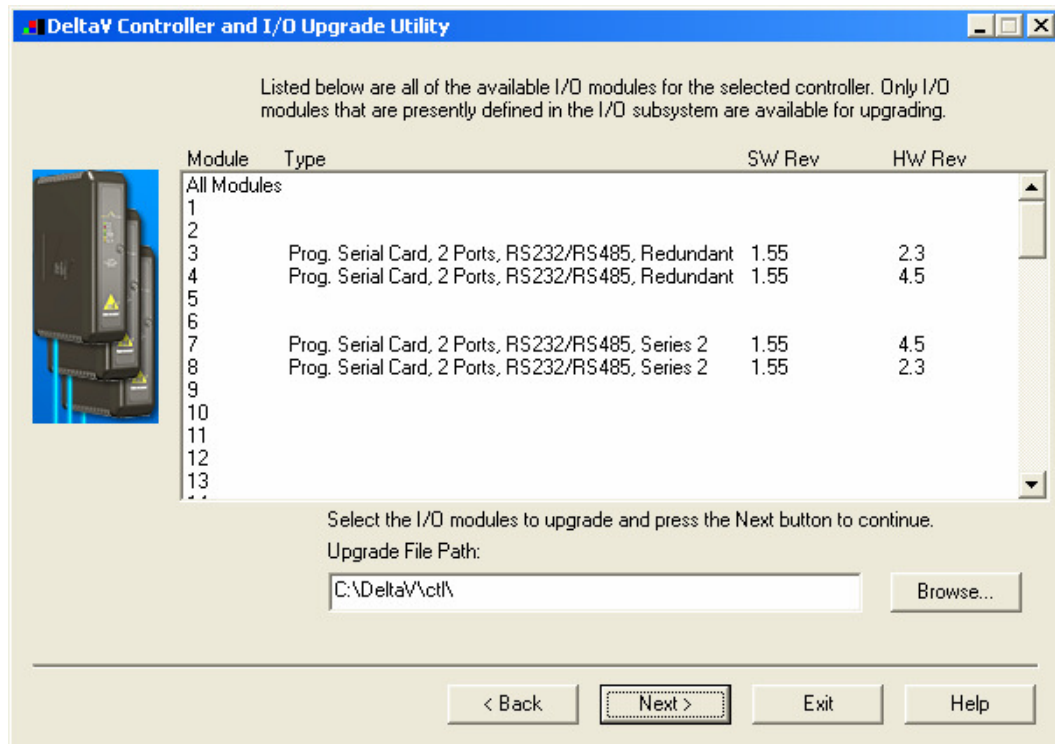


6. Select the I/O module again as shown below and then click Next. Go to Step 9.





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.



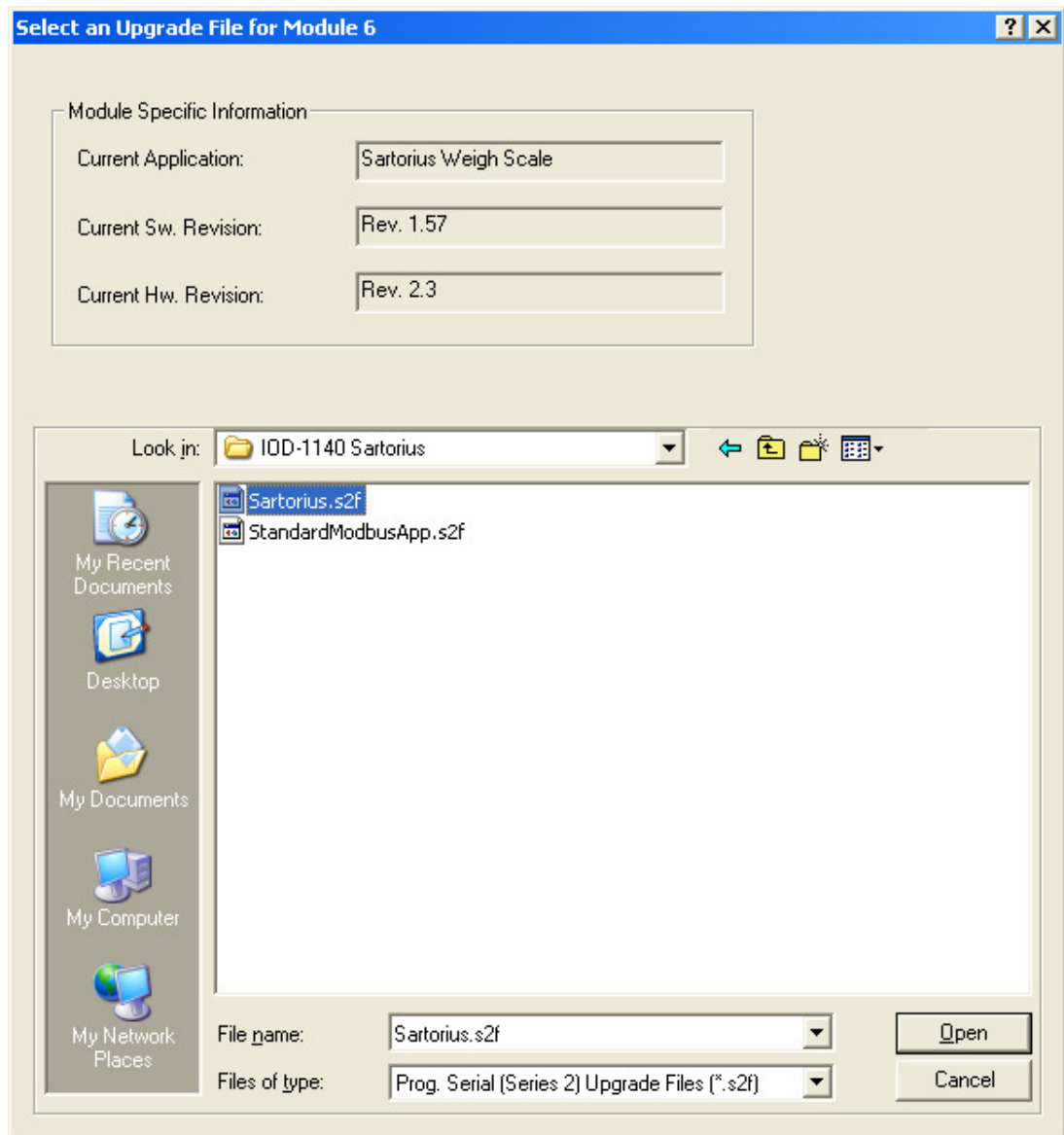


From this dialog, select the Programmable Serial Card I/O Module in the list. For example, we will select I/O Module 1. This will give you the following dialog, from which you will select the file path to where the driver software is located. This will be:

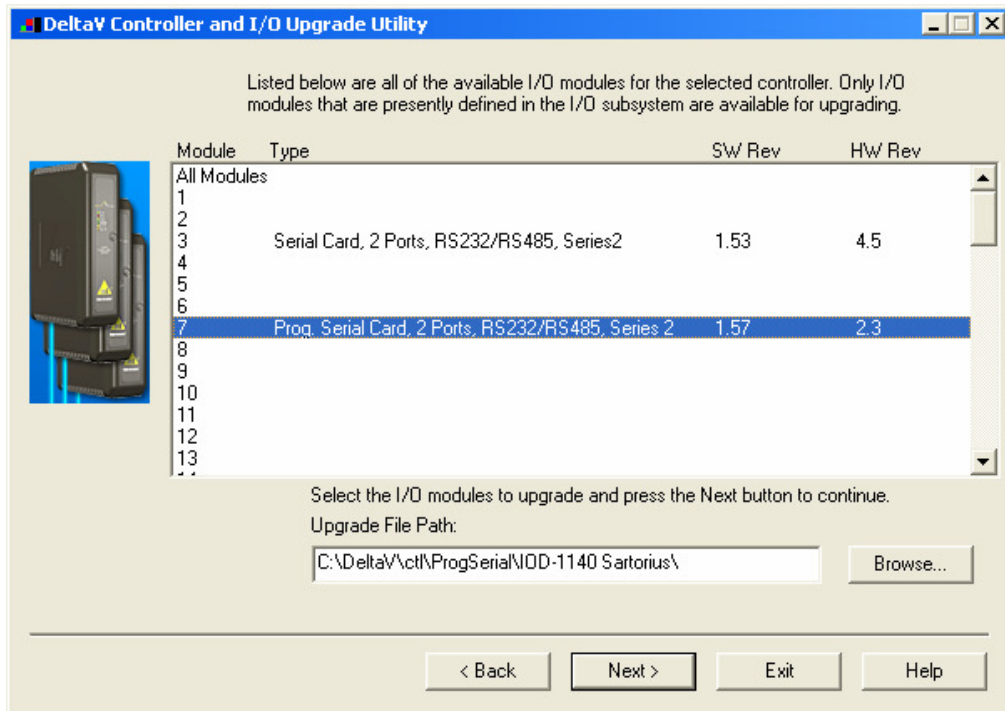
**\Delta\ctl\ProgSerial\IOD-1140 Sartorius**

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

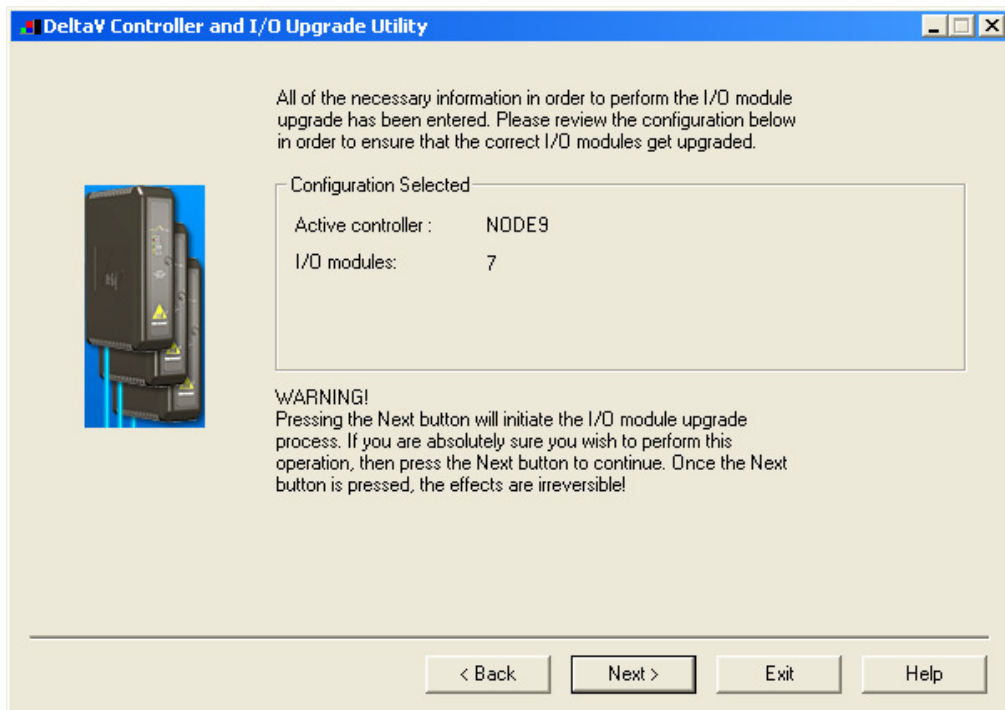
**Sartorius.s2f**



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

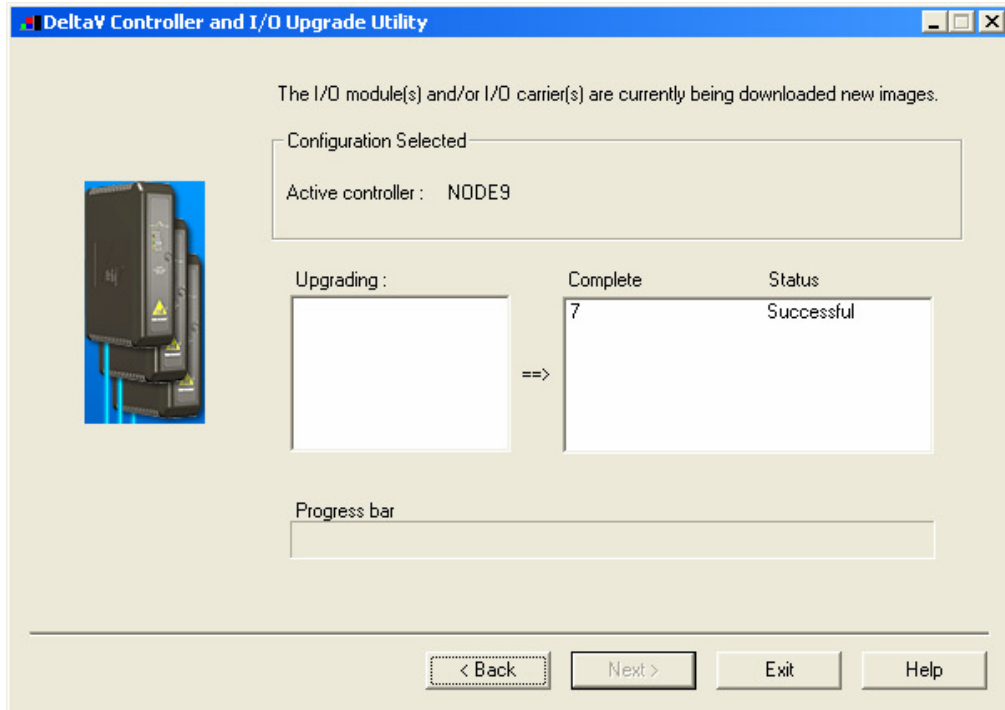


9. In this dialog, Click the serial card and click Next again. You will get the following dialog, confirming the Controller and I/O Module to program.





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 Sartorius device to obtain proper communication.

### 4.1 Dataset Configuration

#### 4.1.1 SBI Interface

Three PSIC datasets will be allocated for each connected Sartorius Weigh Scale. Since the Sartorius communicates using RS-232, and unique scale addressing is not available, consequently, only one scale will be connected to a PSIC port. Thirteen datasets in the port will remain unused.

The first dataset will be configured as Floating Point with Status. Only register one of this dataset is used to store the current weigh scale data. Configure the dataset with the following parameters:

<b>Data Direction</b>	Input
<b>DeltaV Data Type</b>	Floating Point with Status
<b>Device Data Type</b>	0
<b>Data Start Address</b>	0
<b>Number of values</b>	1
<b>Special Data values</b>	0,0,0,0,0

Dataset data will be as follows:

Register	Dataset 1 – Floating Point with Status	Description
1	Scale data	Data format XXXXX.X

The second dataset will be configured as 16-bit integer with status. Only 6 registers of this dataset are used. Configure the dataset as follows:

<b>Data Direction</b>	Output with Readback
<b>DeltaV Data Type</b>	16-bit UINT with Status
<b>Device Data Type</b>	1
<b>Data Start Address</b>	0
<b>Number of values</b>	6
<b>Special Data values</b>	0,0,0,0,0



Dataset registers will be used as follows:

Register	Dataset 2 – 16-bit Integer with Status	Description
1	Units	=1 Grams (g) =2 Kilograms (kg) =20 Percent (%) =21 Pieces Count (pcs)
2	In Command	=6 – Print =9 – Tare
3	New Command	=0 No New Command =1 New Command to Execute
4	Command Executed	=1 Command Executed =0 Command in progress
5	Error Code	3 digit error code
6	Special Code	=1 Weight =2 Overload (H) =3 Overload during weight checking (HH) =4 Underload (L) =5 Underload during weight checking (LL) =6 Calibration/Adjustment (C)

The third dataset will be configured as string with status. Configure the dataset as follows:

<b>Data Direction</b>	Input
<b>DeltaV Data Type</b>	String with Status
<b>Device Data Type</b>	0
<b>Data Start Address</b>	0
<b>Number of values</b>	100
<b>Special Data values</b>	0,0,0,0,0

This dataset will contain the error message string received from the scale, if any:

**SBI - Reading from Sartorius**

DeltaV Control Modules are used to initiate Read commands to the Sartorius scale. The driver will perform the following steps:

1. User writes command number to dataset 2, register 2.
2. User writes a 1 to dataset 2, register 3. This indicates that a new command is ready to be sent.
3. The driver will write a 0 to dataset 2, registers 3 and 4, and send the command to the scale.
4. Upon receiving a good response, the driver will write a 1 to dataset 2, register 4.
5. The driver will parse the received scale data and write it to dataset 1, register 1. Any special codes received will be written to dataset 2, register 6.
6. If the response received has an error code, it will be parsed and written to dataset 2, register 5. The error string is also written to dataset 3.
7. The driver then updates the DeltaV Controller and returns to wait for user command.



**4.1.2 xBPI Interface**

Three PSIC datasets will be allocated for each connected Sartorius Weigh Scale. A maximum of 5 scales may be multi-dropped on a Port when using RS-485. A unique scale address will be assigned to the scale and to each Device configured under the PSIC port. The scale address must be in the range 1-31.

The first dataset in each device will be configured as Floating Point with Status. Configure the dataset with the following parameters:

<b>Data Direction</b>	Input
<b>DeltaV Data Type</b>	Floating Point with Status
<b>Device Data Type</b>	0
<b>Data Start Address</b>	0
<b>Number of values</b>	10
<b>Special Data values</b>	0,0,0,0,0

Dataset data will be as follows:

<b>Register</b>	<b>Dataset 1 – Floating Point with Status</b>
1	Net Weight
2	Gross Weight
3	Tare Weight
4	Scale Status 1
5	Scale Status 2
6	Scale Status 3
7-10	Reserved

The second dataset will be configured as 16-bit integer with status. Only 6 registers of this dataset are used. Configure the dataset as follows:

<b>Data Direction</b>	Output with Readback
<b>DeltaV Data Type</b>	16-bit UINT with Status
<b>Device Data Type</b>	2
<b>Data Start Address</b>	0
<b>Number of values</b>	100
<b>Special Data Values</b>	X,0,0,0,0  X = 0 if only one scale is configured = 2 if multiple scales are configured



Dataset registers will be used as follows:

Register	Dataset 2 – 16-bit Integer with Status	Description
1	Units	See scale units below
2	In Command	=21 – Read Net Weight =22 – Read Gross Weight =23 – Read Tare Weight =24 – Tare Scale =25 – Zero Scale =26 – Tare and Zero the Scale =27 – Read Scale Status =28 – Read Scale Model ID =29 – Read Scale Serial Number =30 – Read User ID =31 – Read Scale Manufacturer
3	New Command	=0 No New Command =1 New Command to Execute
4	Command Executed	=1 Command Executed =0 Command in progress
5-9	Reserved	
10-18	Scale Status	

Scale weight Units:

Grams	2
Kg	3
Carats	4
Pounds	5
Ounces	6
Troy Ounces	7
HK Taels	8
Singapore Taels	9
Taiwanese Taels	10
Grains	11
Pennyweight	12
Milligrams	13
Parts/Pound	14
Chinese Taels	15
Mommes	16
Austrian Carats	17
Tola	18
Baht	19
Mesghal	20
Tons	21





The third dataset will be configured as string with status. Configure the dataset as follows:

<b>Data Direction</b>	Input
<b>DeltaV Data Type</b>	String with Status
<b>Device Data Type</b>	0
<b>Data Start Address</b>	0
<b>Number of values</b>	100
<b>Special Data Values</b>	0,0,0,0,0

The driver will store the Model ID, Scale Serial Number, User ID and Manufacturer name as the result of the corresponding commands.

**xBPI - Reading from Sartorius**

DeltaV Control Modules are used to initiate Read commands to the Sartorius scale. The driver will perform the following steps:

1. User writes command number to dataset 2, register 2.
2. User writes a 1 to dataset 2, register 3. This indicates that a new command is ready to be sent.
3. The driver will write a 0 to dataset 2, registers 3 and 4, and send the command to the scale.
4. Upon receiving a good response, the driver will write a 1 to dataset 2, register 4
5. The driver will parse the received scale data and write it to dataset 1 registers.
6. The driver then updates the DeltaV Controller and returns to wait for user command.



## **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 Sartorius 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 Sartorius 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 Sartorius 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 Sartorius Weigh Scale and the PSIC. For input data, the values should be changed in the Sartorius 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 Sartorius 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 - Sartorius Electrical Interface

The electrical interface between DeltaV and the Sartorius devices conforms to the RS-232 protocol. The RS-232 cable connecting Sartorius and the DeltaV PSIC should not exceed 50 feet as specified by the EIA standard for RS-232 protocol.

The Sartorius uses a 9-pin D-Shell connector, and a prefabricated cable. This cable must be acquired from Sartorius. One end of the Sartorius Cable is a 9-pin D-shell plug. To connect the DeltaV Serial Card Termination Block to the Scale, fabricate a cable with a 9-pin D-shell socket on one end and open conductors on the other end. The 9-pin socket should have the following pin out.

Pin Number	Description	Term Block Connection
1	No connection	
2	TxD	Connect to screwterm 3 (TxD)
3	RxD	Connect to screwterm 5 (RxD)
4	jumper to pin 6	
5	Gnd	Connect to screwterm 1 (Gnd)
6	jumper to pin 4	
7	jumper to pin 8	
8	jumper to pin 7	
9	No Connection	

On the open end of the cable, only 3 conductors are used. These are RxD, TxD and Gnd. Screw down these conductors to the terminal block as indicated below. Lastly, install a jumper between 7 and 8 for port 1, and 15 and 16 for port 2.

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)



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## **7 Technical Support**

For technical support or to report a defect, please give MYNAH Technologies a call at (636) 728-2000. If a defect is discovered, please document it in as much detail as possible and then fax your report to us at (636) 728-2001.

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.



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## **8 Release Notes**

### **8.1 Release Notes for v1.55**

- This release is a rebuild of the driver under the new Emerson driver toolkit v3.01. There are no other changes.

### **8.2 Release Notes for v1.57**

- Added the xBPI protocol support so that Sartorius scales which support this protocol can be connected.