



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

## **Hardy HI 2151/30WC Driver for DeltaV Programmable Serial Interface Card**

### **USER MANUAL**

**Rev. P1.0**

**November 28, 2000**

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# 1 INTRODUCTION

## 1.1 Scope

This document is the User Manual for the Hardy HI 2151/30 WC Weigh Scale serial communication driver firmware for the Emerson Process Management (EPM) DeltaV Control System; it provides information required to install, configure, and maintain the Hardy driver firmware on the DeltaV Programmable Serial Interface Card (PSIC). The reader should be familiar with EPM's DeltaV controller system and the Hardy Equipment.

The section *Document Format* briefly describes the contents of each section of this manual. *System Specifications* outlines hardware and software requirements for the Hardy Driver (P1.0) firmware. *Related Documents* lists other documents used to prepare this manual.

## 1.2 Document Format

This document is organized as follows:

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<b>Introduction</b>	Describes the scope and purpose of this document
<b>Theory of Operation</b>	Provides a general functional overview of the Hardy Weigh Scale Driver.
<b>Downloading Firmware</b>	Describes downloading procedures for the Hardy 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 Hardy commands used and DeltaV Registers containing Weight Data.
<b>Operational Check</b>	Provide tips and assistance to ensure PSIC is properly setup and configured
<b>DeltaV-Hardy</b>	Describes the electrical interface between DeltaV and the Hardy Weigh Scale.
<b>Electrical Interface</b>	Describes the pin assignments necessary for RS-232 communications and RS-422/485 communications.
<b>Technical Support</b>	Describes whom to call if you need assistance

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### 1.3 System Specifications

The following table lists the minimum hardware requirements for the Hardy Weigh Scale Driver:

**Table 1 : System Specifications**

Specifications	
<b>Firmware</b>	Hardy HI 2151/30WC Driver Firmware (P1.0)
<b>Protocol Compatibility</b>	Hardy Protocol as defined in the document titled <u>Operation and Installation Manual</u> . Doc. 0596-0224 Rev B-4.
<b>Software Requirements</b>	DeltaV System Software (Release 4.2 or later) installed on a hardware-appropriate Windows NT workstation configured as a ProPlus for DeltaV  Serial Interface Port License (VE4102)
<b>Minimum Hardware Requirements</b>	FRSI DeltaV PSIC Hardware Rev 1.1 or later FRSI DeltaV M3 or M5 Controller, Power Supply and 2 wide controller carrier FRSI 8 wide I/O card carrier Hardy HI 2151/30WC devices

### 1.4 Related Documents

The following documents were referenced either directly or indirectly in the development of this document:

- 96KH06.D01 - Type KJ3003 Serial Interface Hardware Specification
- 96KH05.D03 - DeltaV Programmable Serial Card Design Document
- DeltaV Programmable Serial Card Application Guide
- 96KH05.D01 DeltaV Serial Card Design Document

### 1.5 Recommended Tools

A serial communications/protocol analyzer monitoring the serial communications link from the serial card to the foreign device is recommended for troubleshooting anomalous behavior.



## **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 Hardy protocol before operation.

The RS-232 or RS-422/485 communication settings must be configured properly to ensure accurate communication between the PSIC and Hardy devices.

This driver communicates with the Hardy HI 2151/30WC Weigh Scales and updates emulated DeltaV I/O with the data received from the Weigh Scales. The primary functions of the driver are listed below:

- Performs data and message handling between DeltaV and Hardy devices.
- Sends X command and G, N, T sub-command messages to Hardy Weigh Scales from DeltaV
- Checks validity of messages received from the Hardy devices.
- Processes reply information and updates the corresponding emulated DeltaV I/O channels
- Update emulated input channel status and Data Block status to indicate the communication state.

The DeltaV PSIC is the master in all communications. It polls each weigh scale device and requests data values on a message by message basis.

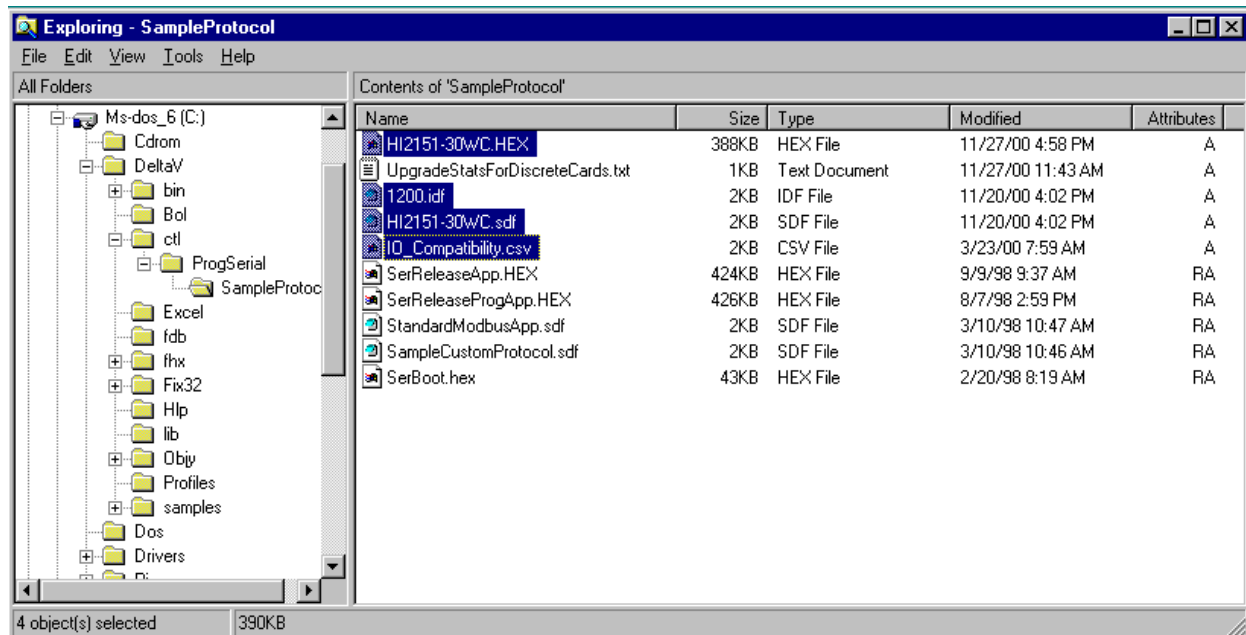


### 3 Downloading the firmware

The driver software comprises 4 files, distributed on a 3.5" diskette. These files must be copied to the DeltaV directory on your ProPlus Workstation. The path is:

**\\DeltaV\ctl\ProgSerial\SampleProtocol**

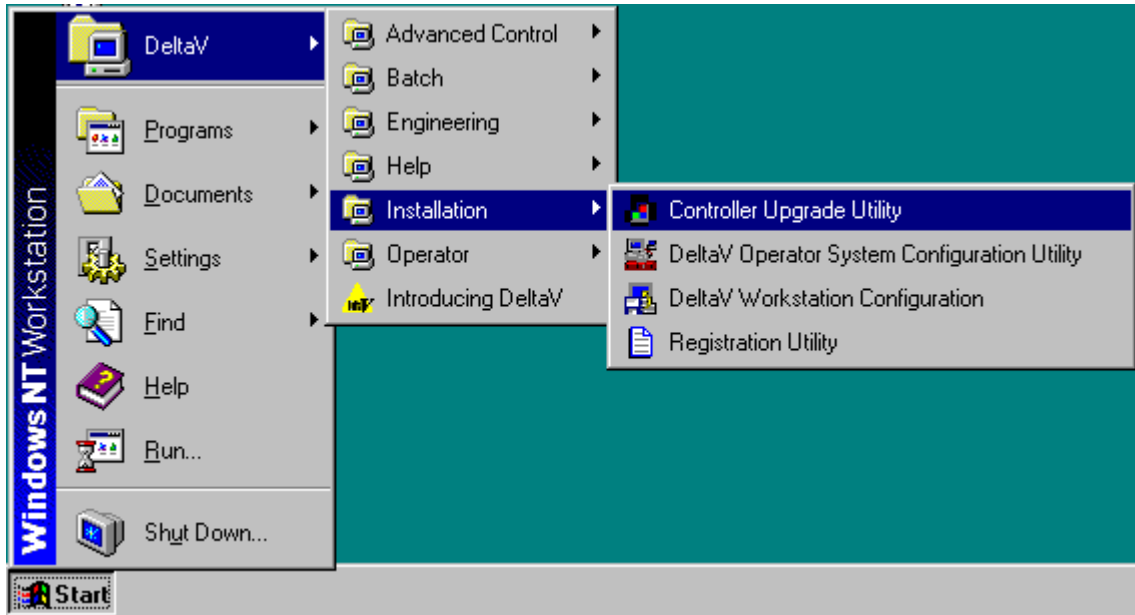
The following shows a completed copy operation:



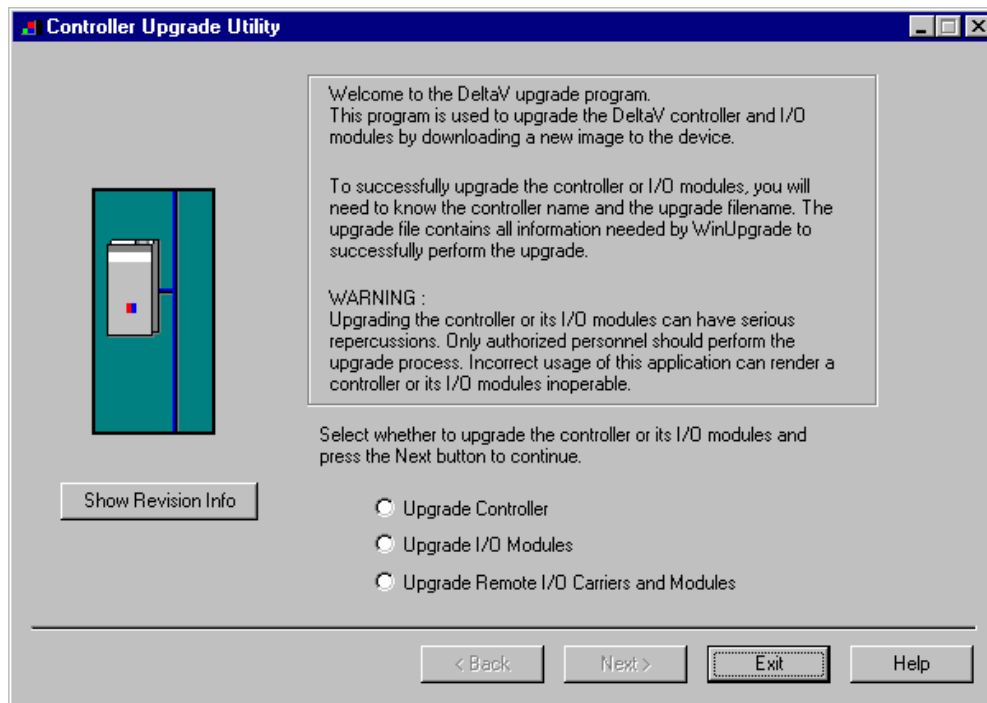
After copy completion, you are ready to program (or upgrade) the Programmable Serial Card with the supplied custom driver software. The steps are as follows:

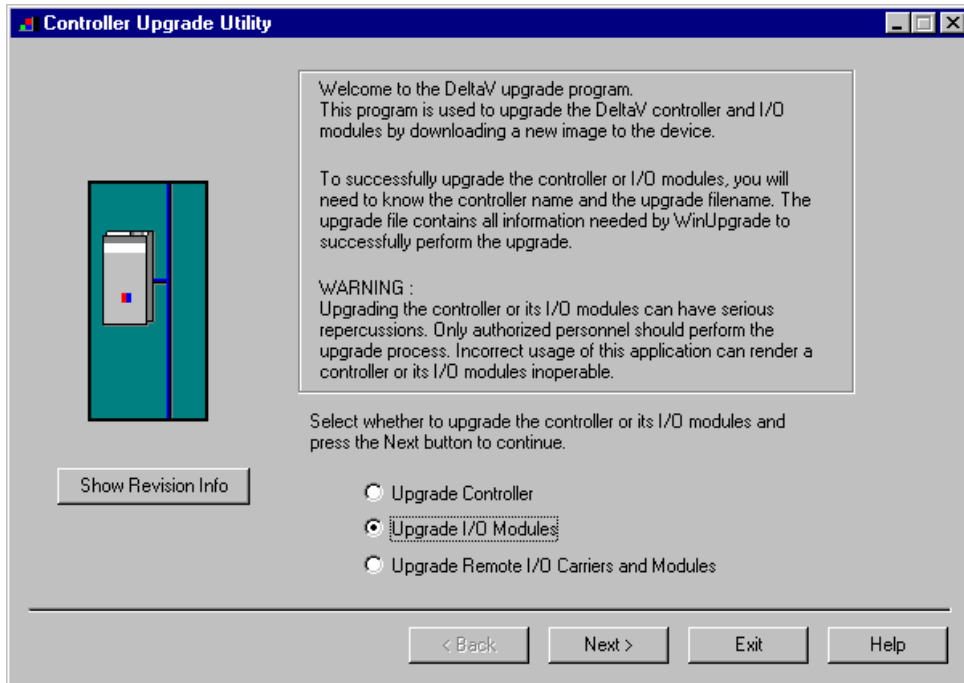


Click on the Start button and select DeltaV, Installation, Controller Upgrade Utility as shown below.

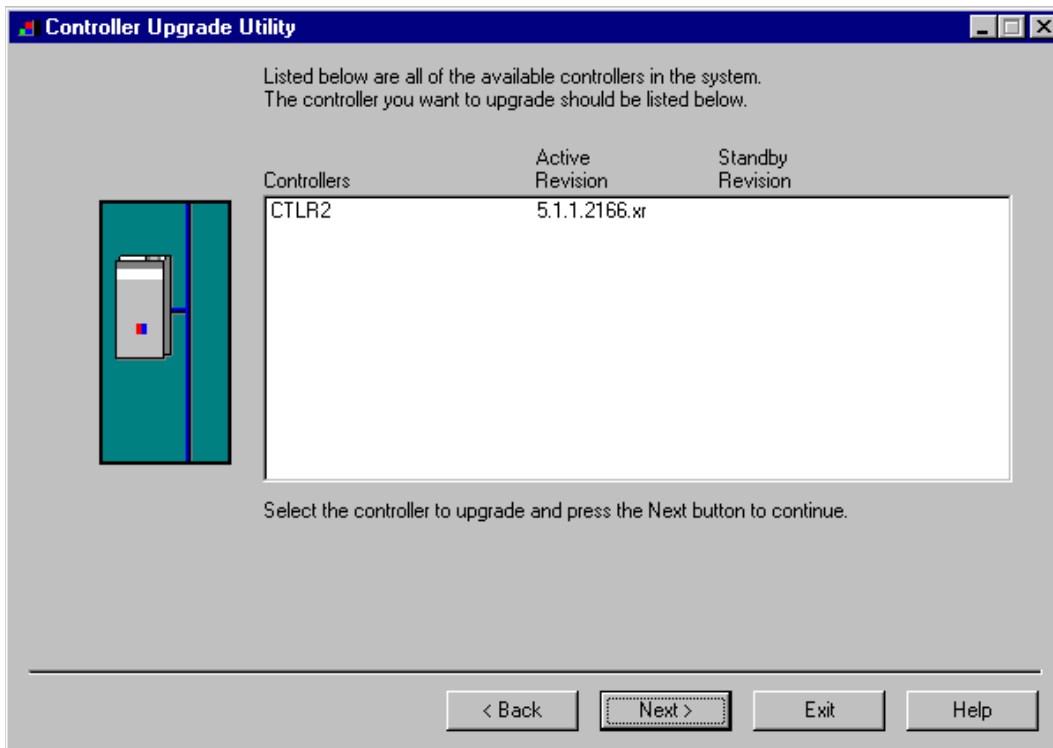


The following dialog will appear:



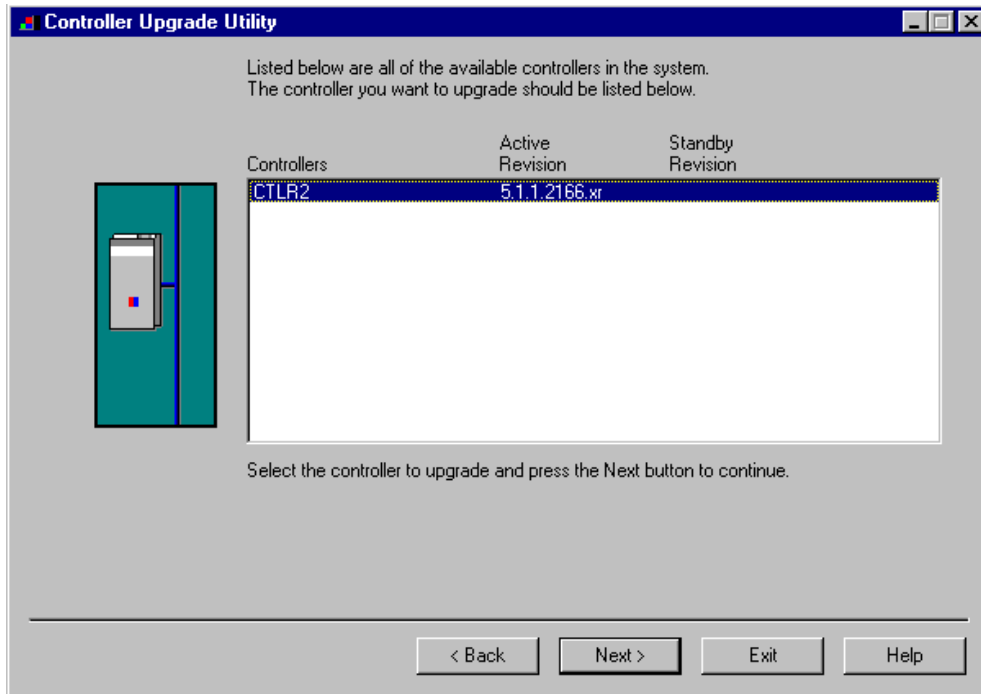


Click on the Upgrade I/O Modules radio button, and then click Next.



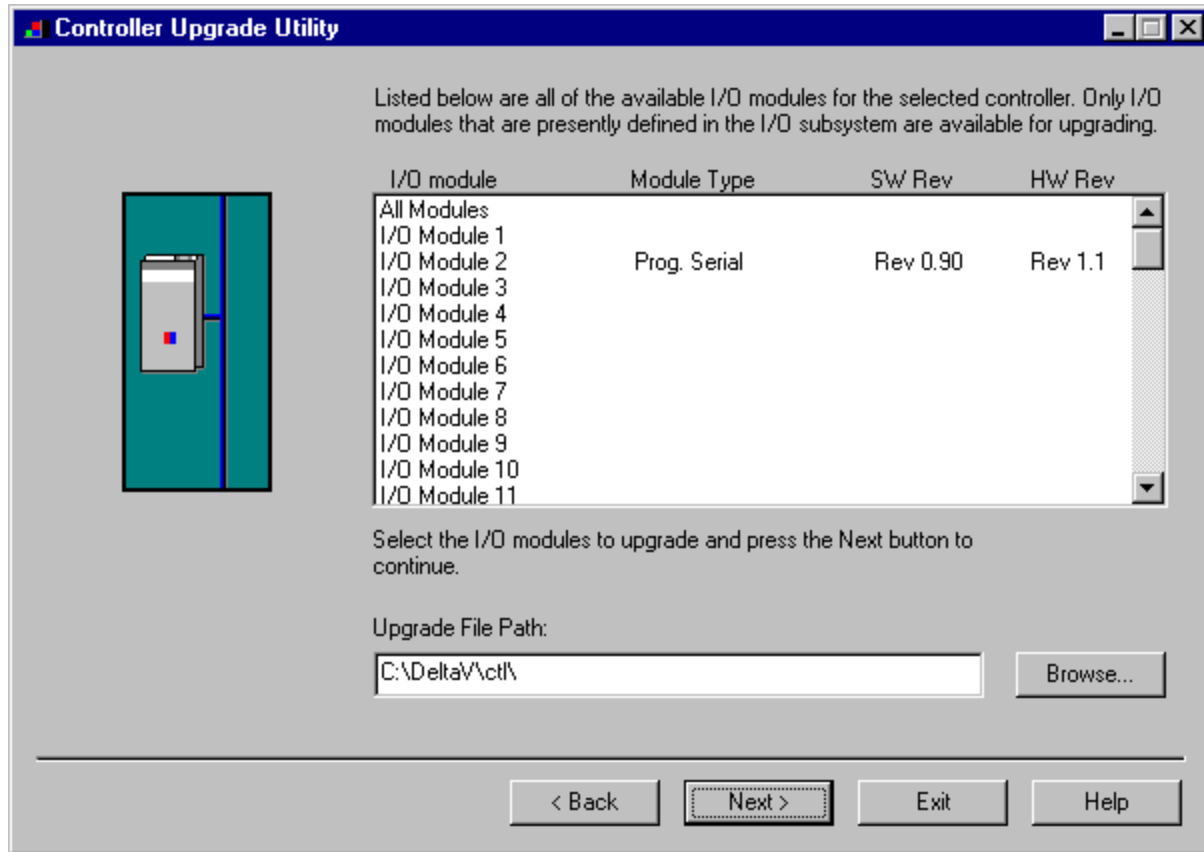


The above dialog will appear, listing all the available Controllers in your network. From this dialog, select the appropriate Controller and then Click Next as shown below.



After you Click Next, 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.



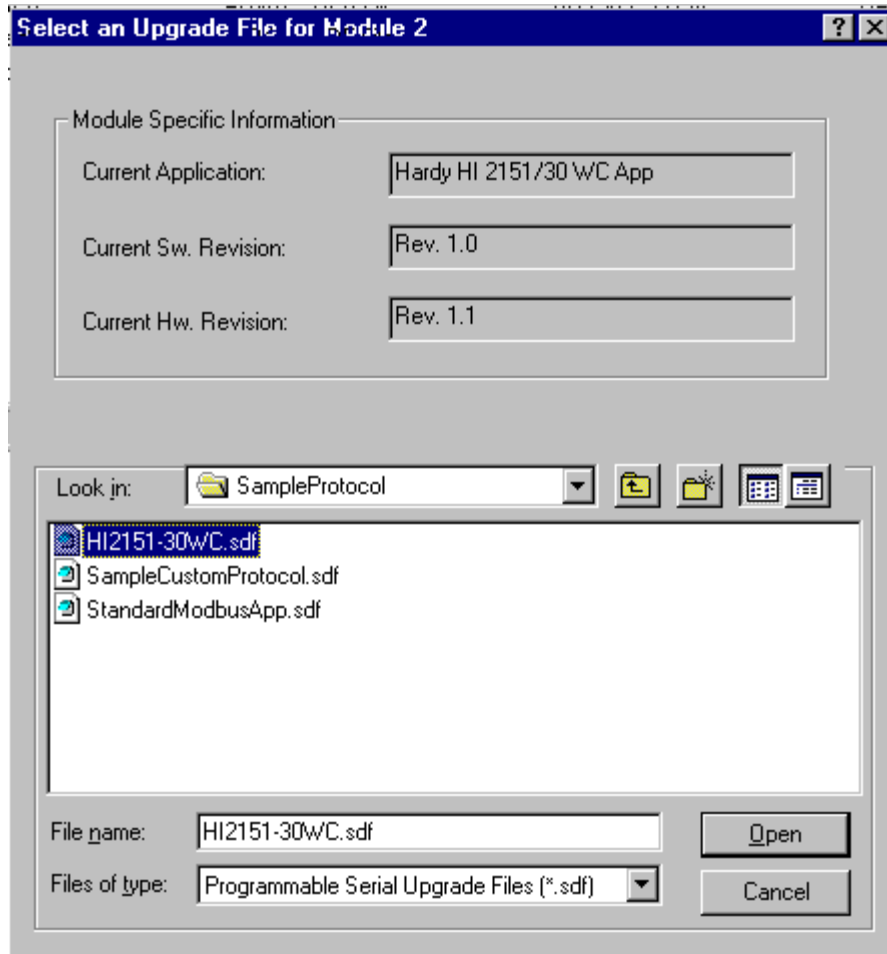


From this dialog, select the Programmable Serial Card I/O Module in the list. For example, we will select I/O Module 2. This will give you the following dialog, from which you will select the file path to where the driver software is located. This will be:

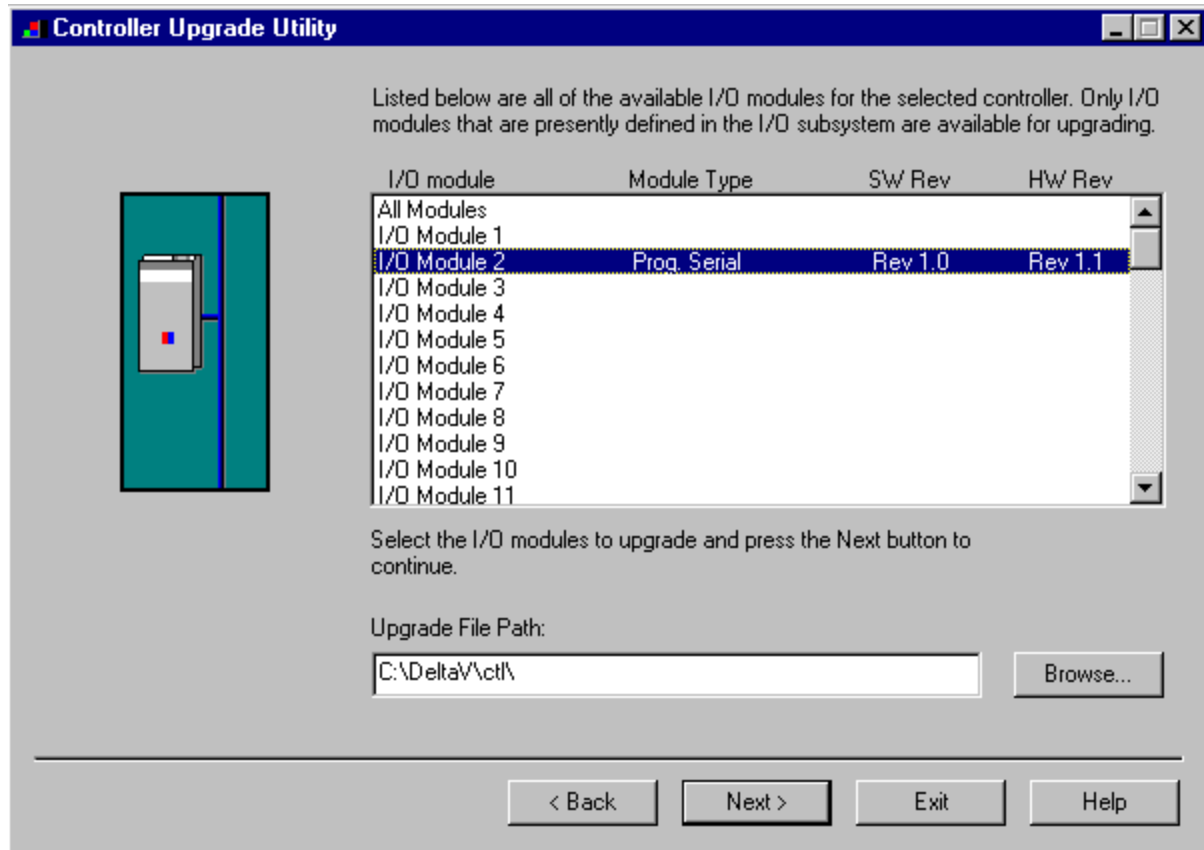
**\\DeltaV\ctl\ProgSerial\SampleProtocol.**

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

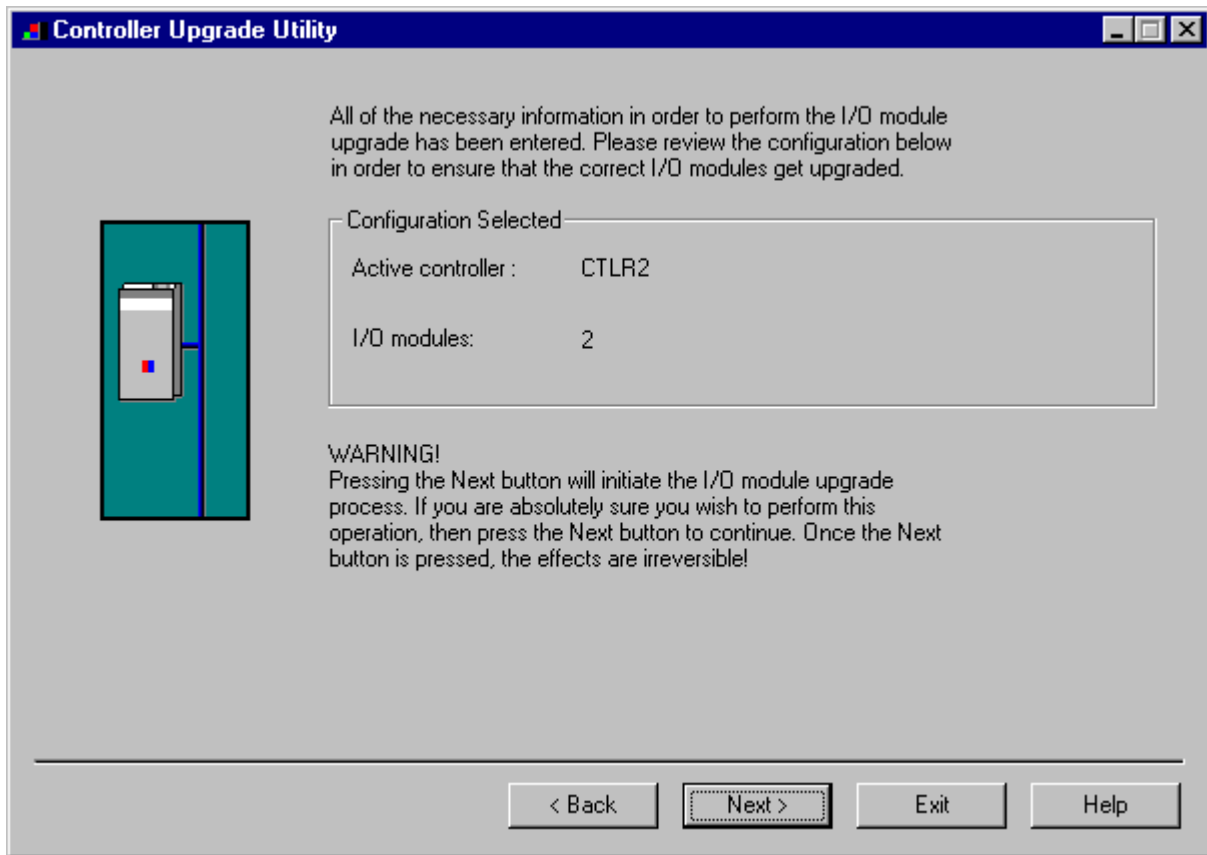
**HI2151-30WC.SDF**



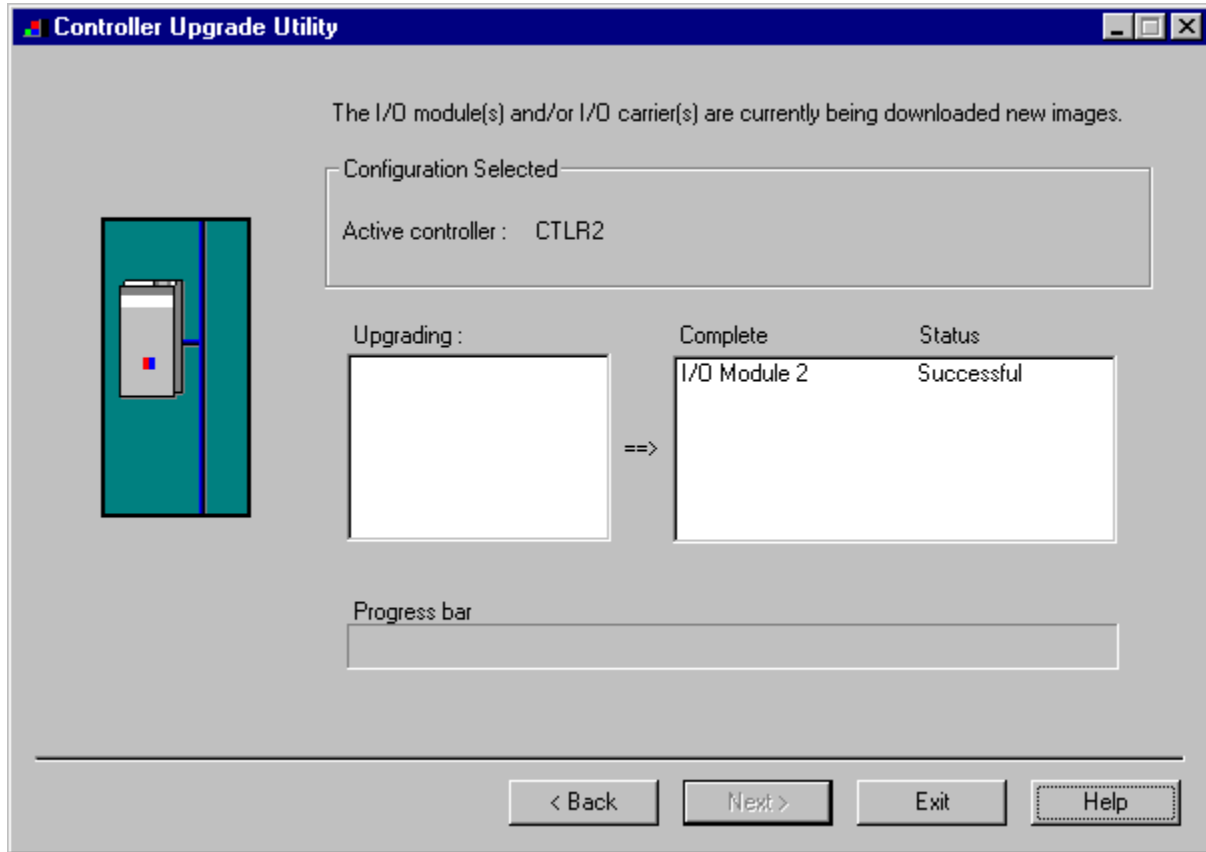
After selecting the .SDF file, Click on Open. This dialog will close and you will be back to the following:



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



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



This completes the I/O Module upgrade process.



## **4 CONFIGURATION INFORMATION**

This section describes the steps necessary to configure the DeltaV PSIC and the Hardy HI2151/30WC to obtain proper communication.

### **4.1 Device And Data Set Configuration**

The following paragraphs discuss some attributes in the device and data set configuration:

#### **4.1.1 Device Address:**

The device address attribute is located in the device configuration box under port. It is the Weigh Scale address, and should be a number between 1 and 99.

#### **4.1.2 Output Mode:**

Two output modes are available in the DeltaV PSIC: block output (0) and single output (1). This value is a don't care for this driver. Leave this value at its default setting.

#### **4.1.3 DeltaV Data Type:**

All data sets must use DeltaV data type Floating point w/ status.

#### **4.1.4 DeviceDataType**

This value is a don't care for Hardy Weigh Scales.

#### **4.1.5 Data Start Address**

This value is a don't care for Hardy Weigh Scales.

#### **4.1.6 Number of Values**

This is the number of registers needed to hold weight data read from the weigh scales. Select 4 for all data sets.

#### **4.1.7 Special Data 1-5**

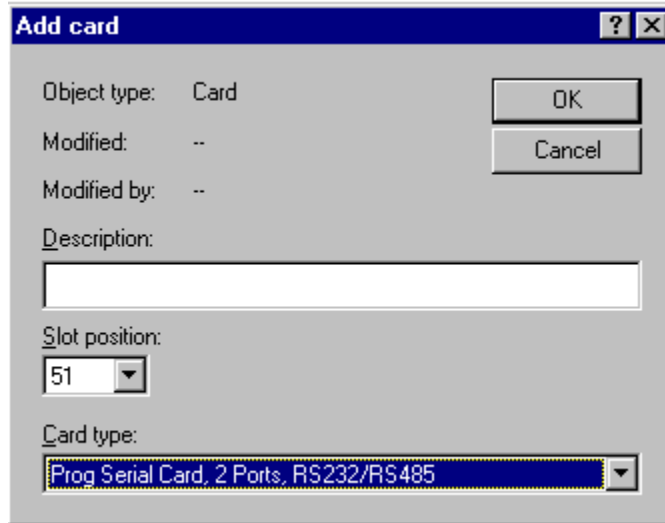
These values are a don't care for Hardy Weigh Scales.



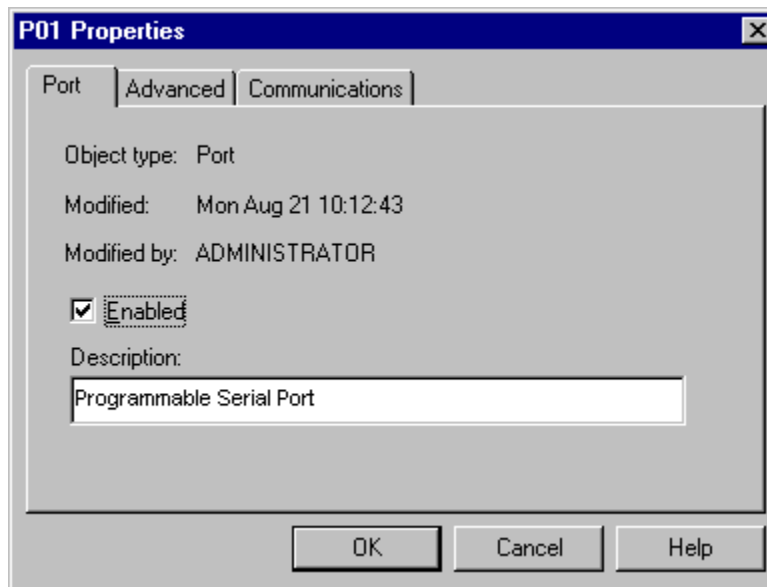
## 4.2 Data Set Configuration Display

To have the Programmable Serial Card communicate with the Weigh Scale, follow these steps:

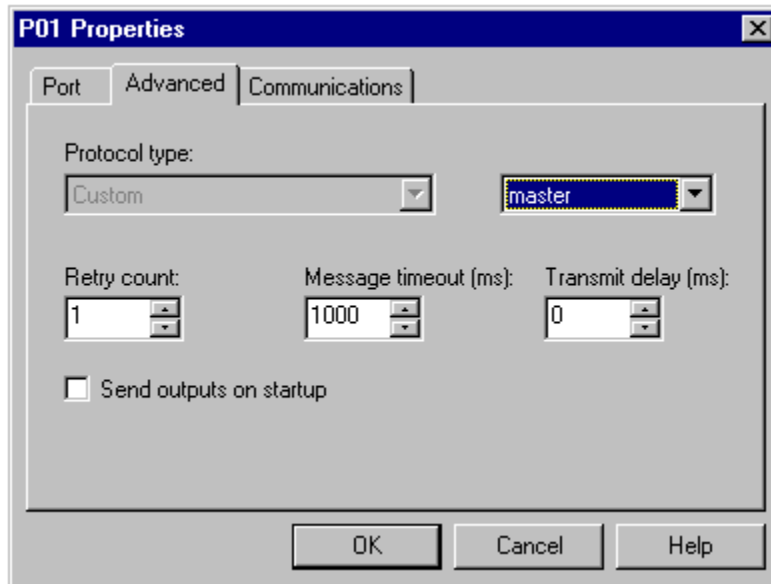
1. In DeltaV, configure the serial card. This will create a Programmable Serial Card and define 2 ports under it, P01 and P02.



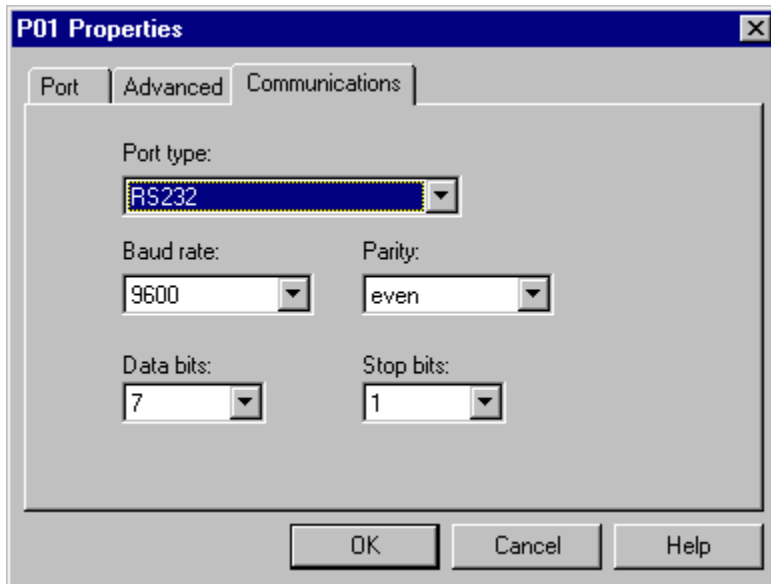
2. Right mouse click on Port 1. The following dialog will appear.



3. Click on the Enabled checkbox to enable the Port. Next select the Advanced tab. The following dialog will appear.



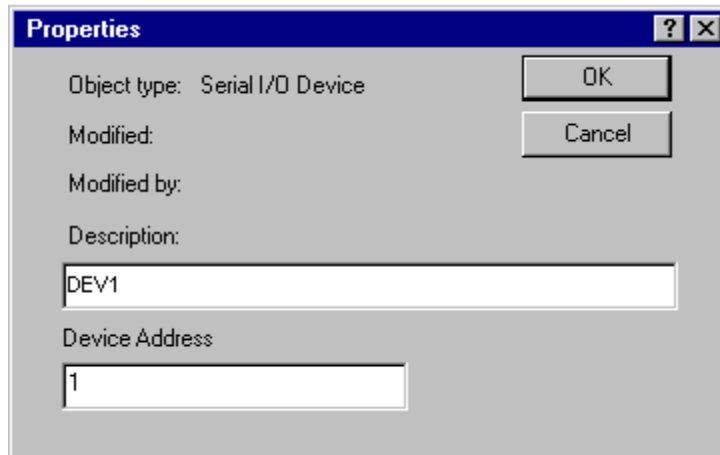
4. In this dialog, select communications parameters as shown. The DeltaV Serial card will always be the Master. Next click the Communications tab. The following dialog will appear.



5. Specify the Port type. The Port type will be RS-232 or RS-422/485 for the Weigh Scale. The Baud Rate, Parity, Data bits and Stop bits parameters must match the Weigh Scale configuration. Select the appropriate parameters and then click OK

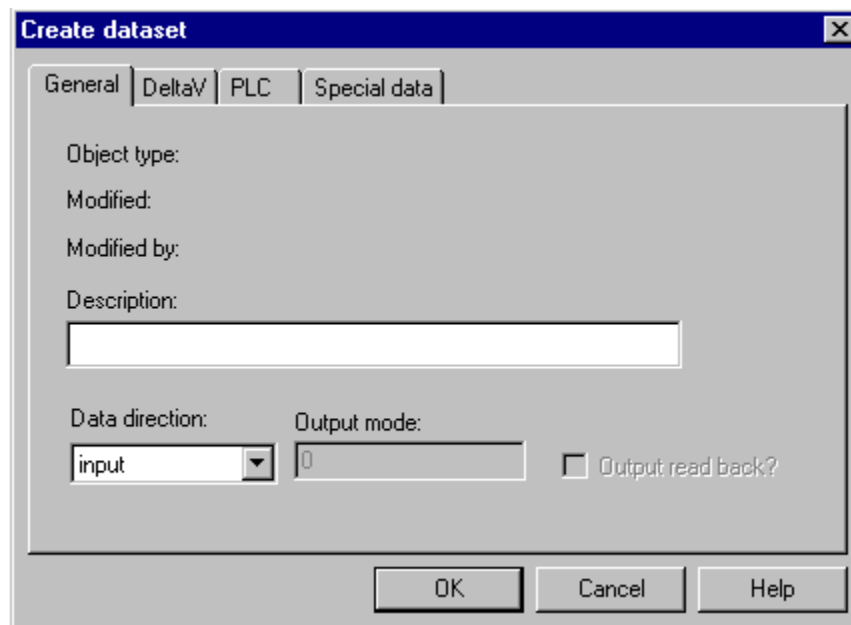


6. Configure a Serial Device under the Port by doing a Right Mouse click and selecting New Serial Device. The following dialog will appear:

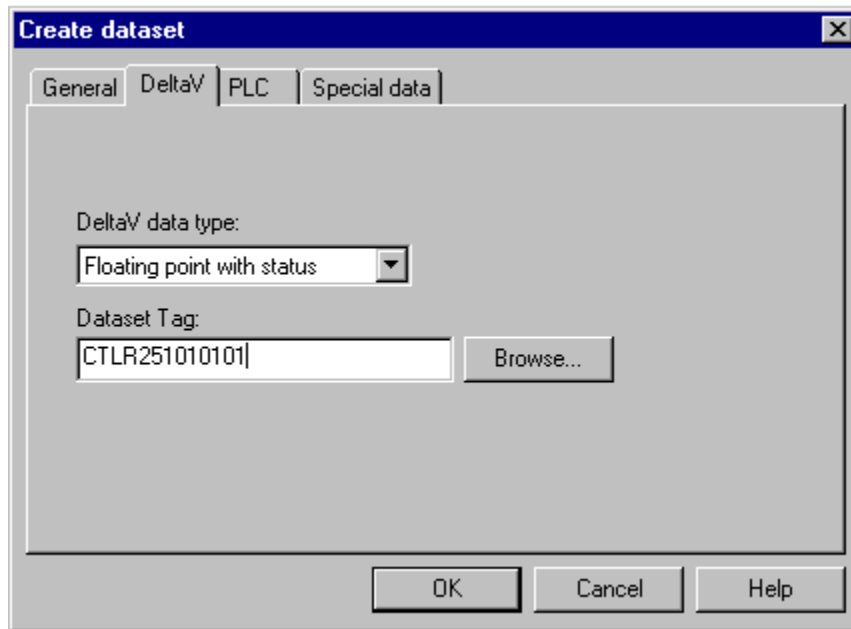


7. Specify the device address and description. The device address will be used as the Weigh Scale address, and should be in range 1-99. Then click OK. This will add the serial device. Only one device per port is supported.

8. Next, configure dataset in the Serial Device. For this application, each configured device must have 1 dataset under it. The dataset will be of type Input, with 4 values of type Floating point. The following dialog will appear.

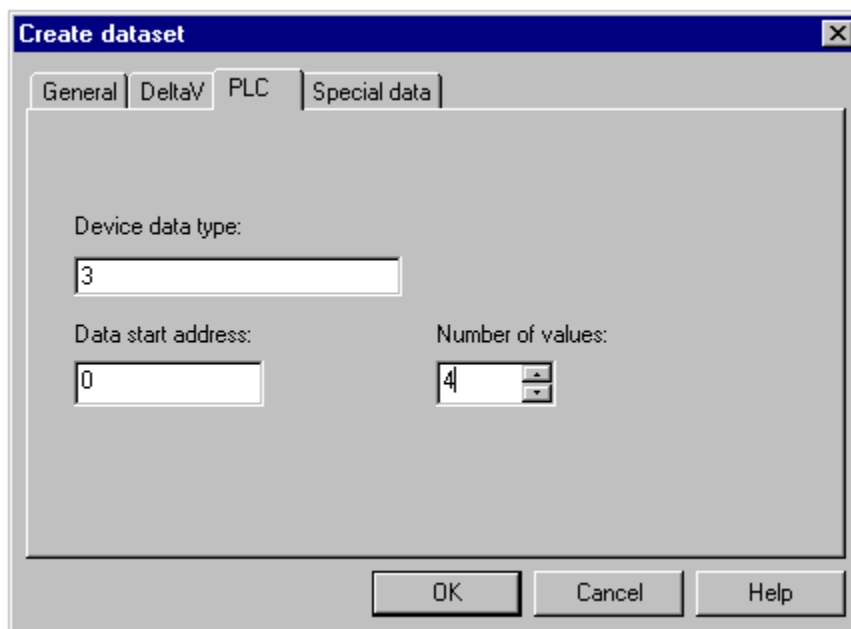


9. Configure the data direction to be input. Next click on the DeltaV tab. The following dialog will appear.



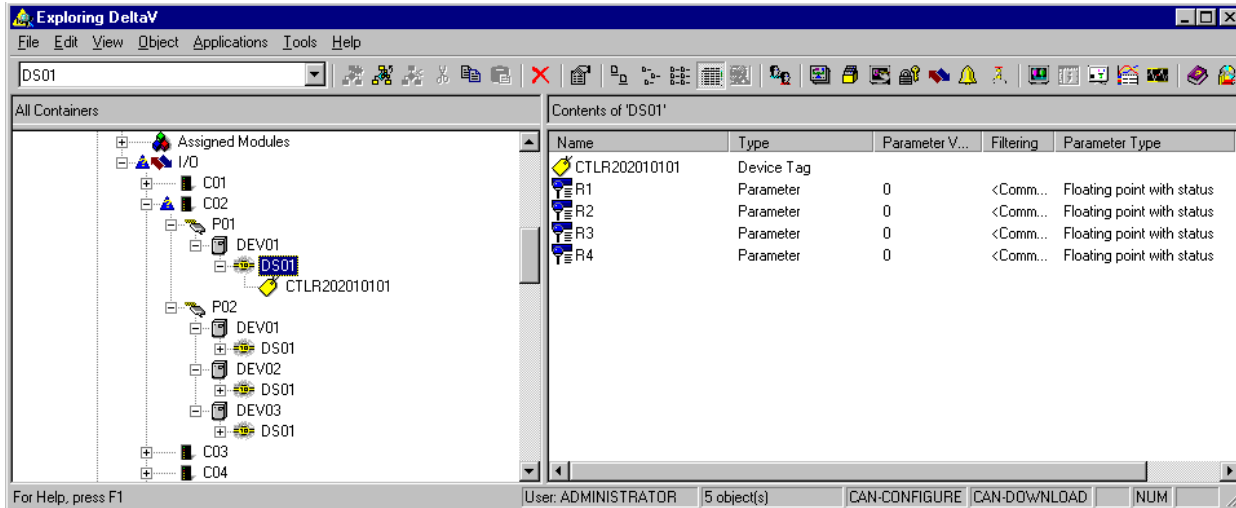
10. In this dialog, configure the data type needed for DeltaV. You can see the available types by clicking on the drop down list. Remember for this application, the dataset data type is Floating point.

11. Next click the PLC tab. The following dialog will appear.





In this dialog, select the parameters as shown above. The following shows both ports of a serial card configured. Port 1 has only one device, as is the case when using RS-232. Port 2 has 3 devices multi-dropped. Each device has 1 dataset of type floating point.





### 4.3 Serial Port Configuration for DeltaV PSIC

In order for proper communication between the Programmable Serial Interface Card and the Hardy Weigh Scales, the serial port settings must be configured properly.

The PSIC serial port can be configured via a combination of the following settings through the DeltaV Explorer Menu using the Properties box.

- Protocol Type                      Custom
- Mode                                      Master
- Retry Count                            0 to 255
- Message time-out                    100 to 25500ms
- Transmit Delay                        0 to 25500ms
- Send Outputs on Startup            Yes or No
- Port Type                                RS-232, RS-422/485 Half - Duplex, RS -  
422/485 Full - Duplex
- Baud Rate                                300, 1200, 2400, 4800, 9600, 38400  
57600, 115200
- Parity                                      None, Even or Odd
- Data Bits                                 7 or 8
- Stop Bits                                 1 or 2



### 4.3 Serial Driver Communications

The driver will continuously communicate with the Weigh Scales using the following Commands.

Hardy Command	Hardy Sub-Command	Description
X	G	Transmit Gross Weight
X	N	Transmit Net Weight
X	T	Transmit Tare Weight

**Note: While setting up the Weigh Scale unit, configure the output format to be single values (Gross, Net, and Tare).**

The Serial Card will send an X command with a sub-command (G, N or T) in sequence to the Weigh Scale. The response packet will be parsed and checked for correctness based on the checksum. If the packet is valid, the data will be made available to DeltaV in the configured registers.

Data Name	Data Type	Assigned Register
Gross Weight	Floating Point	Dataset1-R1
Net Weight	Floating Point	Dataset1-R2
Tare Weight	Floating Point	Dataset1-R3
Reserved	Floating Point	Dataset1-R4

If there are communication errors, these are reported up to DeltaV. The following errors will be reported:

Reported Errors
No Response
CRC Error
Error Response



## **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 Hardy 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 Hardy driver installed.

The following information will be displayed:

:	:	:
HwRev	Hardware Revision	1.1 (or later)
SwRev	Software Revision	P1.0 (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 Hardy device settings.
- Verify device configuration: User must check for the proper device address is entered. The device address assigned must be the same as the Hardy devices.
- Verify data set configuration: The data set 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 Hardy Weigh Scale and the PSIC. For input data, the values should be changed in the Hardy 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 form the drop down menu. Verify that the port communications statistics are being displayed properly and are counting as expected for the Hardy protocol's functionality.
- Verify data set values: Select a data set and press the right mouse button. Select View Data Set Registers from the Drop down window. Verify that the data set 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 - Hardy Electrical Interface**

The electrical interface between DeltaV and the Hardy devices conforms to the RS-232 protocol and the RS-422/485 protocol. The RS-232 cable connecting Hardy and the DeltaV PSIC should not exceed 50 feet as specified by the EIA standard for RS-232 protocol. Section 6.1 shows the pin assignments for the PSIC serial terminal block for RS-232 protocol. Section 6.3 shows the pin assignments for the PSIC serial terminal block for RS-422/485 protocol. Pins 1 - 8 are for Port 1 connections and Pins 9 - 16 are for Port 2 connections

### **6.1 RS-232 Pin Assignments for DeltaV PSIC**

<b>Terminal Number</b>	<b>Signal Description</b>
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 2 - Data Set Ready (DSR)

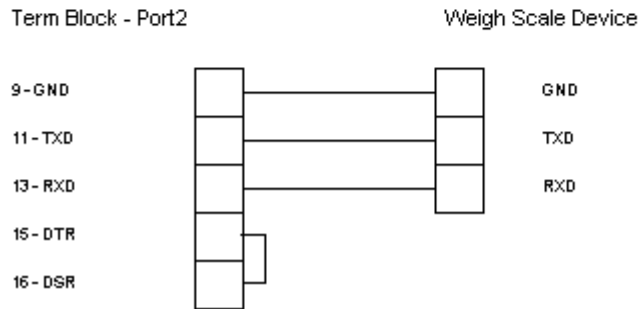
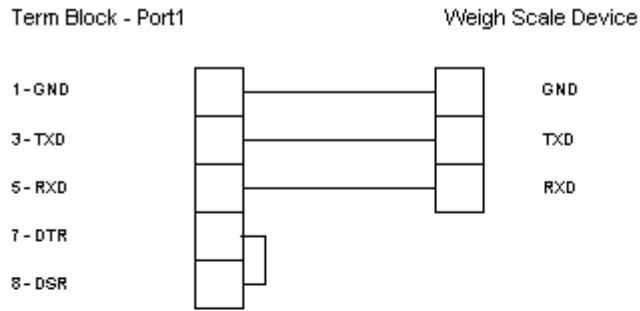
### **6.2 Wiring Connections for RS-232 Communications**

Five terminals need to be connected between the PSIC and the Hardy port. Pins 3 (TXD) and 5 (RXD) need to be crossed so that the Hardy TXD is connected to PSIC RXD, and the Hardy RXD is connected to PSIC TXD. Pins 7 (DTR) and 8 (DSR) also need to be crossed in the same manner between the PSIC and the Hardy.





In general, the following RS-232 cable pinout can be used.





**6.3 RS-422/485 Pin Assignments for DeltaV PSIC**

**Half Duplex**

<b>Terminal Number</b>	<b>Signal Description</b>
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

**Full Duplex**

<b>Terminal Number</b>	<b>Signal Description</b>
1	Port 1 - Isolated Ground (GND)
2	Port 1 - TXD +
3	Port 1 - TXD -
4	Port 1 - RXD +
5	Port 1 - RXD -
6	Unused
7	Unused
8	Unused
9	Port 2 - Isolated Ground (GND)
10	Port 2 - TXD +
11	Port 2 - TXD -
12	Port 2 - RXD +
13	Port 2 - RXD -
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

For Product functionality questions, ask for the people in the following order:

1. Nobin William
2. Martin Berutti

For Commercial issues, ask for people in the following order:

1. Martin Berutti
2. Jane Wagner

For all other driver and related questions, ask for Nobin William.

You can also send us your questions via e-mail. Our addresses are:  
[support@mynah.com](mailto:support@mynah.com)

Thank you for using DeltaV.