



M Y N A HSM

**YSI 2700 SELECT
Programmable Serial Interface Card
Series 2**

USER MANUAL

Rev. P1.55

August 2009

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1 INTRODUCTION

1.1 Scope

This document is User Manual for the YSI 2700 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 YSI 2700 devices.

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 YSI 2700 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 YSI 2700 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:

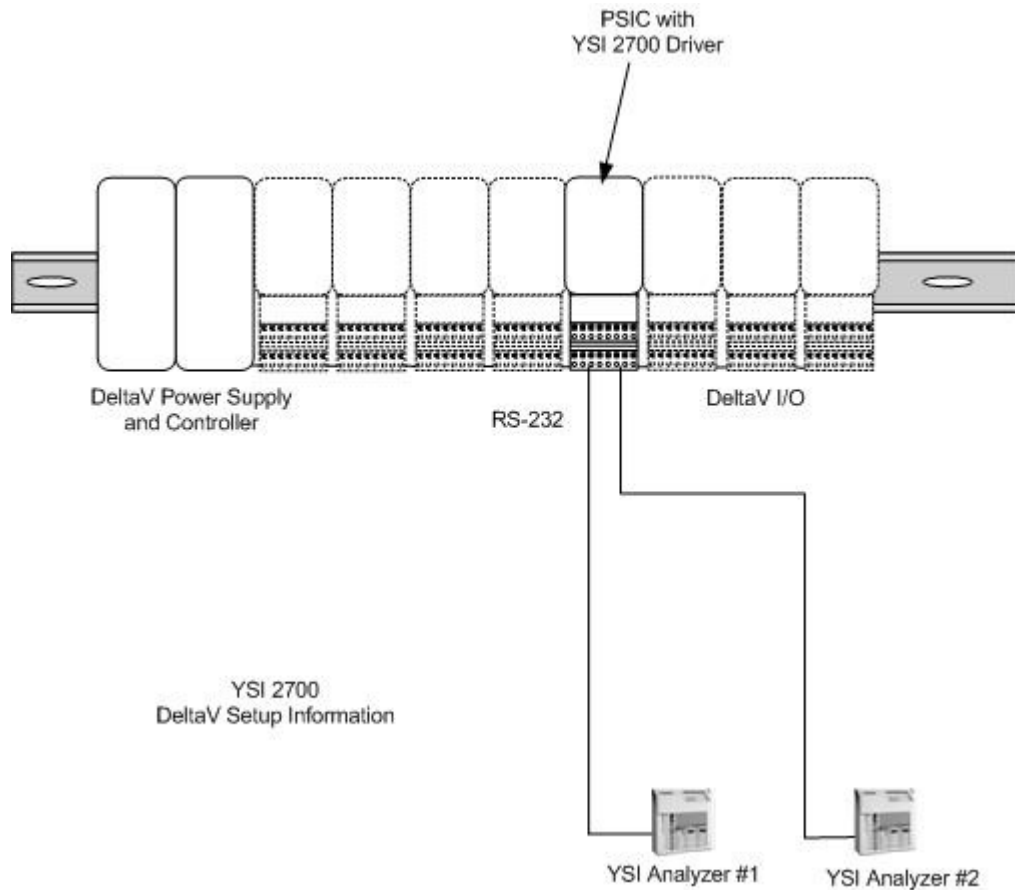
Protocol Compatibility and Reference documents	The communication protocol used will be the YSI 2700 RS232 Communication Protocol described in YSI 2700 manual: 2700 User Manual Rev L
Software Requirements	DeltaV System Software (Release 6.3.2 or later) installed on a hardware-appropriate Windows workstation 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

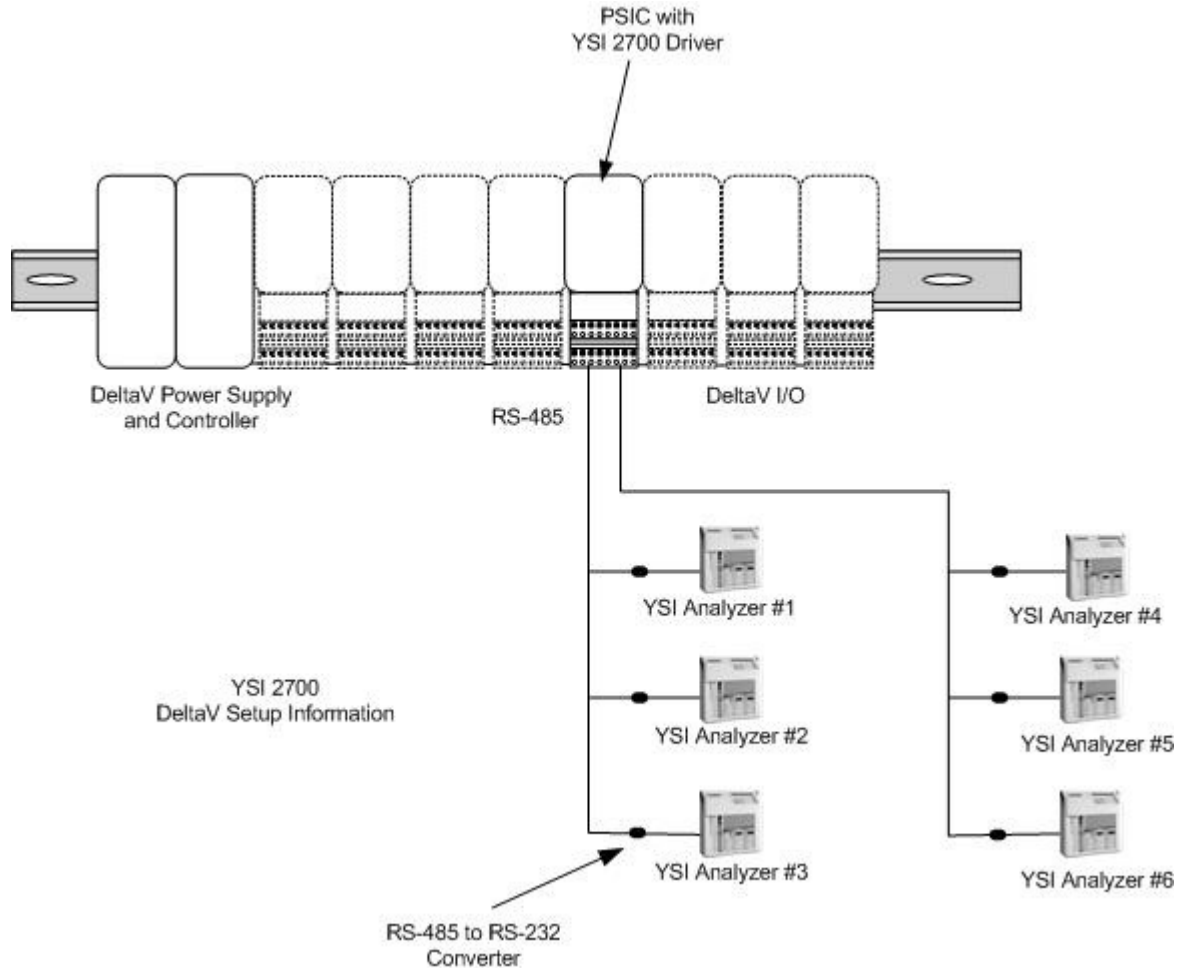
The Programmable Serial Interface Card (PSIC) has 2 ports which can be configured for RS-232, RS-422/RS-485 Half Duplex or RS-422/RS-485 Full Duplex communications with external devices.

For communications with YSI 2700 devices, the PSIC has the option to connect using RS-232 or RS-485. The communication port in the YSI device is RS-232 capable only. Consequently, there are two options available. First, the PSIC can connect to the YSI using RS-232 as point-to-point, shown below. Each PSIC communication port will connect to a single YSI device.





Second, the PSIC can connect to a maximum of three (3) multi-dropped YSI devices using RS-485. Because the communication port on the YSI is RS-232 only, a RS-232 to RS-485 converter must be used. The following illustrates multi-dropped devices.



The following Rs-485 to RS-232 converters have been tested:

1. B&B Electronics Convert Model 385COSN; and
2. Telebyte Converter Model 365

The related wiring for each converter is documented in Section 6.

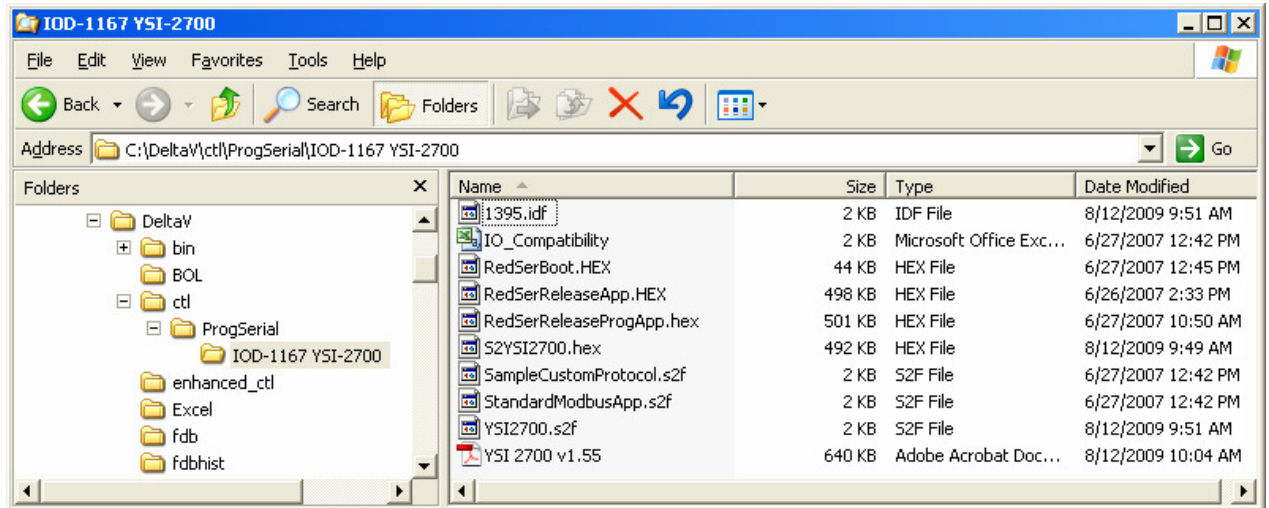


3 Downloading the firmware

The driver software distribution comprises 10 files, distributed on a CD. These files must be copied to the DeltaV directory on your ProPlus Workstation. The path is:

\DeltaV\ctl\ProgSerial\IOD-1167 YSI-2700

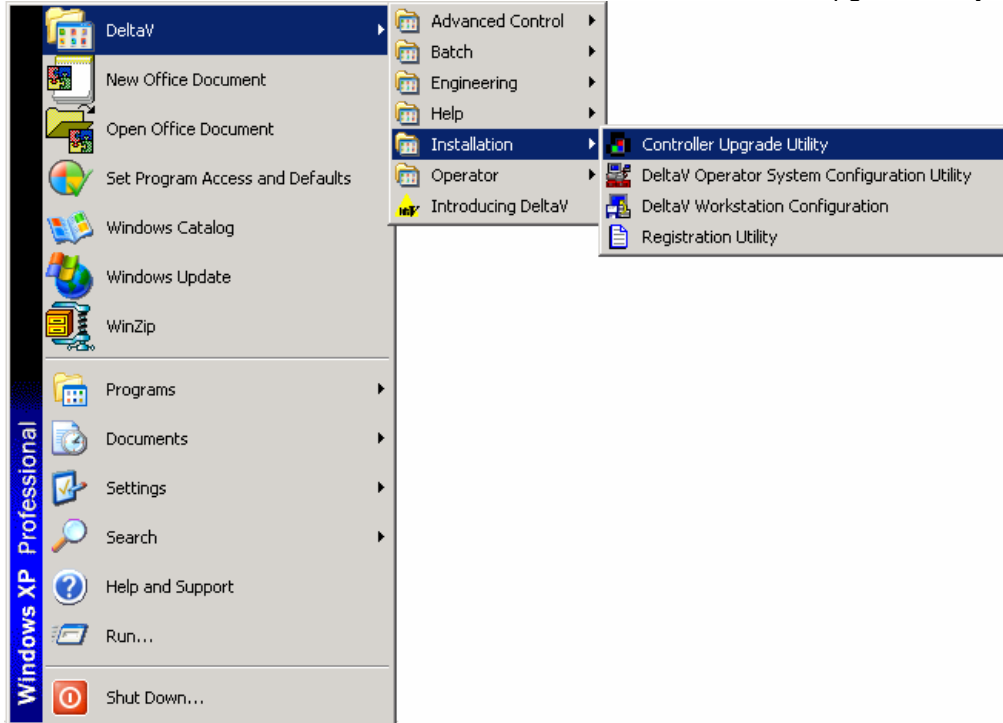
Note that you will have to create the **IOD-1167 YSI-2700** subdirectory. The following files will be copied:



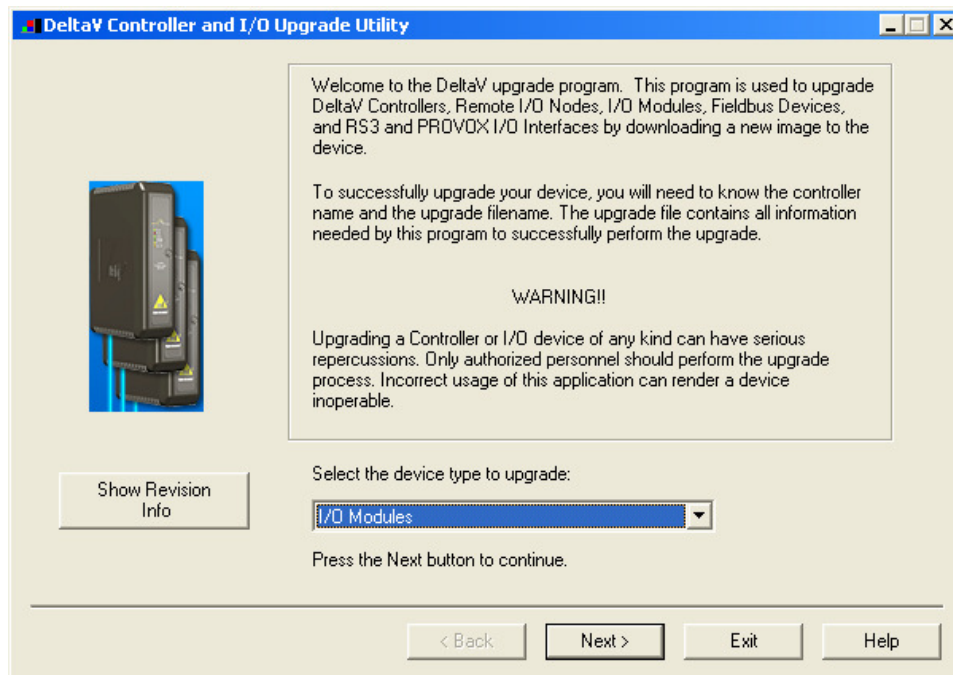


After copy completion, you are ready to program (or upgrade) the Programmable Serial Card with the supplied custom driver software. The steps are as follows:

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

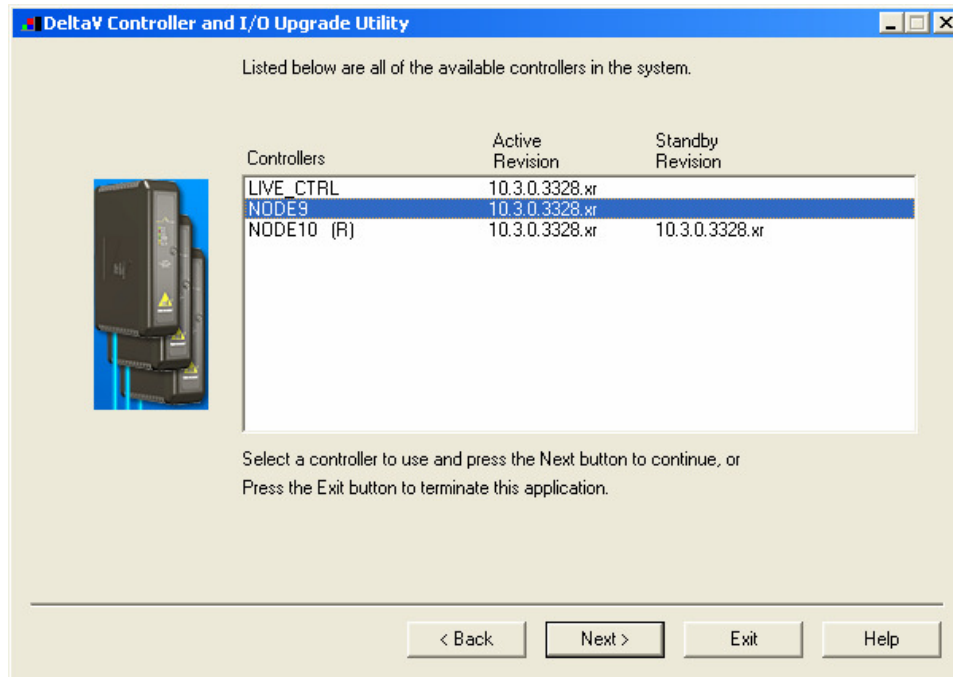


The following dialog will appear:





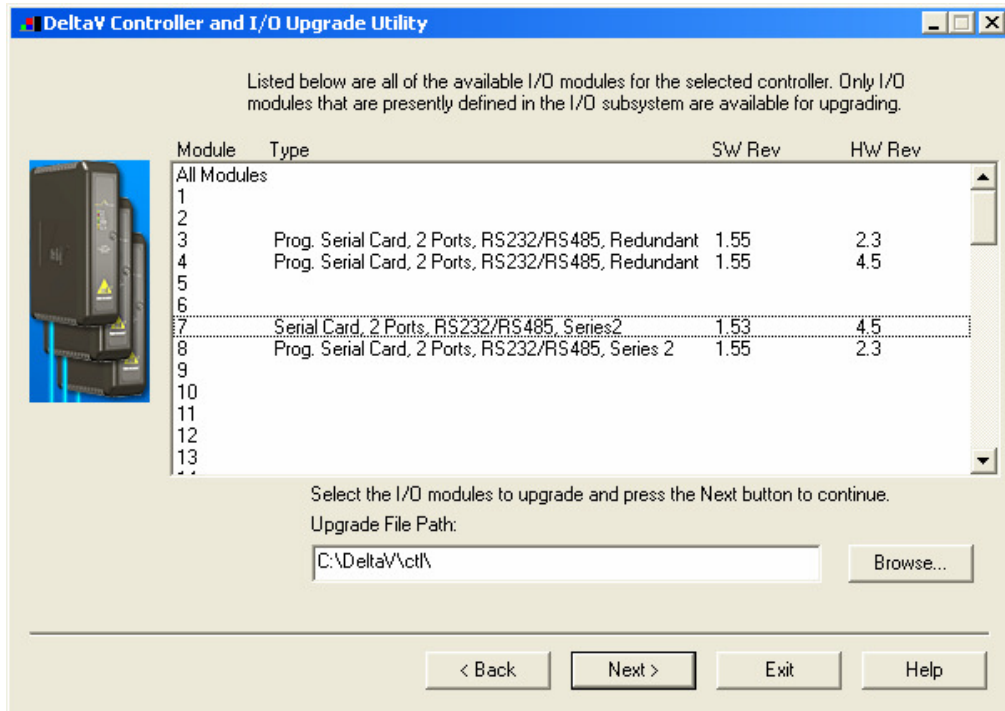
Choose Upgrade I/O Modules from the drop down menu as shown, and click Next.



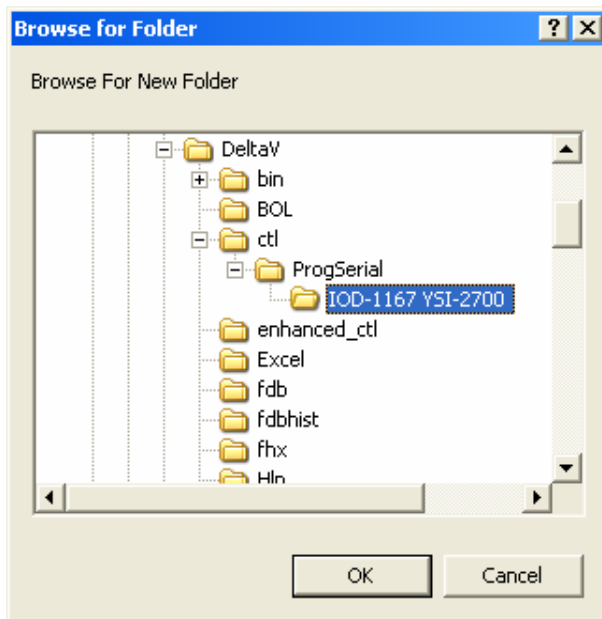
The above dialog will appear, listing all the available Controllers in your network. From this dialog, select the appropriate Controller and then Click Next

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 YSI-2700 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.



DeltaV Controller and I/O Upgrade Utility

Listed below are all of the available I/O modules for the selected controller. Only I/O modules that are presently defined in the I/O subsystem are available for upgrading.

Module	Type	SW Rev	HW Rev
All Modules			
1			
2			
3	Prog. Serial Card, 2 Ports, RS232/RS485, Redundant	1.55	2.3
4	Prog. Serial Card, 2 Ports, RS232/RS485, Redundant	1.55	4.5
5			
6			
7	Serial Card, 2 Ports, RS232/RS485, Series2	1.53	4.5
8	Prog. Serial Card, 2 Ports, RS232/RS485, Series 2	1.55	2.3
9			
10			
11			
12			
13			
...			

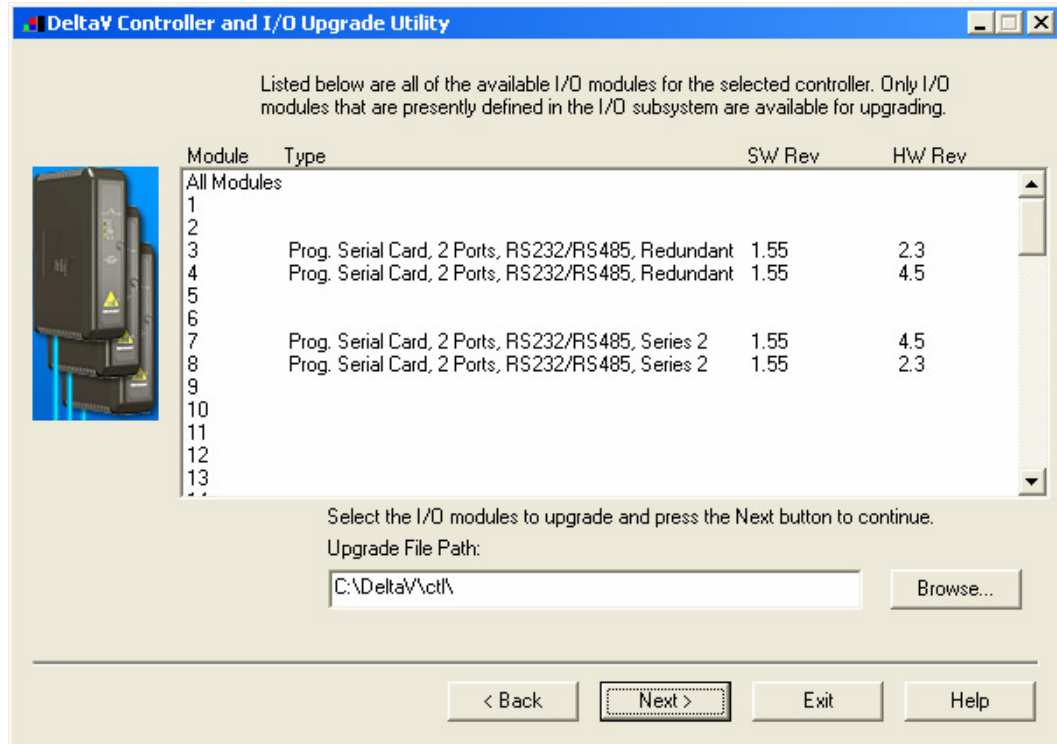
Select the I/O modules to upgrade and press the Next button to continue.

Upgrade File Path:

< Back Next > Exit Help



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.

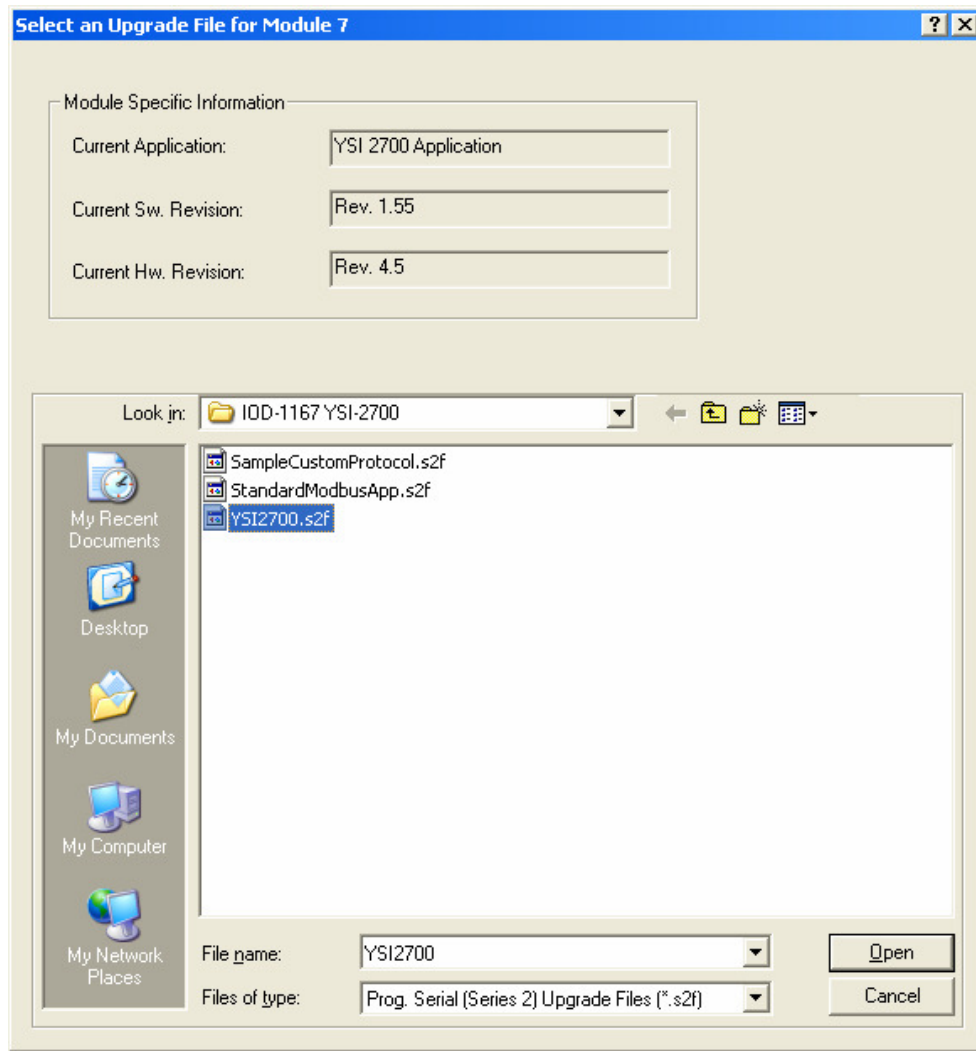


From this dialog, select the Programmable Serial Card I/O Module in the list. For example, we will select I/O Module 1. This will give you the following dialog, from which you will select the file path to where the driver software is located. This will be:

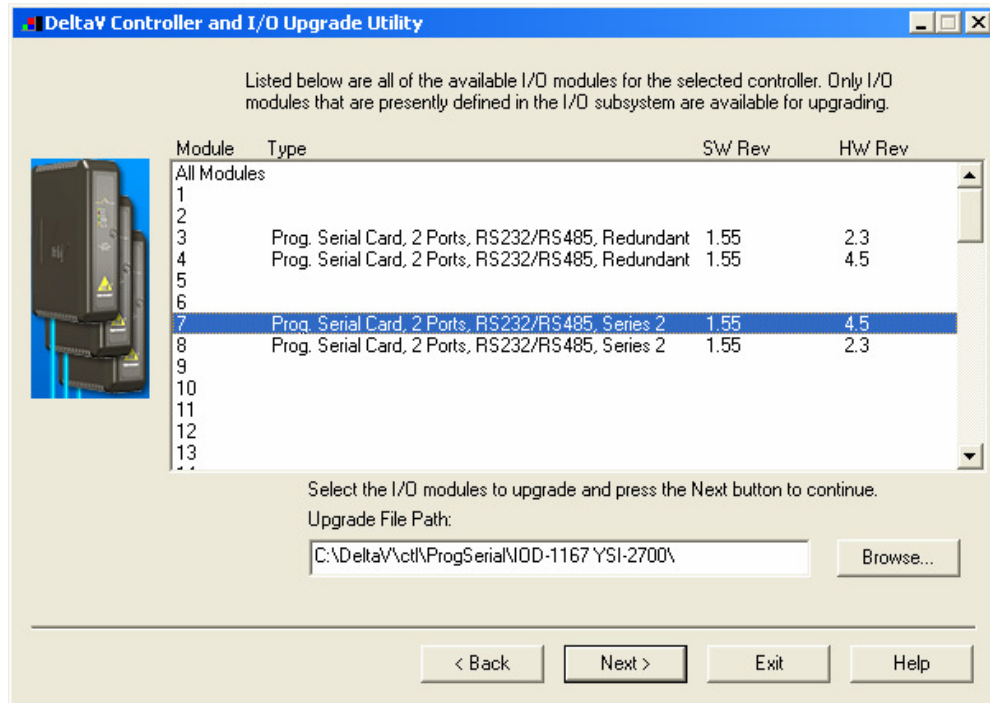
\DeltaV\ctl\ProgSerial\IOD-1167 YSI-2700

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

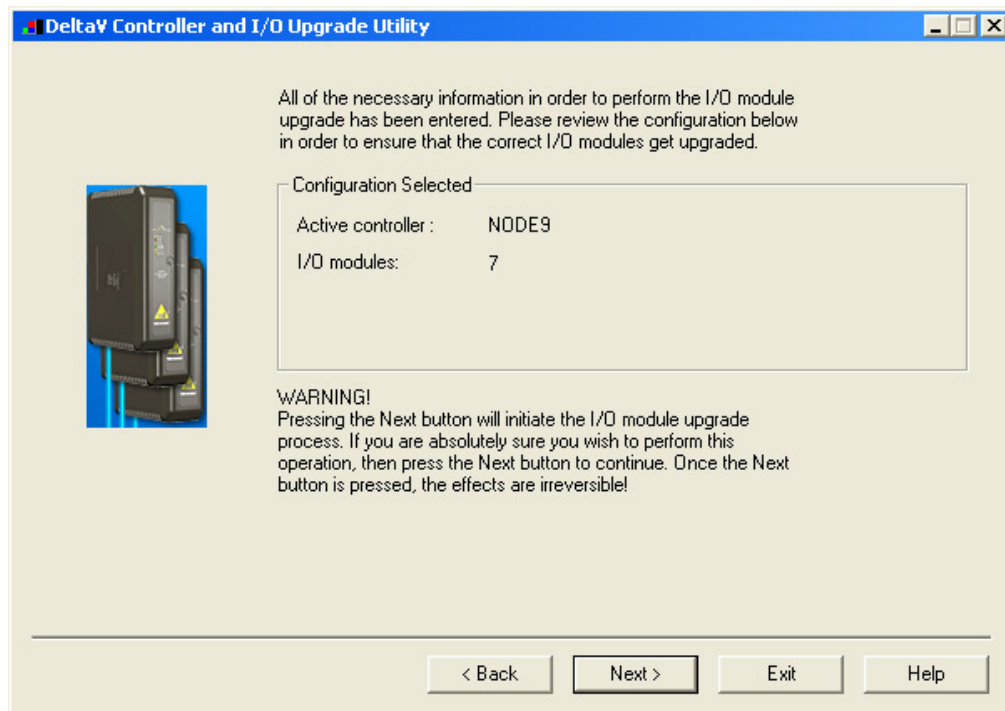
YSI2700.s2f



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

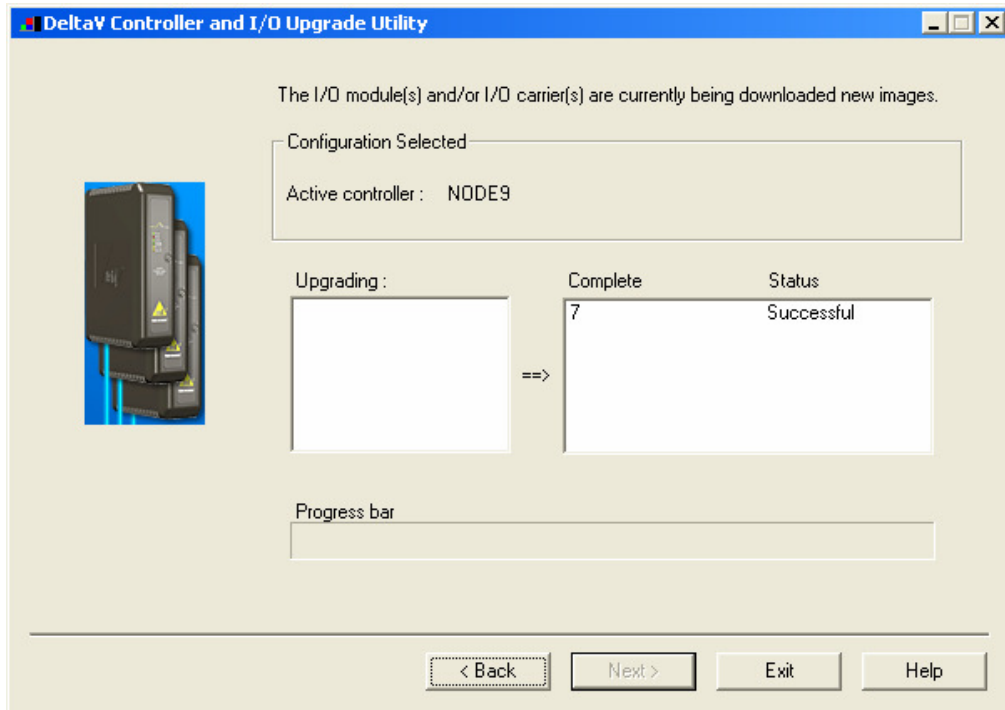


9. In this dialog, Click the serial card and click Next again. You will get the following dialog, confirming the Controller and I/O Module to program.





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



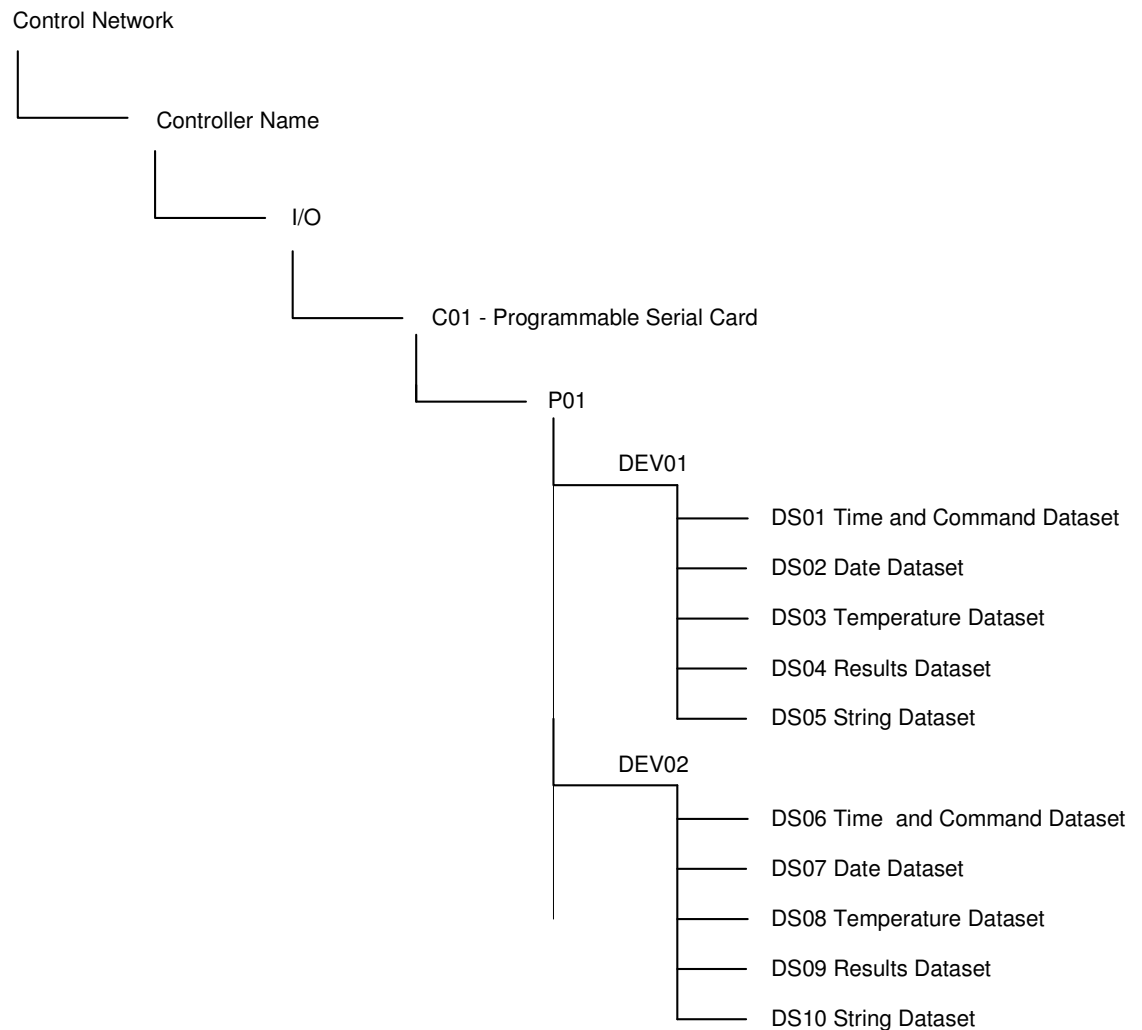
11. This completes the I/O Module upgrade process.



4 CONFIGURATION INFORMATION

Under each port, there exist 16 datasets. Each attached YSI 2700 will need 5 datasets for operation. This allows for up to 3 analyzers per port. Under the port a Device will be created for each attached analyzer. The device address should match the Analyzer Number assigned to YSI 2700 Analyzer. Under each device, 5 datasets will be defined that will handle reading values and writing commands.

The figure below shows an example YSI 2700 setup:



4.1 Port Configuration

The port should be configured as master. Retry Count and Transmit Delay can be left as default or changed at users discretion. Message Timeout needs to be changed to at least 1500ms.

The Port Type should be defined as RS-232 for point-to-point, or as RS-485 Half-Duplex for multi-dropped connectivity. Note that for multi-dropped connectivity, you must use a RS-485 to RS-232 converter before connecting to the YSI devices. The Baud Rate and



Stop Bits should match the settings in the YSI 2700 devices. Parity should be set to “None” and Data Bits to “8”.

Configure the YSI port to Multi-Drop, with Flow Control option as None. The YSI is configured as Multi-Drop even for RS-232 communications.

4.2 Device Configuration

One device should be configured for each YSI 2700 Analyzer connected to a given port. The device address should match the Analyzer Number of the analyzer you wish to communicate with. Up to 3 devices may be configured per port for a total of 6 per PSIC.

4.3 Dataset Configuration

4.3.1 Data Direction:

Five datasets will be defined under each device. The first dataset will be an Output Dataset. The last four 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 1 – Dataset Configuration

DATASET	DeltaV DATA TYPE	DEVICE DATA TYPE	DATA START ADDRESS	NUMBER OF VALUES
1	32-Bit UINT	0	0	14
2	32-Bit UINT	0	0	8
3	Float	0	0	8
4	Float	0	0	8
5	String	0	0	100

Note: Dataset 5 can also be configured as an 8-bit Unsigned Integer or an 8-bit Signed Integer. Both will still have 100 values. Each character of the string will be put into consecutive registers of the dataset. This can make handling certain parts of the string easier in some instances.

4.3.5 Special Data

The Special Data values (2-5) will not be used in this driver and can be left as default. Special Data 1 is used to tell the driver to not request the most recent sample (command RS). This is needed to be able to use the RS# effectively.

4.3.6 Register Mappings

Table 2 – Dataset 1 Register Mapping for Time Data

REGISTER	DESCRIPTION
1	Calibration Time for Probe 1 (Format HHMMSS)
2	Calibration Time for Probe 2 (Format HHMMSS)
3	Sample Time for Probe 1 (Format HHMMSS)
4	Sample Time for Probe 2 (Format HHMMSS)
5	Sample Time with Sample ID # for Probe 1 (Format HHMMSS)
6	Sample Time with Sample ID # for Probe 2 (Format HHMMSS)
7	None
8	None
9	None
10	Send Command
11	Command
12	Command Argument 1
13	Command Argument 2
14	Command Status/Error Code

Table 3 – Dataset 2 Register Mapping for Date Data

REGISTER	DESCRIPTION
1	Calibration Date for Probe 1 (Format MMDDYY)
2	Calibration Date for Probe 2 (Format MMDDYY)
3	Sample Date for Probe 1 (Format MMDDYY)
4	Sample Date for Probe 2 (Format MMDDYY)
5	Sample Date with Sample ID # for Probe 1 (Format MMDDYY)
6	Sample Date with Sample ID # for Probe 2 (Format MMDDYY)
7	None



8	None
---	------

Table 4 – Dataset 3 Register Mapping for Temperature Data

REGISTER	DESCRIPTION
1	Calibration Temperatures for Probe 1
2	Calibration Temperatures for Probe 2
3	Sample Temperatures for Probe 1
4	Sample Temperatures for Probe 2
5	Sample Temperatures with Sample ID # for Probe 1
6	Sample Temperatures with Sample ID # for Probe 2
7	None
8	None

Table 5 – Dataset 4 Register Mapping for Results Data

REGISTER	DESCRIPTION
1	Calibration Result for Probe 1
2	Calibration Result for Probe 2
3	Sample Result for Probe 1
4	Sample Result for Probe 2
5	Sample Result with Sample ID # for Probe 1
6	Sample Result with Sample ID # for Probe 2
7	None
8	None

Dataset 5 is a single string comprised of multiple Registers. The format is “Instrument Status _ Probe 1 Chemistry _ Probe 2 Chemistry _ Instrument Model Number _ Software Version Number _ Software Revision Date”. Probe chemistry’s are always padded with spaces to be 4 characters long. The Software Revision Date, Software Version Number and Instrument Model are only read every 30 seconds.



Dataset 1 will be used to send commands to the YSI 2700 Analyzers. Below are the steps taken to write a command to the analyzer.

Step 1: Write Command Code into Register 11

Table 6 – Command Codes

Command Code	Description
3	Report Sample Result by ID (RS# # is Sample ID, max 9 digits. See example 3.)
11	Process Calibration (PC)
12	Process Sample at Default Location
13	Process sample from calibration well (PS1)
14	Process sample from test tube holder (PS2)
15	Process turntable batch (PS4;#;# Both # are optional, the first # is the turntable starting position and is in the first argument register, the second # is the number of turntable positions to be sampled. If these values are absent, the defaults are used. See example 4.)
16	Process monitor sample (PS5)
17	Clear database memory (RZ)
18	Turn remote control off (TR0)
19	Turn remote control on (TR1)
20	Turn 2700 printer off (TP0)
21	Turn 2700 printer on (TP1 See example 1.)
22	Change pump purge time (MP# # is in seconds. See example 2.)
23	Change monitor time interval (MT# # is in minutes)
24	Change precal time interval (MR# # is in minutes)
25	Change postcal time interval (MO# # is in minutes)
26	Change monitor station number (MS# # is a station number)
27	Abort turntable sampling (PA)
28	Exit run mode; Enter standby mode (TN0)
29	Enter run mode from any mode (standby or menu) (TN1)

Step 2: If the command requires arguments, enter them into Register 12 and 13. Command Codes 3 and 21- 25 require arguments.

Step 3: Write a value of 1 into Register 10 to send the command out to the YSI 2700.

Please note that any commands that require the analyzer to be in remote control mode will automatically send command 19 if needed. To use command 3 to retrieve samples by ID, ID's must be assigned to the samples from the YSI 2700 Keypad. Consult the YSI 2700 user manual on how to enable this. Also, a "1" must be put into Special Data 1 of the first Dataset of the device. This keeps the driver from continuously interrogating the YSI 2700 for samples. This is needed due to the fact that once the YSI 2700 sends a sample it won't ever send it again.

EXAMPLE 1: Turn 2700 printer on

Step 1: Enter a value of 21 into Register 11
 Step 2: Enter a value of 1 into Register 10 to send the command to the analyzer.

EXAMPLE 2: Change pump purge time

Step 1: Enter a value of 22 into Register 11
 Step 2: Enter the new purge time into Register 12
 Step 3: Enter a value of 1 into Register 10 to send the command to the analyzer.

EXAMPLE 3: Get Sample 42

Step 1: The device must already be in the state where Special Data 1's value is set to 1 and the sample with an ID of 42 is already in memory and has not been retrieved yet. Note that the YSI 2700 will only retain the last 32 samples.
 Step 2: Enter a value of 3 into Register 11
 Step 3: Enter Sample ID 42 into 12
 Step 4: Enter a value of 1 into Register 10 to send the command to the analyzer.
 Step 5: The values will be placed into Datasets 1-4 as specified in Tables 1-4

EXAMPLE 4: Process Turntable 3 Samples starting at turntable position 2

Step 1: With the device in run mode, enter a value of 15 into Register 11
 Step 2: Enter 2 into register 12 to specify starting turntable position. If set to 0 the defaults are used.
 Step 3: Enter 3 into register 13 to specify the number of positions to be sampled. If set to 0 the defaults are used.
 Step 4: Enter a value of 1 into Register 10 to send the command to the analyzer.

4.3.7 Errors

The following errors can occur and will be shown in the status of the datasets in DeltaV Diagnostics:

Invalid Device Configuration: If the device is not configured correctly, the status of each dataset within that device will be shown as "Invalid Device Configuration." If any of the devices on a port are in this state, it could affect the rest of the devices.

Receive Buffer exceeds maximum size: Indicates that the data received from the YSI 2700 Analyzer is larger than the Serial Card's buffer.

Also, when sending outputs, if the number of retries goes up often, it could indicate that the YSI 2700 Analyzer is taking longer than 1500 ms to respond. The Message Timeout parameter of the port configuration should be increased to rectify this.

Upon losing communications with the YSI 2700 Analyzer, the driver will automatically set registers 1-6 of the first four datasets to 0.



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 YSI 2700 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 YSI 2700 Analyzer settings.
- Verify device configuration: User must check for the proper device address is entered. The YSI 2700 Analyzer number should match the Device Address.
- Verify Dataset configuration: The first Dataset should be defined as Output, unsigned 32 bit integer, with 14 values. The second should be Input, unsigned 32 bit integer, with 8 values. The third and fourth Datasets should be defined as Input, floating point with 8 values. The fifth Dataset should be defined as Input, string, with 100 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 YSI 2700 Analyzers operate in RS-232 Full-Duplex mode only. If RS-485 is required for distance or multiple device interface, the appropriate converter must be used.

6.1 Pin Assignments for DeltaV PSIC

RS-422/485 Half Duplex Standard

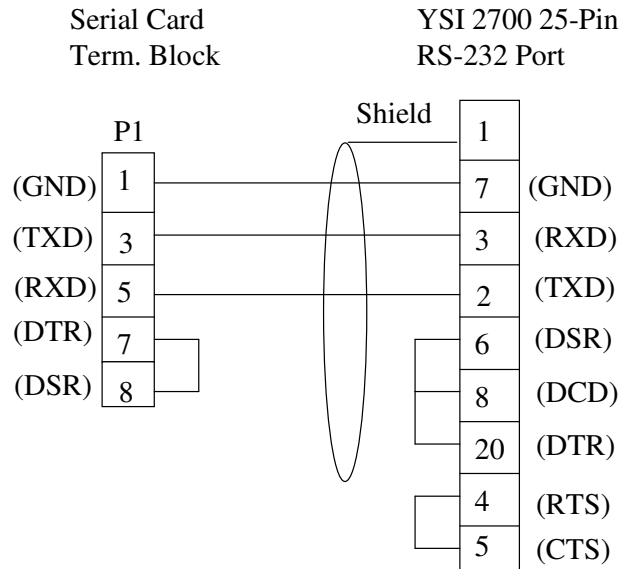
Table 7

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

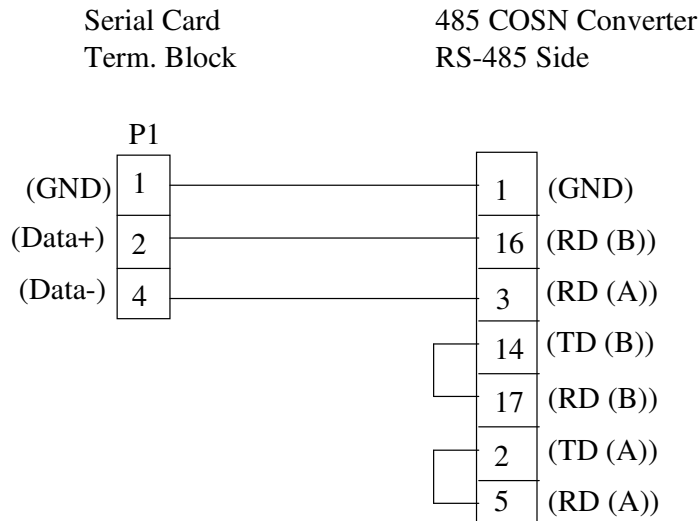


6.2 Wiring Connections

The figure below shows the connections between the YSI 2700 RS-232 port and Port 1 on the Serial Card Termination Block.

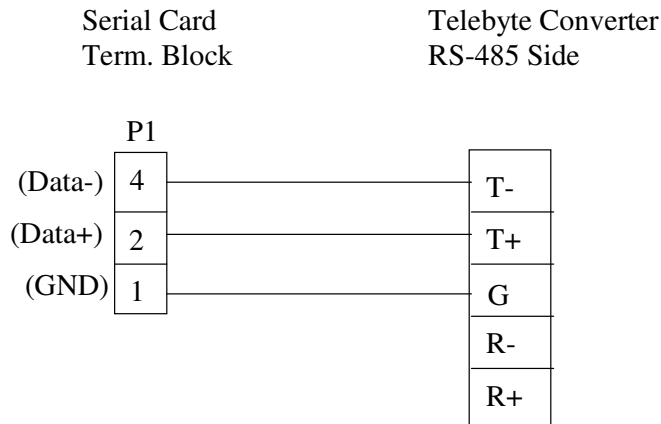


The figure below shows the connection between a B&B Electronics RS-232/RS-485 Converter Model 485COSN and Port 1 on the Serial Card Termination Block using Half Duplex (2-wire) RS-485.





The figure below shows the connection between a Telebyte RS-232/RS-485 Converter Model 365 and Port 1 on the Serial Card Termination Block using Half Duplex (2-wire) RS-485. The Telebyte converter has a bank of dip switches used for RS-485 setup. Left to right, the dip switches should be Closed, Open, Closed, Closed, Open. Switching the third dip switch to open will disable the 220W terminating resistor built into the converter. The DTE/DCE switch should be set to DTE.





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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 address is:

support@mynah.com

Thank you for using DeltaV.