MYNAH℠

Rotork Pakscan Driver for DeltaV Programmable Serial Interface Card

USER MANUAL

Rev. P1.0

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1 INTRODUCTION

1.1 Scope

This document is the User Manual for the Rotork Pakscan serial communication driver firmware for the Emerson Process Management DeltaV Control System; it provides information required to install, configure, and maintain the Pakscan driver firmware on the DeltaV Programmable Serial Interface Card (PSIC). The reader should be familiar with Emerson Process Management DeltaV controller system and the Rotork Pakscan Equipment.

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

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 Rotork Pakscan Driver.
Downloading Firmware	Describes downloading procedures for the Rotork Pakscan Driver firmware on to the DeltaV PSIC
PSIC Configuration	Describes procedures and guidelines for configuring the DeltaV PSIC
Operational Check	Provide tips and assistance to ensure PSIC is properly setup and configured
DeltaV-Pakscan	Describes the electrical interface between DeltaV and the Pakscan
Electrical Interface	Describes the pin assignments necessary for RS-232 communications

1.3 System Specifications

The following table lists the minimum hardware requirements for the Rotork Pakscan Driver:

Table 1 : System Specifications

	Specifications
Firmware	Rotork Pakscan Driver Firmware (P1.0)
Protocol Compatibility	Rotork Pakscan Protocol as defined in the documents faxed by Emerson Australia (from Rajesh Bhave) titled Control of Pakscan Master station By Serial Data Link. Doc. 5146-003, Release 1.5, Originator PK.
Software Requirements	DeltaV System Software (Release 3.1 or later) installed on a hardware-appropriate Windows NT workstation configured as a ProPlus for DeltaV
	Serial Interface Port License (VE4102)
Minimum Hardware Requirements	Emerson DeltaV PSIC Hardware Rev 1.1 or later
	Emerson DeltaV M3 or M5 Controller, Power Supply and 2 wide controller carrier
	Emerson 8 wide I/O card carrier
	Rotork Pakscan master station and outstation 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 Pakscan protocol before operation.

The RS-232 communication settings must be configured properly to ensure accurate communication between the PSIC and Pakscan master station.

This driver communicates with the master station and updates emulated DeltaV I/O with the data received from the PAKSCAN. The primary functions of the driver are listed below:

- Performs data and message handling between DeltaV and Pakscan master station.
- Sends output messages to master station from DeltaV
- Checks validity of messages received from the master station.
- 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 of the master station.

The maximum number of Data Sets (DS) that can be supported by the PSIC depends on the data file type. For integer and discrete data, the limit is 16 per port for a total of 32. Floating point file type require 32 bits per data element, thus reducing to 8 Data Sets per port assuming all data sets to be floating point.

The DeltaV PSIC is the master in all communications. It polls each input device and requests data values on a message by message basis. The output is performed when a new value is to be written to the devices. The PSIC constantly scans the configured input data sets for new values and updates the database. Upon a change of value in the output data set, the PSIC will finish the current input scan and suspend the input process. It will service all the output requests before resuming the input process.

3 Downloading the firmware

Under the DeltaV root directory should be the directory **DeltaV\ctl\ProgSerial.** Create directory **DeltaV\ctl\ProgSerial\PakscanProtocol.**

Next, copy and extract the Pakscan1_0.ZIP file into this folder. There should be eight files extracted:

1200.idf
IO_Compatibility.csv
PakScanApp.sdf
PakScanApp.HEX
SerBoot.hex
SerReleaseApp.hex
StandardModbusApp.sdf
UserManual.doc

Once the files have been extracted, the process of downloading the driver can begin:

1. On the desktop, select the following:

   Start
   DeltaV
   Installation
   Controller Upgrade Utility

2. Select "**Upgrade I/O Modules**" and click the "**Next**" button

3. From the controller list select the controller to which the serial card is attached and click the "**Next**" button

4. Find the list of I/O cards connected to the selected controller. At the bottom of the screen there is an upgrade file path displayed. Click the "**Browse**" button and browse to the directory containing the Pakscan driver. This should be **DeltaV\ctl\ProgSerial\PakscanProtocol**. Click the "**OK**" button to return to the I/O card selection screen

5. Select the Serial Card or ProgSerial Card to be upgraded

6. If the user chooses a standard Serial Card to be upgraded then the card will automatically be upgraded as soon as the "**Next**" button is entered. If the user chooses a Programmable Serial Card, the user will be prompted for the SDF file to use. Browse to and select the proper SDF file (it should be in **DeltaV\ctl\ProgSerial\ PakscanProtocol** directory, and select **PakScanApp.sdf)**. Click the "**Open**" button followed the "**Next**" button to start the upgrade process

7. The Flash Upgrade process should start and the progress will be displayed in the progress window. An upgrade complete message will be displayed upon completion of the upgrade.

4 CONFIGURATION INFORMATION

This section describes the steps necessary to configure the DeltaV PSIC and the Pakscan to obtain proper communication.

4.1 Channel Attributes Block of PSIC

For the PSIC configuration, there is one channel attributes block per data set. There can be up to 16 data sets configured per port for a total of 32 Channel Attribute Blocks per Serial Card. Each Channel Attribute Block contains all the configuration information for a single configured PSIC Data Set.

The two following attributes are unique to the Pakscan driver. All other values are as per the standard serial interface card:

Attribute	Defined Values
DeviceDataType These are the different categories of the commands. They identify what type of control is to be performed by the data set. This value will be used with special data 1 to identify the exact command to be executed for relay, valve, and status types. It is a don't care for global and pump types.	1 = Global Control 2 = Relay Control 3 = Pump Control 4 = Valve Control 5 = Status
SpecialData1 This field specifies the commands to be performed on the outstation. It is a subcategory of the DeviceDataType.	For DeviceDataType 1 and 3: It is don't care or 0 For DeviceDataType 2 (Relay Control): 1 = Relay 1 2 = Relay 2 3 = Relay 3 4 = Relay 4 For DeviceDataType 4 (Valve Control): 1 = Digital Valve 2 = Analog Valve For DeviceDataType 5 (Status): 1 = System Status 2 = Output Status 3 = Digital Status 4 = Analog Status 5 = Alarm Status

The Channel Attributes Block is not a display option on the DeltaV system. It is included in this manual for informational purpose.

Channel Attribute Block				
Attribute	**Position**	**User Configurable**	**Value**	**Description**
SubBlockNum	1	No	1	Sub-Block Identification
PortNumber	2	No	1 or 2	Serial Card Port which this data set is configured for
DataSetIndex	3	No	1 - 16	Data Set index for this ports configuration
DeviceAddr	4	Yes	1 - 255 Default = 1	Rotork Pakscan Slave Device Address to read or write data to or from
DataDirection	5	Yes	0 or 1 Default = 0	Input or Output data set. 0 = Input, 1 = Output
DeviceDataType	6	Yes	0 - 255 Default = 0	Custom Special Device Data Type Code
DeviceStartAddress	7-8	Yes	0 to 65535 Default = 0	Starting address in Custom Device for data set data.
NumberOfValues	9 - 10	Yes	1 to 100 Default = 1	Number of values in the data set.
OutputMode	11	Yes	0 - 255 Default = 0	Custom Special Output Mode
OutputReadBack	12	Yes	0 or 1 Default = 0	Readback Outputs Flag. 0 = Don't Readback 1 = Readback
SpecialData1	13-14	Yes	0 - 65535 Default = 0	Custom Special Data Value #1
SpecialData2	15-16	Yes	0 - 65535 Default = 0	Custom Special Data Value #2
SpecialData3	17-18	Yes	0 - 65535 Default = 0	Custom Special Data Value #3

Channel Attribute Block				
Attribute	**Position**	**User Configurable**	**Value**	**Description**
SpecialData4	19-20	Yes	0 - 65535 Default = 0	Custom Special Data Value #4
SpecialData5	21-22	Yes	0 - 65535 Default = 0	Custom Special Data Value #5
DataType	23	Yes	0 - 9 Default = 0	DeltaV data type which makes up the data set. 0 = Boolean 1 = Discrete 2 = 8 bit signed int 3 = 16 bit signed int 4 = 32 bit signed int 5 = 8 bit uint 6 = 16 bit uint 7 = 32 bit uint 8 = Floating Point 9 = String
DataValue#1	24 - 24+data size	Yes	Default = 0	Current value of the 1st value in the Data Set. The data size is based on the Data type (1 to 4 bytes).
DataValue#2	xx - xx	Yes	Default = 0	Current value of the 2nd value in the Data Set
.	.	.	.	.
.	.	.	.	.
DataValue#n	xx - xx	Yes	Default = 0	Current value of the nth value in the Data Set

4.2 Device And Data Set Configuration

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

4.2.1 Device Address:

The device address attribute is located in the device configuration box under port. It is the master station address, not the outstation address.

4.2.2 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 in the driver because each message packet contains a specific outstation address and outputs only one value for control. For example, to open the valve on outstations 1 and 2 requires two separate output messages for the PSIC, one for each outstation.

4.2.3 DeltaV Data Type:

All data sets must use DeltaV data type 16-bit unit w/ status. Assigning other data types will cause the driver to fail. The status will come into DeltaV as 16 bit UINT and will require Boolean fan out function to read each bit. For analog status, the 16-bit integer contains two 1-byte integers. The upper byte either is reserved or contains the desired value (set point) and the lower byte has the measured value (pv). User will need to create a DeltaV Calculation module to display the 16-bit unsigned integer as two 8-bit integers for these values.

4.2.4 DeviceDataType

This parameter specify the command category for the data set. It identifies what type of control is to be performed by the data set. This value will be used with special data 1 to identify the exact command to be executed for relay, valve, and status types. It is a don't care for global and pump types. They are summarized in the table in section 4.2.10.

4.2.5 Data Start Address

This is the starting address of the data in the data set. This parameter denotes the first Outstation address. The start address differs based on the DeviceDataType parameter. For status and global DeviceDataType, it is a 0. For valve, relay, and pump DeviceDataType, it is a 1. They are summarized in the table in section 4.2.9.

4.2.6 Number of Values

This is the number of registers needed to address all the outstations in the data set. This number is dependent on the DeviceDataType parameter. All the status DeviceDataType except system status requires 33 values because of the master station and 32 outstations. The system status only needs 1 value to display the status of the system. The valve, pump, and relay DeviceDataType require 32 values because master station is not included. The global DeviceDataType only requires 1 value because only master station is involved. They are summarized in the table in section 4.2.9.

4.2.7 Special Data 1

This field specifies the commands to be performed on the outstation. It is a subcategory of the DeviceDataType. They are summarized in the table in section 4.2.10.

4.2.8 Special Data 2 -5

These fields are not used in the driver.

4.2.9 Summary table 1

The table below summarizes the relationship between DeviceDataType, DataStartAddress, and NumberOfValues parameters in the data set.

DeviceDataType	Global	Relay	Pump	Valve	Status
DataStartAddress	0	1	1	1	0
NumberOfValues	1	32	32	32	1 for system 33 for others
R1 applies to	Master station	X	X	X	Master station
R2 applies to	X	O.S. 1	O.S. 1	O.S. 1	O.S. 1
R3 applies to	X	O.S. 2	O.S. 2	O.S. 2	O.S. 2
.					
.					
.					
R31 applies to	X	O.S. 30	O.S. 30	O.S. 30	O.S. 30
R32 applies to	X	O.S. 31	O.S. 31	O.S. 31	O.S. 31
R33 applies to	X	O.S. 32	O.S. 32	O.S. 32	O.S. 32

X = Don't care

4.2.10 Summary table 2

The table below lists the combination of possible data sets with some data set parameters.

Possible Data Set List	Direction	Device Data Type	Special Data1	Data value entered by user
1	Output	1 (Global)	X	0 = clear the previous command (note 1)
				1 = shutdown
				2 = reset
				3 = alarm accept
2	Output	2 (Relay)	1 = Relay1	0 = de-energize
				1 = energize
3	Output		2 = Relay2	0 = de-energize
				1 = energize
4	Output		3 = Relay3	0 = de-energize
				1 = energize
5	Output		4 = Relay4	0 = de-energize
				1 = energize
6	Output	3 (Pump)	X	0 = stop
				1 = start
7	Output	4 (Valve)	1 = digital	0 = stop
				1 = open
				2 = close
8	Output		2 = analog	0 – 255 (0 – 100%)
9	Input	5 (Status)	1 = System	X
10	Input		2 = Output	X
11	Input		3 = Digital	X
12	Input		4 = Analog	X
13	Input		5 = Alarm	X

X = Don't care

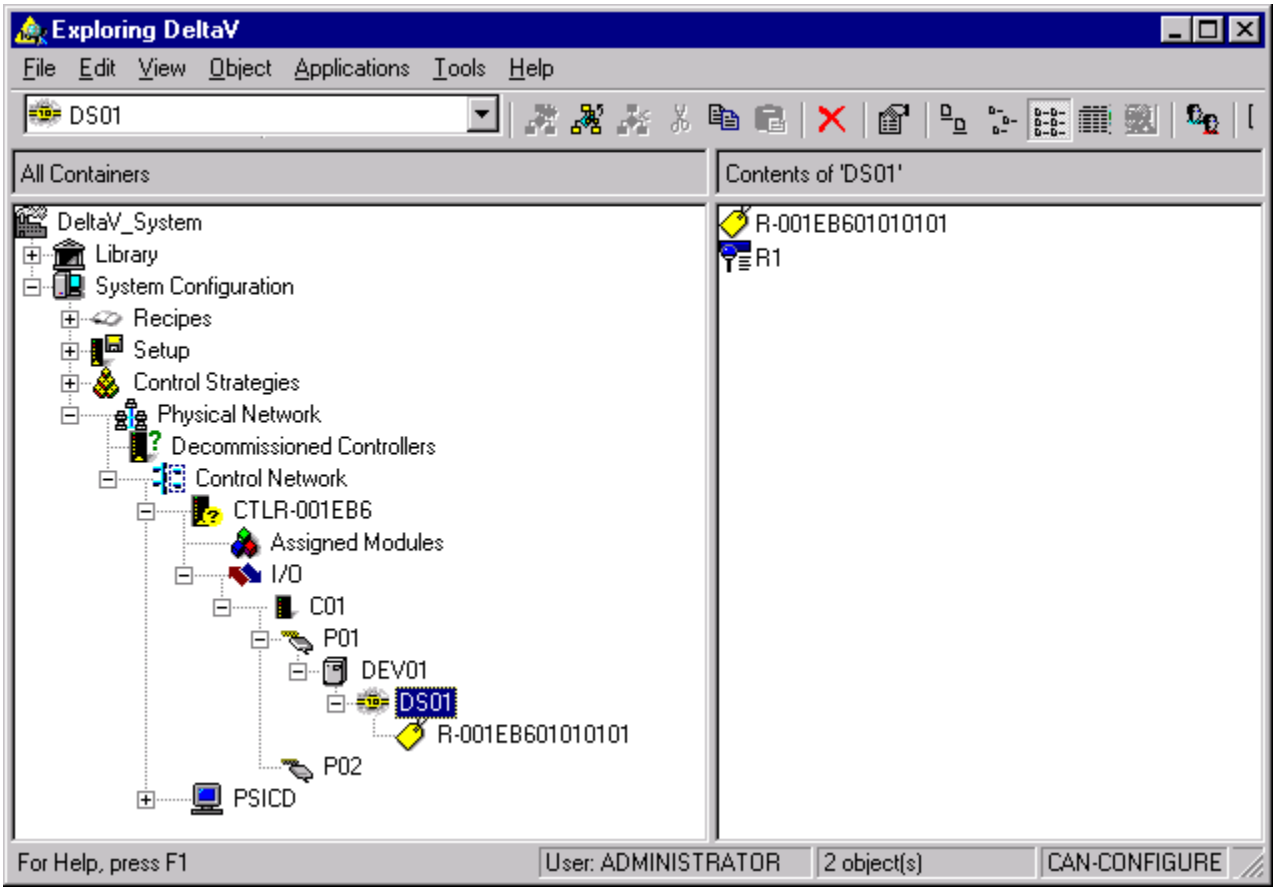
Note 1: After issuing a global command, the user needs to reset the data value to 0 to simulate the push button returning to the de-energized position (one shot command).

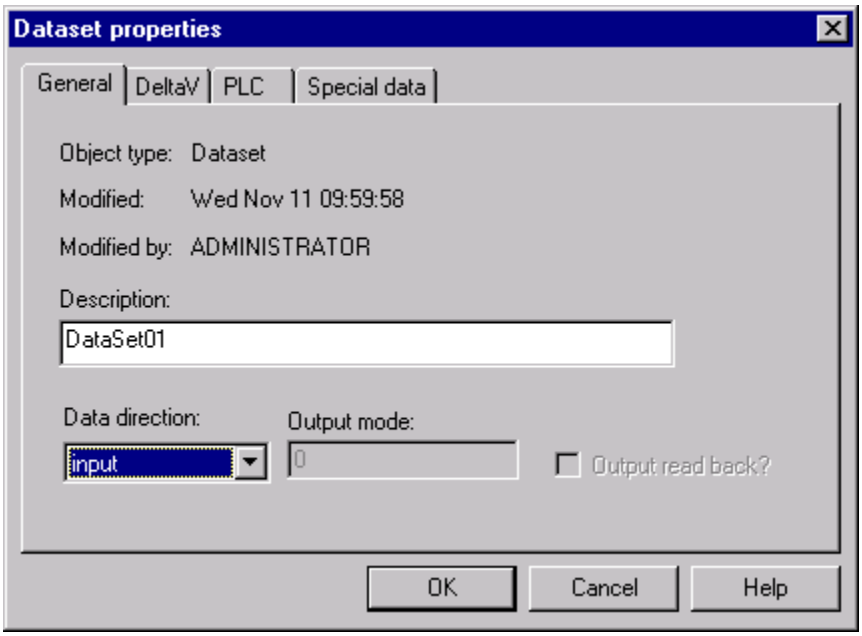
4.2.11 Configuration Examples

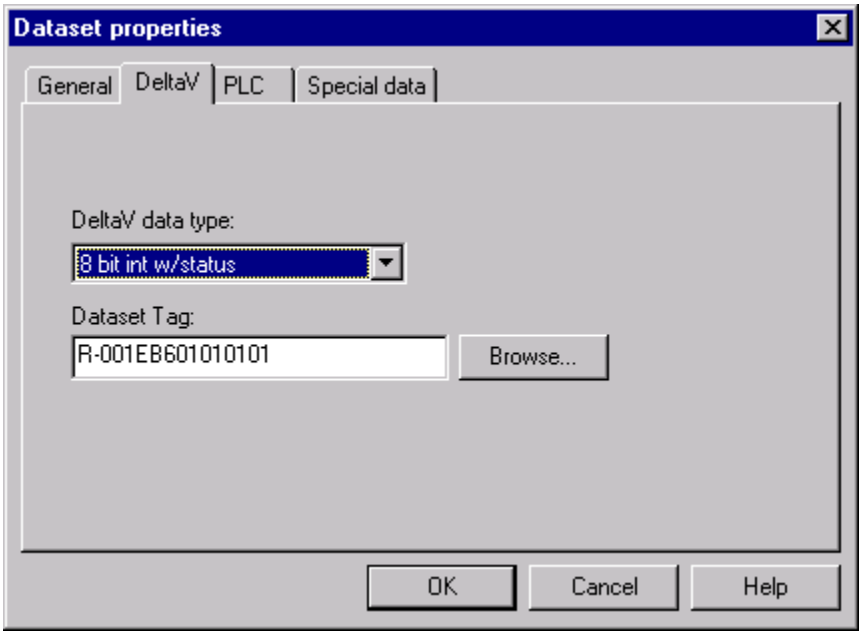
Configuration examples are listed in Appendix A.

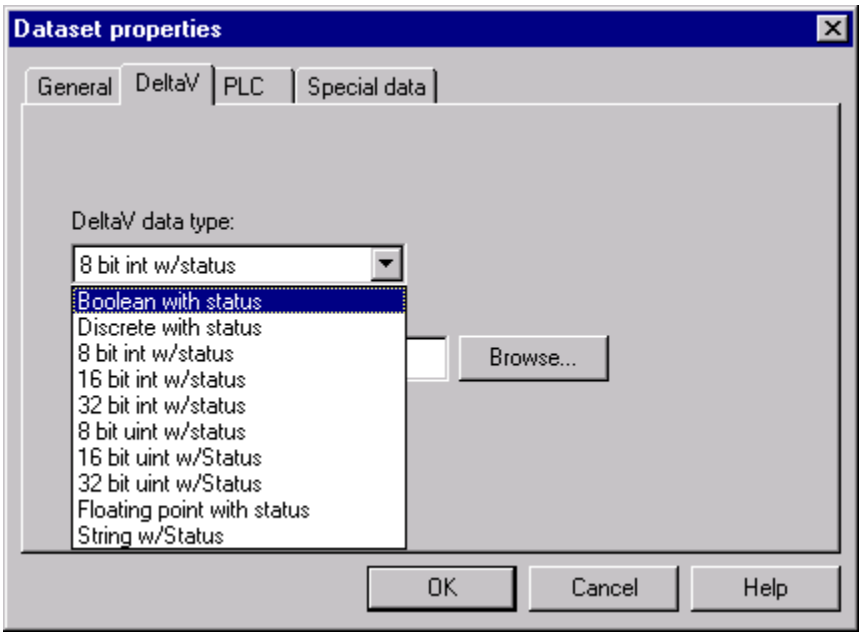
4.3 Data Set Configuration Display

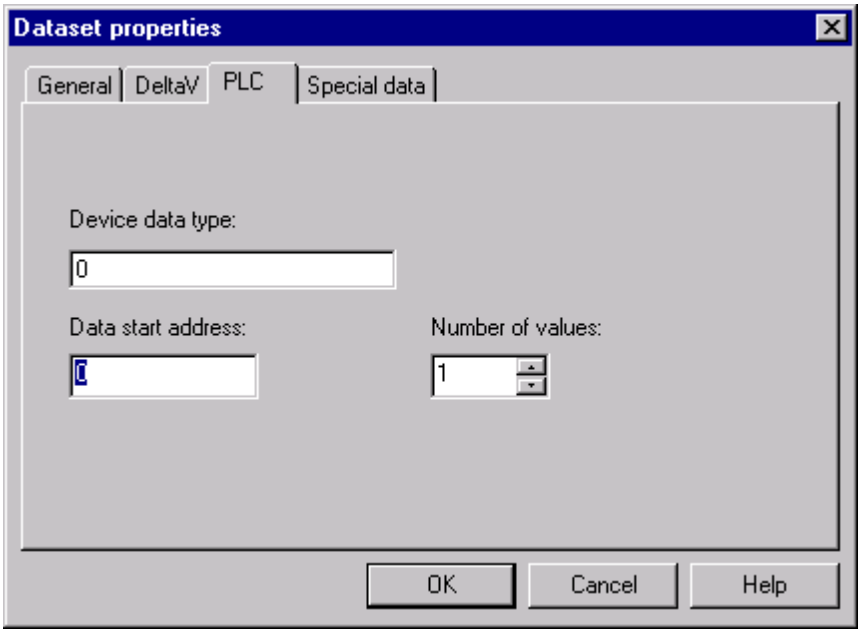
The following DeltaV screens are displayed during a typical PSIC configuration utilizing the above parameters:

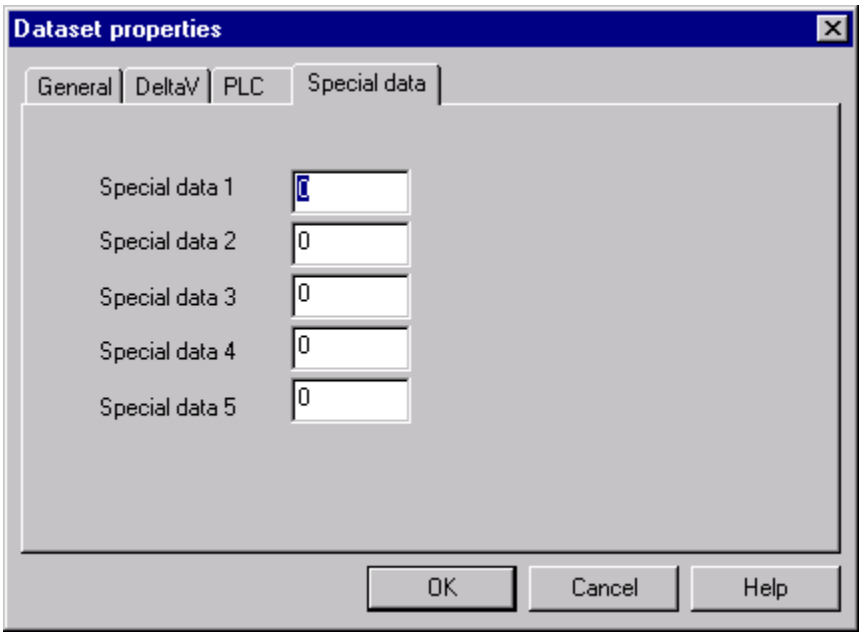



Dataset properties
General
DeltaV
PLC
Special data
Object type: Dataset
Modified: Wed Nov 11 09:59:58
Modified by: ADMINISTRATOR
Description:
DataSet01
Data direction:
input
Output mode:
0
Output read back?
OK
Cancel
Help


Dataset properties
General
DeltaV
PLC
Special data
DeltaV data type:
8 bit int w/status
Dataset Tag:
R-001EB601010101
Browse...
OK
Cancel
Help


Dataset properties
General
DeltaV
PLC
Special data
DeltaV data type:
8 bit int w/status
Boolean with status
Discrete with status
8 bit int w/status
16 bit int w/status
32 bit int w/status
8 bit uint w/status
16 bit uint w/Status
32 bit uint w/Status
Floating point with status
String w/Status
Browse...
OK
Cancel
Help


Dataset properties
General
DeltaV
PLC
Special data
Device data type:
0
Data start address:
0
Number of values:
1
OK
Cancel
Help


Dataset properties
General
DeltaV
PLC
Special data
Special data 1
Special data 2
Special data 3
Special data 4
Special data 5
0
0
0
0
OK
Cancel
Help

4.4 Serial Port Configuration for DeltaV PSIC

In order for proper communication between the Programmable Serial Interface Card and the Rotork Pakscan, the serial port settings on both devices 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 7or 8
- Stop Bits 1 or 2

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 AB 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 Rotork Pakscan 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 Rotork Pakscan 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 Rotork Pakscan master station.

- Verify data set configuration: The data set configured must be one of the thirteen combinations listed in section 4.2.10. User other tables to make sure all parameters are configured correctly.

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 Rotork Pakscan and the PSIC. For input data, the values should be changed in the Pakscan 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 Pakscan.

- To assign a data set and a register in the data set 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 data set tags.
    4. Double click on the desired data set 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 Pakscan 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 - Pakscan Electrical Interface

The electrical interface between DeltaV and the Pakscan conforms to the RS-232 protocol. The cable connecting Pakscan 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. 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

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 - 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 Pakscan in a port. Pins 3 (TXD) and 5 (RXD) need to be crossed so that the Pakscan TXD is connected to PSIC RXD, and the Pakscan 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 Pakscan.

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 address is:
support@mynah.com

Thank you for using DeltaV.

Appendix A Configuration Examples

A.1 Port Configuration Examples:

The port configuration is as follows:

Port tab
- Enabled = checked

Advanced tab
- Protocol type = special
- Master / slave = master
- Retry count = 1
- Message timeout (ms) = 1000
- Transmit delay (ms) = 0
- Send outputs on startup = 0

Communications tab
- Port type = RS232
- Baud rate = 9600
- Parity = odd
- Data bits = 7
- Stop bits = 1

A.2 Data Set Configuration Examples:

The status data set are configured as follows:

System status
- Data direction = input
- Output mode = 0
- DeltaV data Type = 16 bit uint w/Status
- Device data type = 5
- Data start address = 0
- Number of values = 1
- Special data 1 = 1
- Special data 2 – 5 = 0

Output status
- Data direction = input
- Output mode = 0
- DeltaV data Type = 16 bit uint w/Status
- Device data type = 5
- Data start address = 0
- Number of values = 33
- Special data 1 = 2
- Special data 2 – 5 = 0.

Digital status

- Data direction = input
- Output mode = 0
- DeltaV data Type = 16 bit uint w/Status
- Device data type = 5
- Data start address = 0
- Number of values = 33
- Special data 1 = 3
- Special data 2 – 5 = 0.

Analog status

- Data direction = input
- Output mode = 0
- DeltaV data Type = 16 bit uint w/Status
- Device data type = 5
- Data start address = 0
- Number of values = 33
- Special data 1 = 4
- Special data 2 – 5 = 0.

Alarm status

- Data direction = input
- Output mode = 0
- DeltaV data Type = 16 bit uint w/Status
- Device data type = 5
- Data start address = 0
- Number of values = 33
- Special data 1 = 5
- Special data 2 – 5 = 0

This will place the system status word in R1, and the out station status in R2 through R33. The out station address is therefore the register number minus 1. For example, R2 contains status for out station 1, R3 contains status for out station 2, etc.

The valve control data sets are configured as follows:

Valve control

- Data direction = output
- Output mode = 0
- Output read back = unchecked
- DeltaV data Type = 16 bit uint w/Status
- Device data type = 4
- Data start address = 1
- Number of values = 32
- Special data 1 = 1
- Special data 2 – 5 = 0.

This will also place the out stations at the register number minus 1. In this way, R1 is always reserved for input status and the out station addresses are consistent between the data sets.

The global control data sets are configured as follows:

Global control

- Data direction = output
- Output mode = 0
- Output read back = unchecked
- DeltaV data Type = 16 bit uint w/Status
- Device data type = 1
- Data start address = 0
- Number of values = 1
- Special data 1 – 5 = 0

The global commands are always sent to outstation address 0. This makes R1 an outstation 0 or global command register.

The relay control data sets are configures as follows:

Relay control

- Data direction = output
- Output mode = 0
- Output read back = unchecked
- DeltaV data Type = 16 bit uint w/Status
- Device data type = 2
- Data start address = 1
- Number of values = 32
- Special data 1 = relay number
- Special data 2 – 5 = 0

One data set will allow control of relay 1 on up to 32 out stations. Therefore, four data sets will be needed to control all four relays. They will differ only in the value of Special data 1. Relays can be de-energized by writing the SP with 0, and energized by writing the SP with 1.

The pump control data sets are configures as follows:

pump control

- Data direction = output
- Output mode = 0
- Output read back = unchecked
- DeltaV data Type = 16 bit uint w/Status
- Device data type = 3
- Data start address = 1
- Number of values = 32
- Special data 1 – 5 = 0

Pumps can be stopped by writing the SP with 0, and started by writing the SP with 1.

A3 Controlling Out Stations:

Exercising valves: Valves may be manipulated by writing the SP with:

- **0 = stop**
- **1 = open**
- **2 = close.**

The out station address is again the register number minus 1. The master station address is the address assigned to the device when it was added to the port configuration.

Global commands: Global commands are sent by writing the SP with:

- **0 = clear previous command**
- **1 = Emergency shutdown**
- **2 = Reset**
- **3 = Alarm accept.**

It is assumed that the value will be written to 1, 2, or 3, then back to 0 after the command has been sent. DeltaV only notifies the serial card of changes; so setting the **SP** back to 0 allows another assignment to occur. No message is sent to the master station when the value is written back to 0.

Exercising pumps and relays: Pumps and relays may be manipulated by writing the SP with:

- **0 = stop pump or de-energize relay**
- **1 = start pump or energize relay**