

How to connect the Allen Bradley PowerFlex 40 Variable Speed Drive to the the HMS AnyBus Communicator Serial Gateway

Application summary

This document explains the procedure for configuring serial communications between the Allen Bradley PowerFlex 40 variable speed drive and the HMS AnyBus Communicator serial gateway.

Network Note

ControlNet was used on the network side for testing of application. Serial setup will be uniform for all networks.

Application Equipment and Materials

Materials used in the development of this application are as follows:

- Hardware used in test: Allen Bradley ControlLogix 5000 PLC with 1756-CNBR ControlNet Scanner card, HMS AB7006 AnyBus Communicator ControlNet to Serial Gateway, Allen Bradley PowerFlex 40 1.0 HP drive
- Software used in the test: HMS ABC Configurator Software Version 1.81, Rockwell Software RSNetworx for ControlNet, Rockwell Software RSLogix 5000
- Documentation consulted: Allen Bradley PowerFlex 40 User Manual (Publication 22B-UM001B-EN-E), AnyBus Communicator Manual ver. 1.60 (Doc ID SDN-7061-059), AnyBus-S ControlNet Appendix
- Allen Bradley ControlNet Coax Cable, Taps and Terminators
- Appropriate Programming Cables

Serial Cabling

The serial interface between the Allen Bradley PowerFlex and the AnyBus Communicator is accomplished via a 2-wire RS-485 connection. The physical connection to the AnyBus Communicator is through a standard 9-pin D-Shell Connector (male on cable, female on gateway) where pin 8 is the Tx/Rx+ line and Pin 9 is the Tx/Rx- line. Physical connection to the Allen Bradley PowerFlex is through a standard 8-pin RJ45 Modular Connector where Pin 4 is Tx/Rx+ and Pin 5 is Tx/Rx-. A 120 Ohm resistor should be used to terminate the last node on the RS485 network. Cable diagram is shown in figure 1.

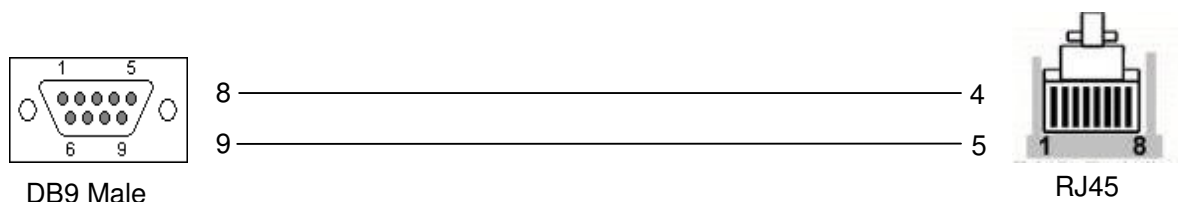


Figure 1

PowerFlex Communications Configuration

The PowerFlex 40 Drive supports Modbus RTU as the serial protocol over RS485. The communication parameters are configured in the drive using the following parameters:

- P036 (Start Source)-This should be set to 5 if the drive is to be started and stopped by a command from the RS485 network.
- P038 (Speed Reference)-This should be set to 5 if the Speed Reference will be controlled over the RS485 network.
- A103 (Comm Data Rate)-Sets the Data Rate for the RS485 network. Value 3 (9600 BPS) is used in this application.
- A104 (Comm Node Addr.)-Sets the node address of the drive on the RS485 network. Each drive must have a unique address. Default value of 100 (64 Hex) is used in this application.
- A105 (Comm Loss Action)-Sets the drives response to a loss of communications or excessive communication errors.
- A106 (Comm Loss Time)-Amount of time to wait before performing action required by A105.
- A107 (Comm Format)-Designates Data Bits, Parity and Stop Bits for communications. Default value of 0 (8, None, 1) is used for this application.

The PowerFlex gives access to five registers over the network. Table 1 shows those registers.

Register No.	Access Level	Description
8192 (2000 Hex)	Write	Drive Control Bits
8193 (2001 Hex)	Write	Speed Reference
8448 (2100 Hex)	Read	Drive Status Bits
8451 (2103 Hex)	Read	Output Frequency
8449 (2101 Hex)	Read	Drive Error Bits

Table 1

Configuring the AnyBus Communicator

The AnyBus Communicator needs to be configured to match the serial parameters of the PowerFlex and the Modbus commands need to be constructed to write and request data to and from the drive. The PowerFlex supports Modbus Command Types 03 (Read Holding Register) and 06 (Preset Single Register). This is accomplished using the Microsoft Windows™ Based HMS ABC Configuration Tool.

Listed Below is a step by step process for setting up the Communicator:

1. Start software in Windows™ by selecting Start>Programs>HMS>ABC Config Tool>ABC Config Tool
2. A window appears offering the option of Modbus Master Wizard or Blank Configuration, choose Blank Configuration. Note: Modbus Master Wizard is used only with devices that support Modbus Commands 03 (Read Holding Register) and 16 (Preset Multiple Registers).
3. The next window to appear will be the main configuration screen. The first step is to select which Fieldbus will be used. In this case select ControlNet as shown in Figure 2.

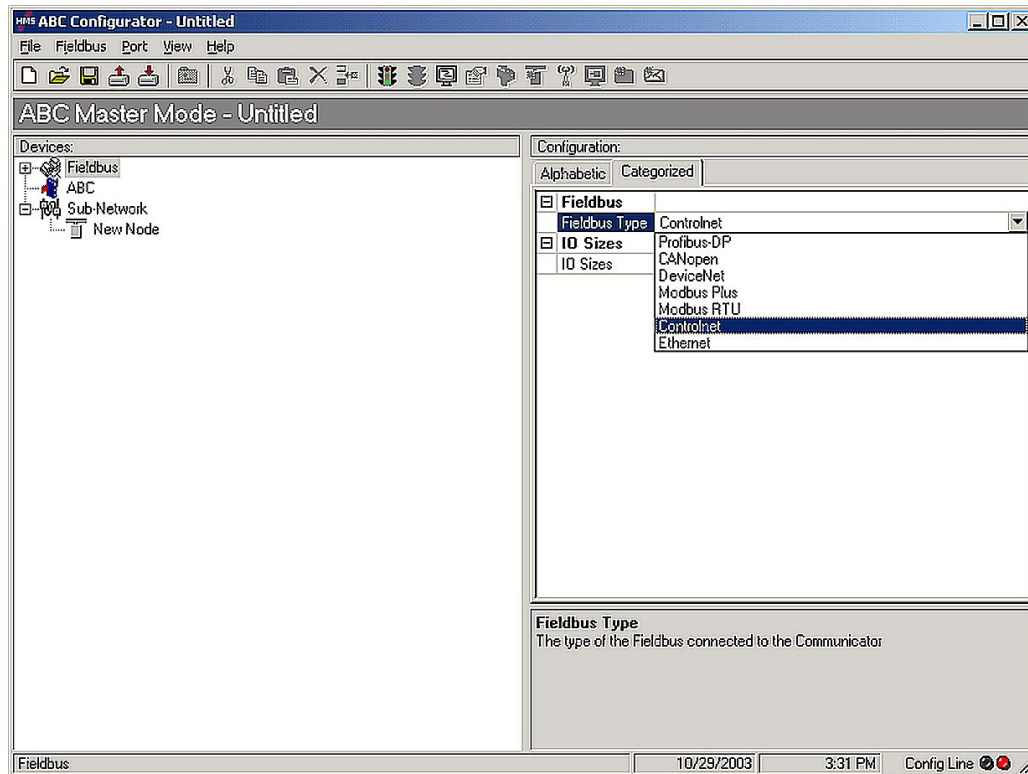


Figure 2

4. Leave the I/O size as Automatic. This allows the Configurator to automatically set the Fieldbus I/O size to match the size of the data coming in and going out.
5. Left-click on ABC Icon, verify that Protocol is set to Master Mode.
6. Next step is to set the Serial Hardware Parameters. Left-click on the Sub-Network icon to view the parameters. Change Physical Standard to RS485 and change remaining parameters (Baud, Data Bits, Parity and Stop Bits) to match drive settings.
7. Next step is to insert the nodes of the drives on the network and to set up the Modbus commands for each node. The software defaults to one node on the network set for address 1. To add nodes, right click on Sub-Network Icon then select Add Node. Configure the Node Address on the RS485 network. The Communicator supports up to 31 Nodes per Communicator. In this application we are using one node with an address of 100 (64 Hex).

8. Next step is to add Modbus commands to each node on the network. Select then right-click on the node under Sub-Network then select Add Command. A table of Modbus Commands will appear as shown in Figure 3.

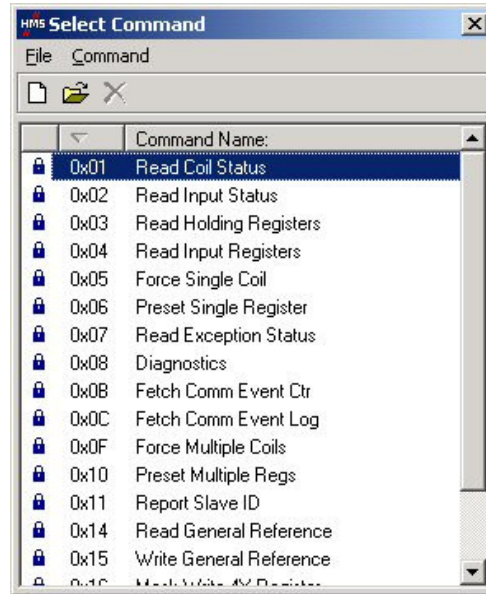


Figure 3

9. To read the Output Frequency from the drive, select 0x03 for Read Holding Registers. You should have two icons labeled Query and Response under the folder icon Read Holding Register as shown in Figure 4.

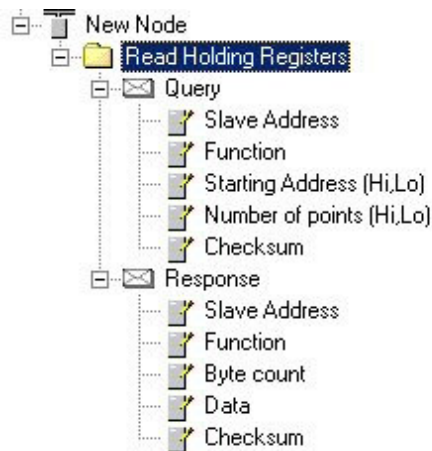


Figure 4

10. The next step is to edit the Starting Address (under Query) for the command which will be the hexadecimal equivalent of register 8451 (Output Frequency) listed in the Allen Bradley PowerFlex Manual. (8451=2103 Hex)
11. Indicate the number of registers to be read under Number of Points. For this application a value of one is used since only one register is being read.

12. Under the Response icon, the value for Byte Count should be set to 2 bytes to match the number of data bytes being read.
13. Under the Response icon and in the field marked Data, set the Data Length to 2 bytes and the Data Location to 0x0002 (This is the internal memory location in the Communicator that will be read by the ControlNet Network Master). Note: The starting byte address is 0x0002 due to the existence of Communicator status bytes in 0x0000 and 0x0001. If Status and Control registers are disabled then the starting address for network data is 0x0000. Consult the AnyBus Communicator Manual for further explanation of Status and Control Registers.
14. If needed set the Byte Swap to Swap Two Bytes, the data is normally copied into the table as High Byte/Low Byte but may need to be written in as Low Byte/High Byte in order to be read properly by the network master.
15. Set the Checksum to CRC per Modbus standard.
16. Next step is to set up the Communicator to write the speed reference to the drive. Right-click on the node and select Add Command then select 0x06 for Preset Single Register. Once again, two fields will appear labeled Query and Response though the subfields will be different as shown in Figure 5.

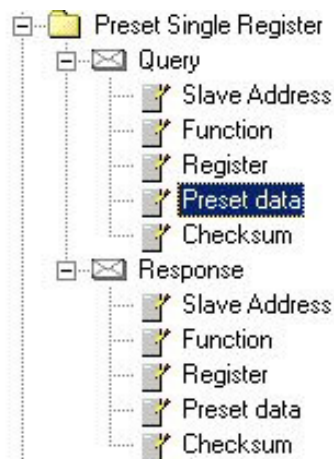


Figure 5

17. The Query will execute the parameter write to the drive and the Response will carry the success or failure of the task.
18. Under the subfield Register, the value should be set to the Hexadecimal equivalent of register 8193 (Speed Reference) listed in the Allen Bradley PowerFlex Manual. (8193=2001 Hex)
19. The subfield Preset Data contains the number of bytes to be written out the serial port and the internal memory location of the data to be written. The Data Length should be set to 0x0002 and the Data Location should be set 0x0202 (These two bytes will be written to by the ControlNet Network Master). Note: The starting byte address for data writes is 0x0202 due to the existence of Communicator Control bytes in 0x0200 and 0x0201. If Status and Control registers are disabled then the starting byte address for data writes is 0x0200. Consult the AnyBus Communicator Manual for further explanation of Status and Control Registers.

20. If needed, set the Byte Swap to Swap Two Bytes, the data is normally retrieved from the data table as High Byte/Low Byte but may need to be written in as Low Byte/High Byte in order to be written to properly by the network master.
21. Set Checksum to CRC per Modbus RTU standard.
22. The only subfield to edit under Response is Preset Data where Data Length should be set to two bytes and Data Location should be set to 0x0400. Note: 0x0400 is an internal memory location used for non-network data. Consult AnyBus Communicator Manual for more information on internal memory mapping.
23. Repeat steps for remaining registers in PowerFlex.

Download the configuration to the AnyBus Communicator and connect the serial cables. System should begin to communicate serially. The Sub-Network LED should be solid green. If problems exist, verify cable connection and make sure the communication parameters match between the Guard PLC and the AnyBus Communicator. If troubles continue, call HMS Industrial Networks at (773) 404-3486 for technical support.

Web References:

- www.hms-networks.com, www.ab.com