LISTEN. THINK. SOLVE.℠

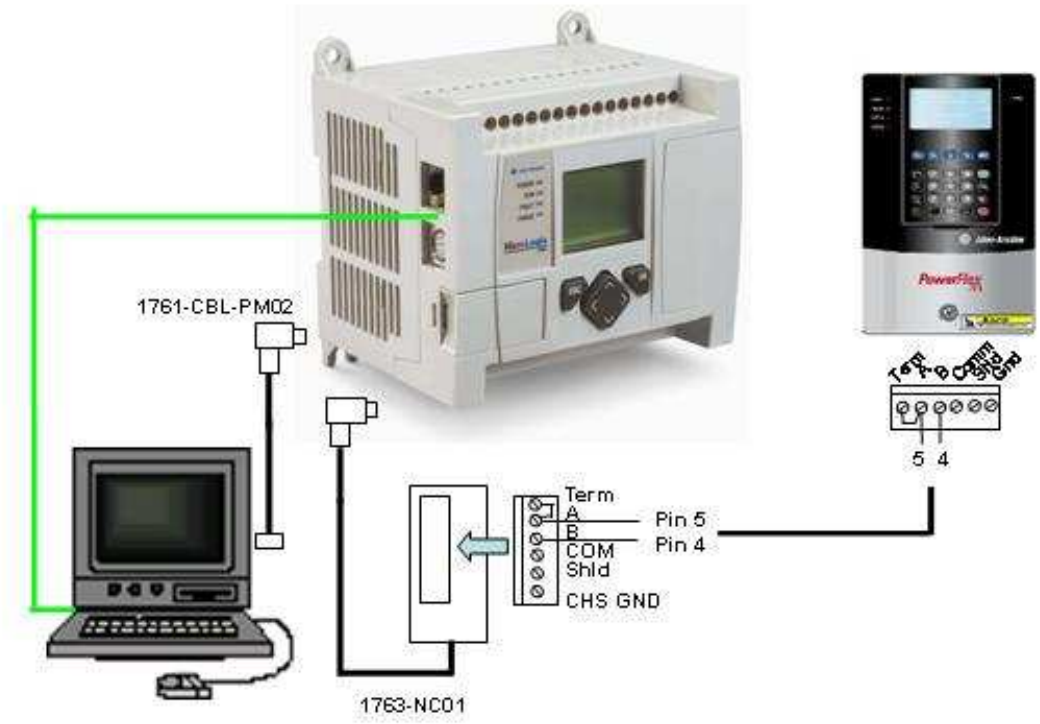
Rockwell Automation

PowerFlex 70 Drives on Modbus RTU with MicroLogix 1100

Overall Description

PowerFlex 7 class drives can be controlled over Modbus RTU using the 20-COMM-H communication adapter. This application note details the Micrologix 1100 plc being used as Modbus RTU master to control the PowerFlex drive.

The MicroLogix 1100 has an embedded multi functional LCD for on-line editing, and EtherNet/IP for connecting to an peer to peer network or our programming PC. The PowerFlex drive being used in this test is a PowerFlex70 setup as Node 3.



Equipment used for test

MicroLogix 1100 1763-L16AWA
RSLogix500 CPR ver 7 and RSLinx ver 2.50
PowerFlex 70 drive, single phase with 20-COMM-H communication adapter
1761-CBL-PM02 ser B, PC to MicroLogix programming cable
1763-NC01 The phoenix plug pin connectons are the same as the RS485 on the NET-AIC

Distribution:
- [x] Open
- [ ] Rockwell Offices
- [ ] Drives Team
- [ ]

Related to:
- [x] Inverter Use
- [ ] Options Use
- [ ] Application Experience

_____(Name) only

Generated by	D.J.Withenshaw
Date	05/09/2007
Revision	A

Drive Parameter setup

Drive parameters need to be setup as below.

Parameter	Details	Value
90 [Speed Ref A Sel]	Start source from Network	22= DPI Port 5

20-COMM-H Parameter setup

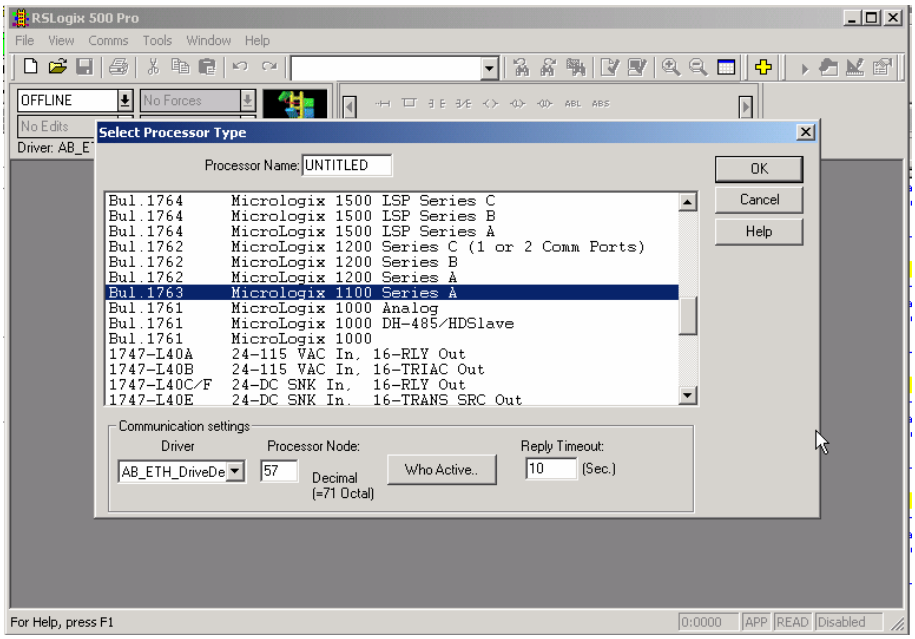
The adapter is assumed at default parameters, so the following adapter parameters need to be setup. The rotary switches on the front of the card, are setup for Modbus RTU at Node address 3. Reset the adapter by cycling power to the drive when done.

Parameter	Details	Value
5 [Net rate Cfg]	Baud Rate of network	4 = 19200b
30 [Stop bits cfg]	Number of stop bits in Modbus RTU	0 = 1 bit

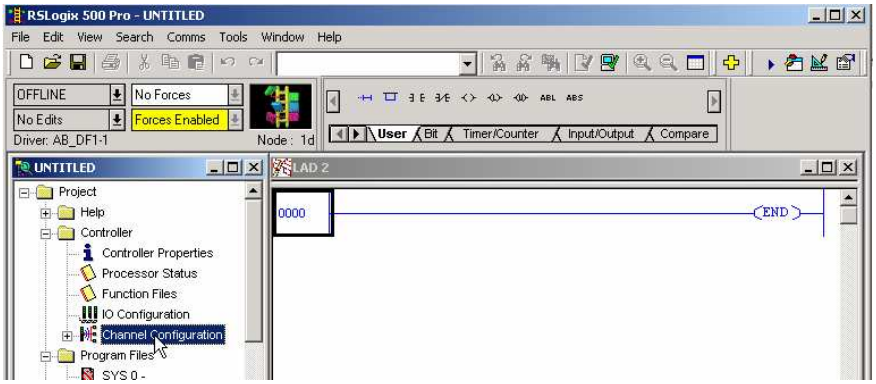
MicroLogix Setup

The MicroLogix 1100 needs to be setup first using the serial cable 1761-CBL-PM02 on channel 0.
If when connecting to the ML1100 an error is reopted that it is not an SLC, then upgrade RSLogix to ver 7 and RSLinx to ver 2.50.

Startup RSLogix500 and create a new project with the Micrologix 1100



Select channel configuration



Distribution:

- [x] Open
- [ ] Rockwell Offices
- [ ] Drives Team
- [ ]

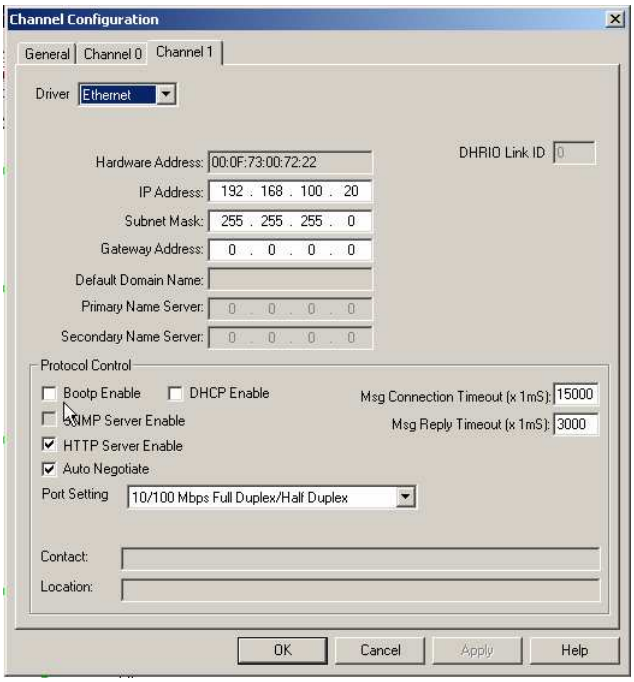
Related to:

- [x] Inverter Use
- [ ] Options Use
- [ ] Application Experience

_____(Name) only

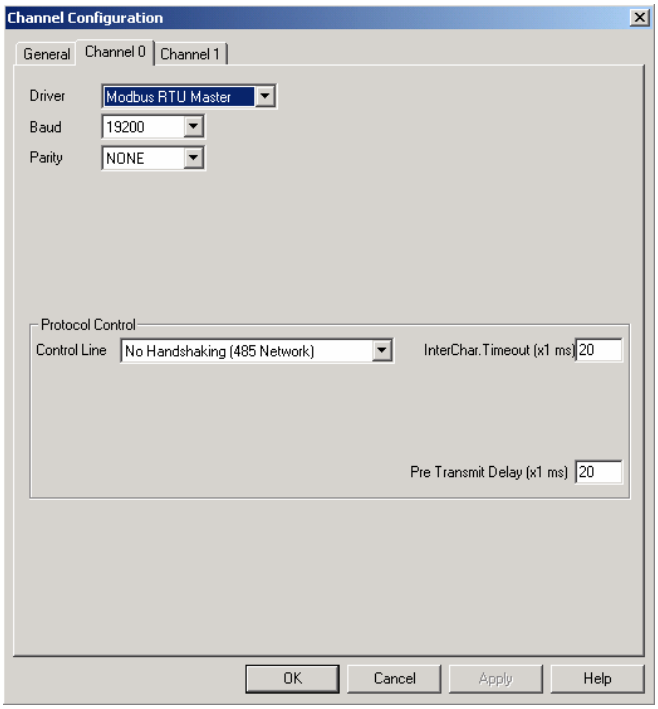
Generated by	D.J.Withenshaw
Date	05/09/2007
Revision	A

Setup Channel 1 EtherNet IP address and subnet. Make sure you uncheck the BootP enable, and then download to the controller.. To make the IP address stick, cycle the power on the ML1100.



Now we have the IP address in the ML1100, then we can reconfigure our computer and go-line using the EtherNet connection. This will allow us to remove the serial cable 1761-CBL-PM02 on channel 0, and use plug in the 1763-NC01 and reconfigure Channel 0 for Modbus RTU.
Additionally ensure that the settings within the ML1100 are setup on the LCD:
ESC …. Scroll down ….. Advance Set …… DCOMM Cfg = disable

Change to cable 1763-NC01, and select the channel configuration as before.
Setup channel 0 to be Modbus RTU master at 19200 with no parity



Make sure you adjust the protocol control from the default No handshaking to No handshaking (485 network) and the timeouts /delays to 20ms.

Download configuration to controller using the EtherNet connection.

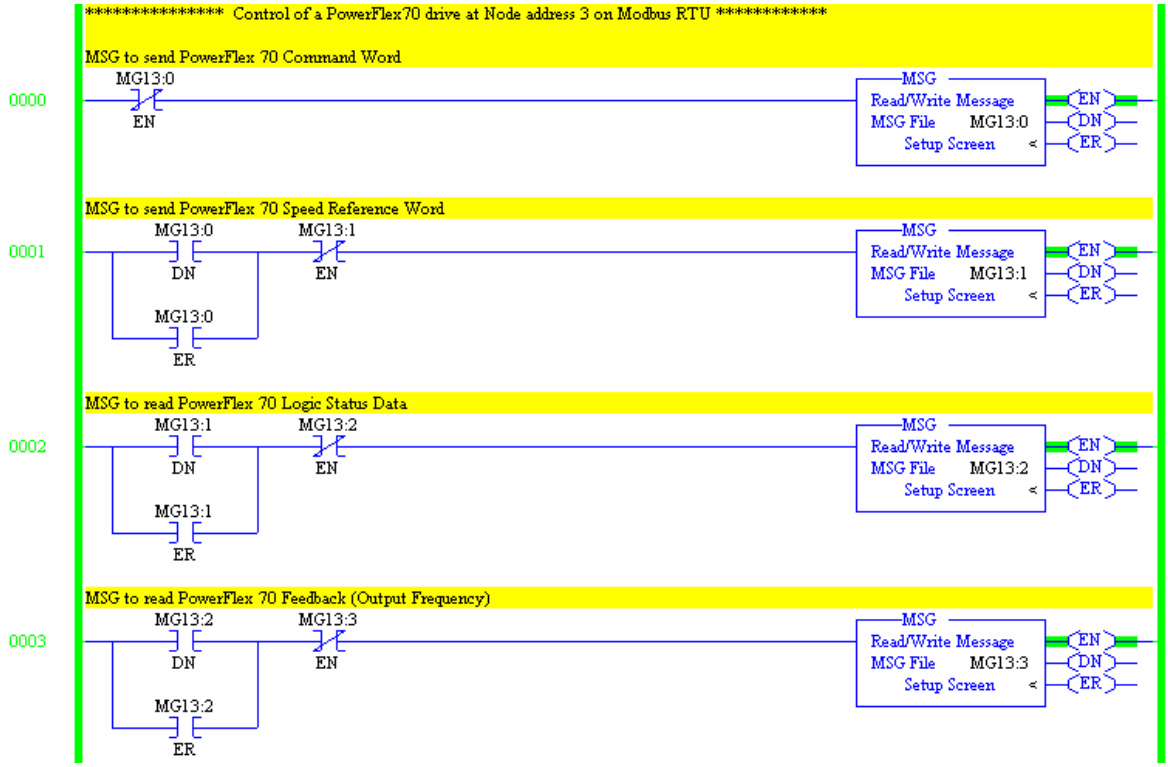
Once the ML1100 is in run mode, both COMM0 and COMM1 will be flashing fast

Distribution:
- [x] Open
- [ ] Rockwell Offices
- [ ] Drives Team
- [ ]

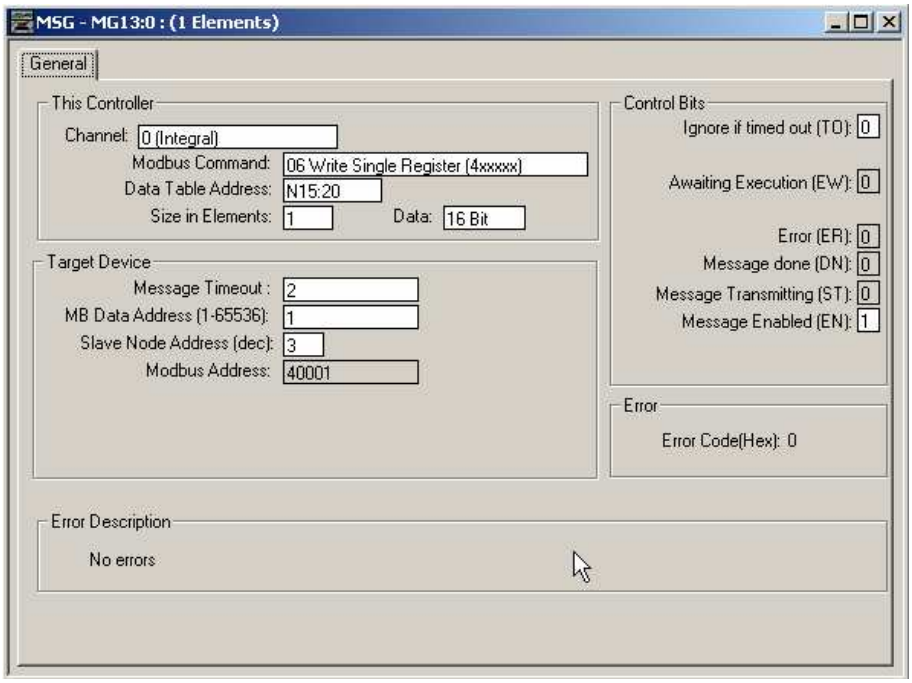
Related to:
- [x] Inverter Use
- [ ] Options Use
- [ ] Application Experience
- _____(Name) only

Generated by	D.J.Withenshaw
Date	05/09/2007
Revision	A

The ML1100 communicates with the drive using MSG instructions on Modbus RTU. So we create a number of MSG instructions for the Logic control, reference , logic status and drive speed feedback..



The logic command data will be stored in N15:20, so configure the message to send N15:20 to the Modbus address for the logic command at address 1 (this means modbus sends to address 40001)



Distribution:

- [x] Open
- [ ] Rockwell Offices
- [ ] Drives Team
- [ ]

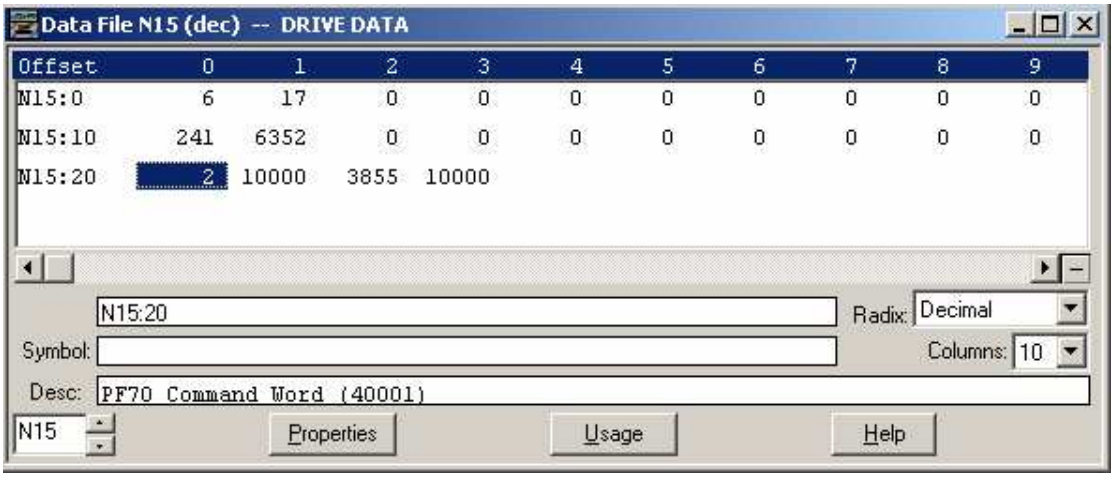
Related to:

- [x] Inverter Use
- [ ] Options Use
- [ ] Application Experience

_____(Name) only

Generated by	D.J.Withenshaw
Date	05/09/2007
Revision	A

When the program is downloaded, we can toggle the logic to provide a start and stop to be sent to N15:20 bits 0 & 1 in the logic command word. Double click on the N15 data file, and change the value of N15:0 to 2. The drive will now start. Changing the value of N15:0 to 1 will stop the drive.



The bits to control the drive are detailed below.

Figure A.1 Logic Command Word

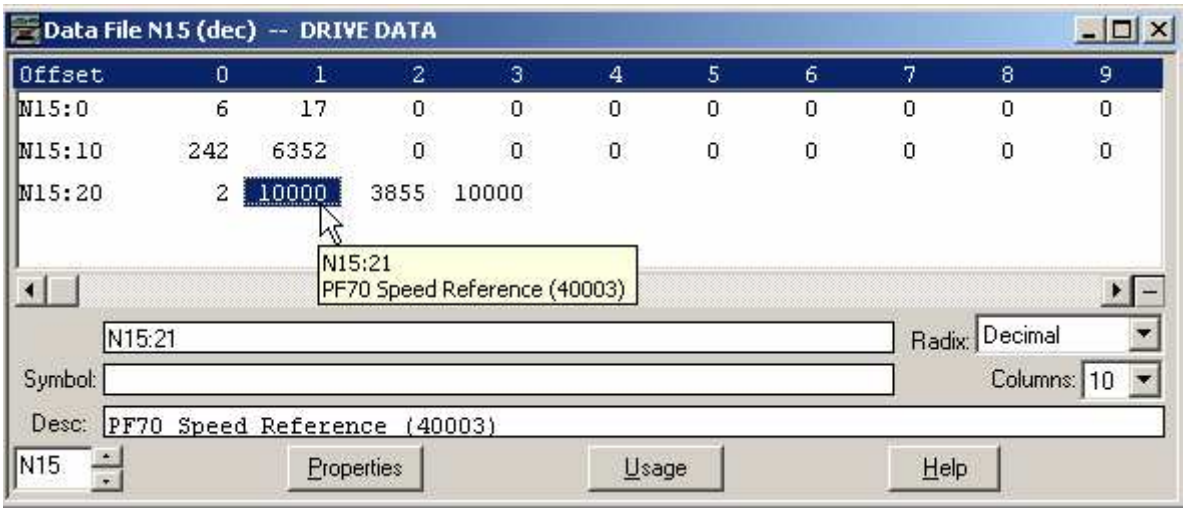
Logic Bits															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Command	Description
															x	Stop[1]	0 = Not Stop 1 = Stop
														x		Start[1][2]	0 = Not Start 1 = Start
													x			Jog	0 = Not Jog 1 = Jog
												x				Clear Faults	0 = Not Clear Faults 1 = Clear Faults
										x	x					Direction	00 = No Command 01 = Forward Command 10 = Reverse Command 11 = Hold Present Direction
									x							Local Control	0 = No Local Control 1 = Local Control
								x								MOP Increment	0 = Not Increment 1 = Increment
						x	x									Accel Rate	00 = No Command 01 = Use Accel Time 1 10 = Use Accel Time 2 11 = Use Present Time
				x	x											Decel Rate	00 = No Command 01 = Use Decel Time 1 10 = Use Decel Time 2 11 = Use Present Time
	x	x	x													Reference Select[3]	000 = No Command 001 = Ref. 1 (Ref A Select) 010 = Ref. 2 (Ref B Select) 011 = Ref. 3 (Preset 3) 100 = Ref. 4 (Preset 4) 101 = Ref. 5 (Preset 5) 110 = Ref. 6 (Preset 6) 111 = Ref. 7 (Preset 7)
x																MOP Decrement	0 = Not Decrement 1 = Decrement

The plc MSG 13:1 sends the reference to the drive on address 2 via N15:21. Therefore change the value of N15:21 between 0 to 32767 = 130.0Hz.

Distribution:
- [x] Open
- [ ] Rockwell Offices
- [ ] Drives Team
- [ ]

Related to:
- [x] Inverter Use
- [ ] Options Use
- [ ] Application Experience
- _____(Name) only

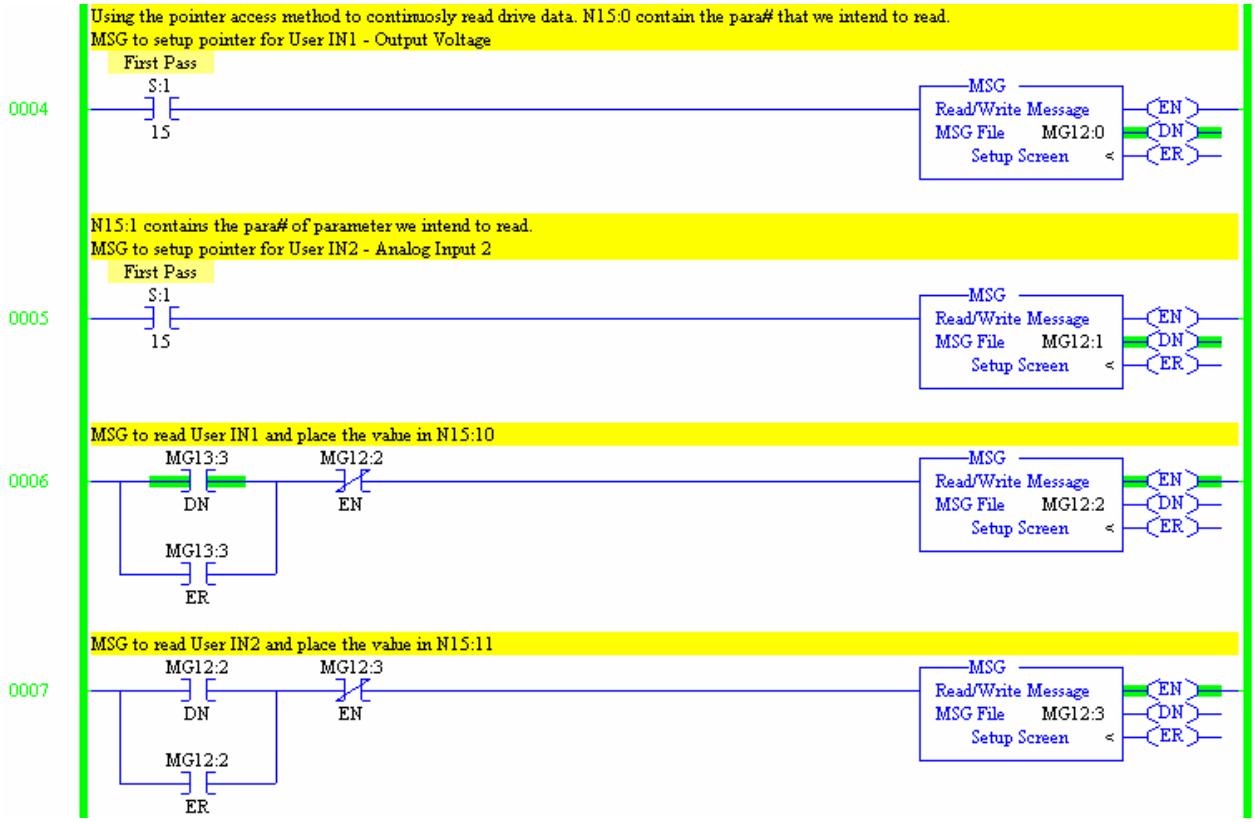
Generated by	D.J.Withenshaw
Date	05/09/2007
Revision	A



The method of control above uses the direct access method, whereby specific registers are used. Modbus RTU also supports a Pointer Access method to read parameters in the drive. The pointer (the parameter number you want to read) needs to be setup in the User IN1 to 8 register (40004 – 11), then you can continuosly read the parameter data at the User IN1 to 8 register inputs (30004 – 11).

The advantage of using this method, is that you can change the pointer to the parameter you want dynamically in the user program, thereby you could read and store the full parameter set of the drive.

The program below demonstrates how this works, although to keep things simple, the pointer is loaded with just 1 parameter number at startup.



Distribution:

- [x] Open
- [ ] Rockwell Offices
- [ ] Drives Team
- [ ]

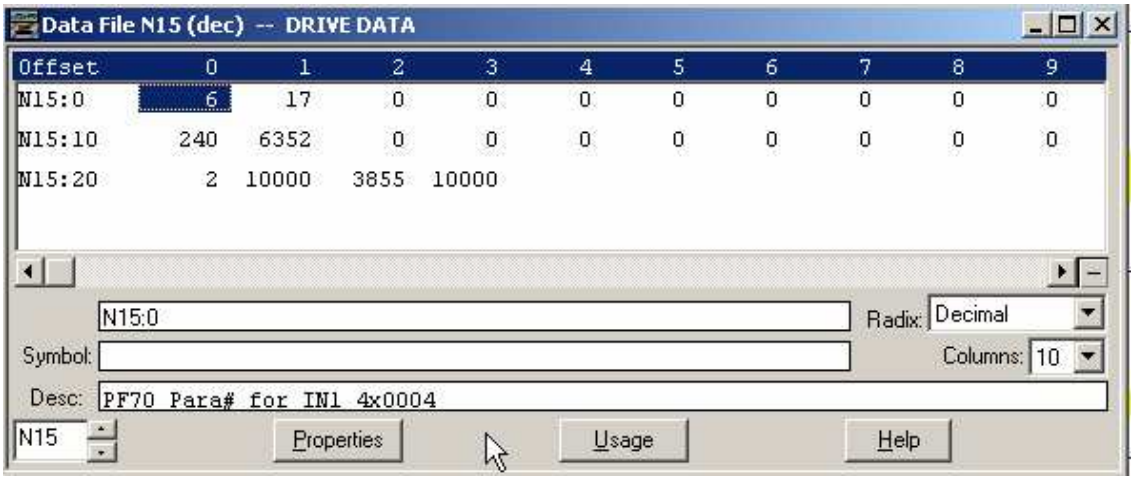
Related to:

- [x] Inverter Use
- [ ] Options Use
- [ ] Application Experience

_____(Name) only

Generated by	D.J.Withenshaw
Date	05/09/2007
Revision	A

The MSG MG12:0 loads the value of N15:0 into User IN1 40004. In the example below it is set to the value of 6, which is the drive Output Voltage.



The MSG MG12:1 loads the value of N15:1 into User IN2 40005. In the example below it is set to the value of 17, which is the drive Analog Input 2

The MSG MG12:2 reads the value of User IN1 30004 and stores it in N15:10. In the example below it is a value of 240 which is 24.0 Volts, and the Analog Input 2 at N15:10 is 6342 is 6.342 Volts (the input is scaled 0-10V).

The program associated with this test is called PFLEX7_USING ML1100_ON_MODBUS_RTU.RSS