



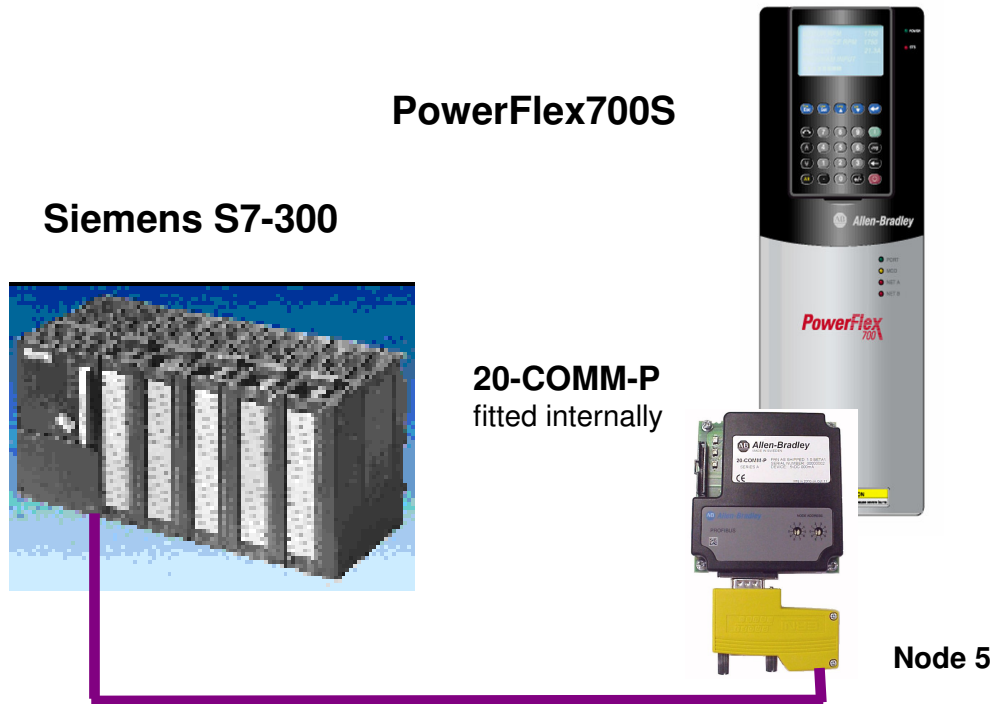
PowerFlex 700S & 20-COMM-P Adapter using Siemens S7-315 DP PLC

March 30, 2006

Purpose

The purpose of this document is to provide set-up and programming details of the PowerFlex 700S drive and the 20-COMM-P Profibus-DP interface using the Siemens S7-315 DP platform.

All the operation detailed below assumes the user is familiar with the programming of Siemens PLC's with Step7 software.



The PowerFlex 700S drive uses 16 bit logic control/status words, and 32 bit reference, feedback and datalinks.

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Revision	A

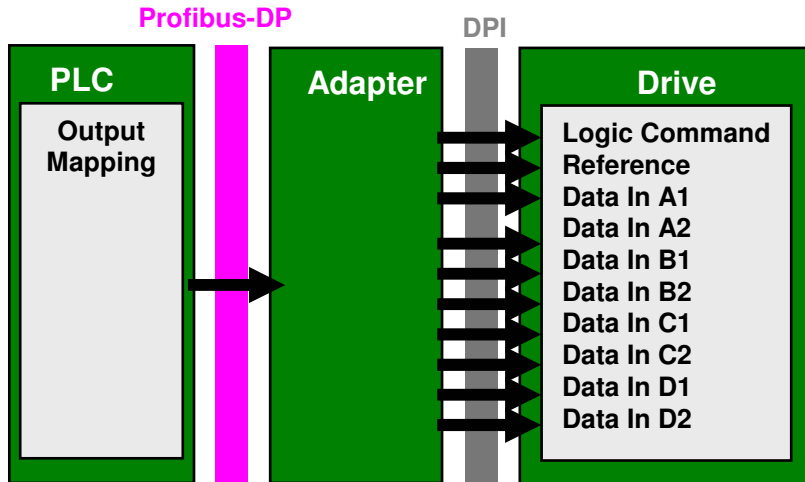
Drive Control Overview

On PROFIBUS, I/O messaging is used to transfer the data which controls the PowerFlex drive and sets its Reference. I/O can also be used to transfer data to and from Datalinks in PowerFlex drives.

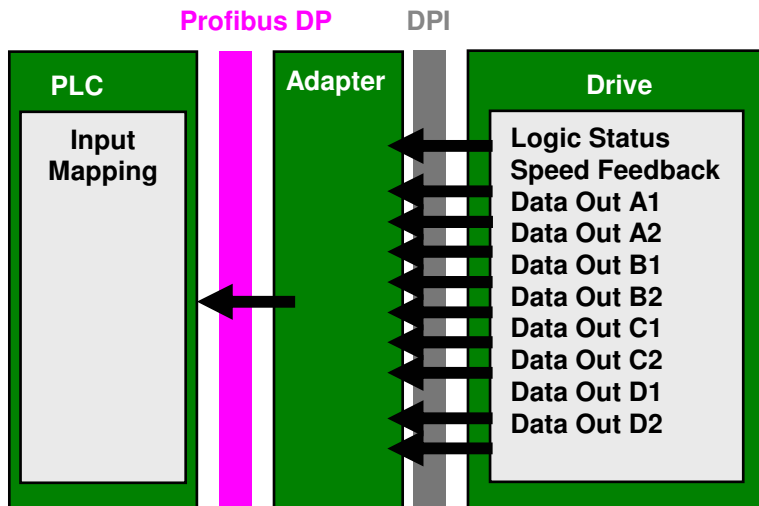
The Logic Command word from the PLC contains 2 bytes of data, whereby each bit has a control significance. See User Manual 20-COMM-P Appendix C. So we can start / stop the drive by changing the relevant bits in the Logic Command word.

The drive reference is a 32 bit real value scaled according to the [Motor NP RPM] parameter of the drive.

A 20-COMM-P drive adapter supports up to 4 datalinks, which can be initialized by a parameter in the adapter. Each datalink passes 2 parameters to the drive AND 2 parameters from the drive. Unlike all the other PowerFlex '7' class drives, the datalinks passes data *direct* to/from the DPI Data In/Out parameters in the drive. This raw data can then be linked to different parameters in the drive.



The Logic status from the drive provides feedback on the operational condition of the drive. See User manual Appendix C.



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Initial Set-up

- Set switches on the Master 20-COMM-P to a Node Address of “05”.
- This setup assumes that the PowerFlex 700S and the 20-COMM-P interface are at their default settings.

Note: The Parameter Access Level on each drive needs to be set to “Advanced” in order to access some of the parameters used in this application note. To do so, perform the following steps:

1. Select “Parameter”, then [Enter]
2. Select “Utility”, then [Enter]
3. Select “Drive Memory”, then [Enter]
4. Select “Param Access Lvl”, then [Enter]
5. Press the [Sel], select “Advanced” and press [Enter]

- Connect Profibus DP cable plug, and screw plug fasteners home to ensure earth continuity.
- Note that as this is the only drive being used, the plug terminators are switched on at the drive and the PLC.
- In this application note the drive is setup with the following drive parameters

27	Speed Ref A sel	DPI Port 5	Select the source of the speed ref to the 20-COMM-P
3	Motor NP Hz	50.0 Hz	Scales the drive to 50Hz
4	Motor NP RPM	1400	Scales the drive to 1400 rpm

- Setup the following 20-COMM-P parameter.

11	DPI I/O Config	xxxx xxxx xxx0 00 11	Enabling Datalink A
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- Cycle power to the drive.

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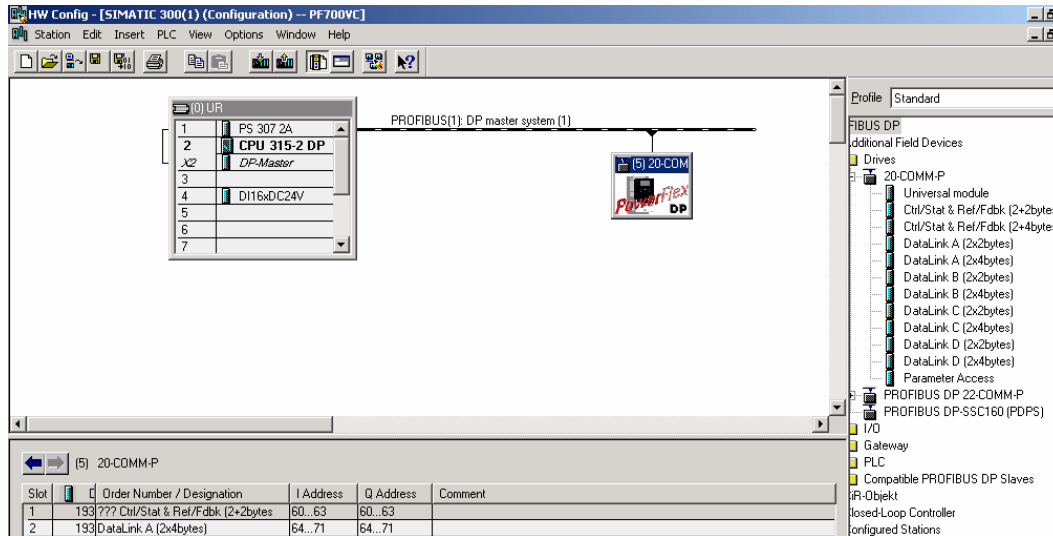
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Control the Drive

Power up the drive and PLC, and startup the Step7 programming software.

Install the GSD file A_B_0572.GSD into the hardware catalogue. Drag the 20-COMM-P from the hardware catalog, onto the Profibus DP master system.



Configure the 20-COMM-P adapter as Node 5, and as the Control, status are 16bit, and the Ref, and feedback are 32 bit, we configure as 2+4 bytes for the input and output addresses 60 to 65. As the datalinks are 32 bit, we will use the 2+4 bytes, and so the adapter is configured 66-73 for DataLink A.

	Drive OutPut										Drive Input												
Bits/Add	15										0	15											0
60 & 61	Logic Status										Logic Control												
62 & 63	Feedback (LSW)										Reference (LSW)												
64 & 65	Feedback (MSW)										Reference (MSW)												
66 & 67	Datalink out A1 (LSW)										Datalink in A1 (LSW)												
68 & 69	Datalink out A1 (MSW)										Datalink in A1 (MSW)												
70 & 71	Datalink out A2 (LSW)										Datalink in A2 (LSW)												
72 & 73	Datalink out A2 (MSW)										Datalink in A2 (MSW)												

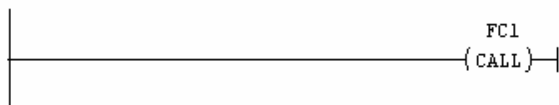
The main control block OB1, is used to call the different control programs FC1 & FC3.

OB1 : Title:

Comment:

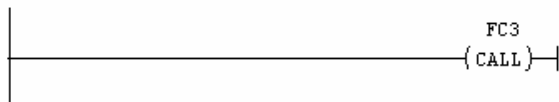
Network 1: Logic Control and reference generator

Comment:



Network 2: Read and Write datalinks

Comment:



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FC1 contains the run logic, and the reference ramp generator to control the speed of the drive. The screens below are shown in monitor mode (solid line means logic = true).

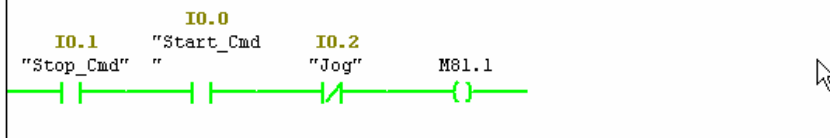
The logic shows the drive running in the forward direction. See User Manual Appendix C for the significance of the logic command and status bits.

FC1 : PowerFlex700S with a 20-COMM-P set to Node address 5

The program controls a PowerFlex700S on a Siemens S7-315DP processor. The drive is setup with logic control, reference, logic status, feedback (2+4 bytes) and one datalink which gives A1 and A2 only (2+4 bytes).

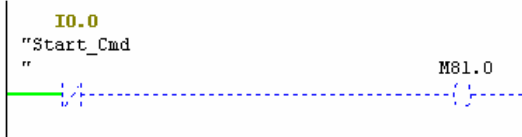
Network 1 : Start Logic

Comment:



Network 2 : Stop Logic

Comment:



Network 3 : Jog Logic

Comment:



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Network 4 : Clear Faults

Comment:



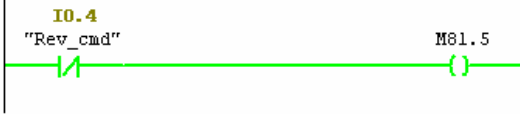
Network 5 : Forward Command

Comment:



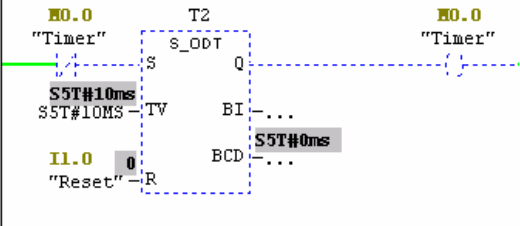
Network 6 : Reverse Command

Comment:



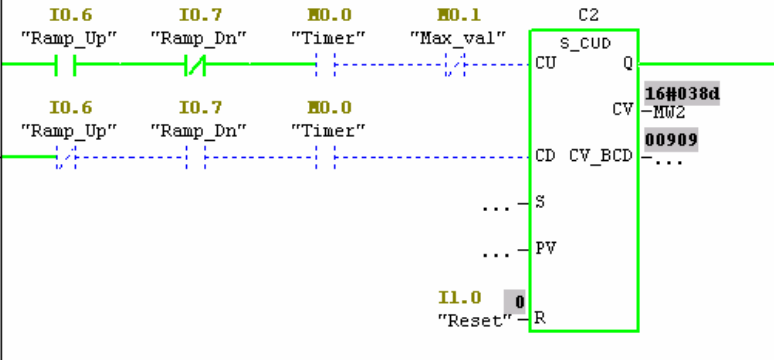
Network 7 : Ramp Generator Timer

This is a free running timer, with a 10ms cycle.



Network 8 : Ramp Generator value counter

This generator circuit counts up or down until a max value is reached, to create a number of 0 to 910 sent to MW2.



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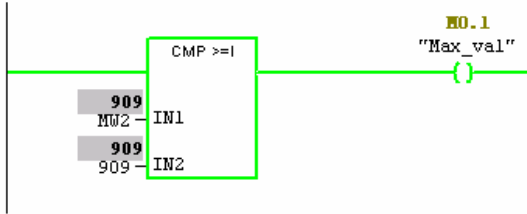
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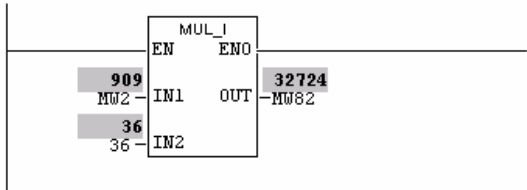
Network 9 : Ramp Comparator

Check if count has reached the maximum value of reference (910)



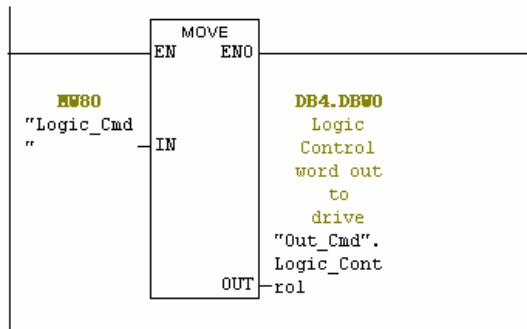
Network 10 : Scale output for reference

The Motor Nameplate RPM is scaled in the drive as 32767. Therefore to ensure we don't go above that, we will limit the max value = 32760. This results in a scale factor of 36.



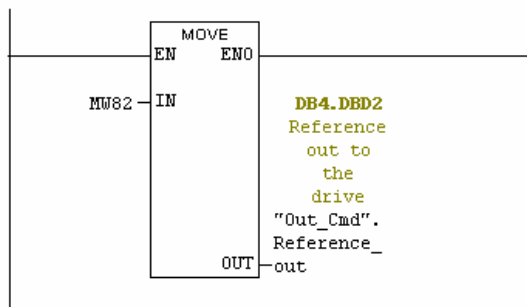
Network 11 : Move Logic control bits to DB4

The Logic control bits are swapped LSB and MSB, so are contained in MB81. MB80 & MB81 are grouped together as MW80 "Logic_Cmd"



Network 12 : Move scaled reference to DB4

Comment:



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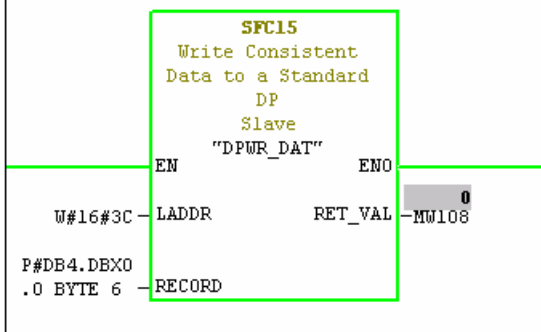
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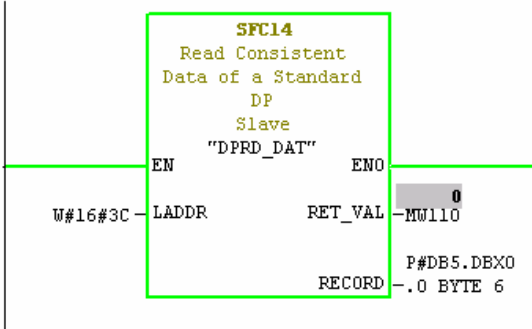
Network 13: Write drive data Logic control and reference to DB4

The PLC passes 6 bytes of data to/from the drive. To ensure the passing of data is not interrupted, it needs to be passed as a block. Passing data in a block is called consistent data. To WRITE consistent drive data, we use an SFC15 command.
 LADDR = start address where drive is mapped = 60d = 3Ch.
 RET_VAL = memory location to store error codes.
 RECORD = source address where we intend to store data ready for transfer. In this case DB4 will store the data, which is a 6 byte structure (2+4 bytes).



Network 14: Read drive data from Logic status, and speed feedback into DB5

The PLC passes 6 bytes of data to/from the drive. To ensure the passing of data is not interrupted, it needs to be passed as a block. Passing data in a block is called consistent data. To READ consistent drive data, we use an SFC14 command.
 LADDR = start address where drive is mapped = 60d = 3Ch.
 RET_VAL = memory location to store error codes.
 RECORD = destination address where we intend to store data. In this case DB5 will store the data, which is a 6 byte structure (2+4 bytes)



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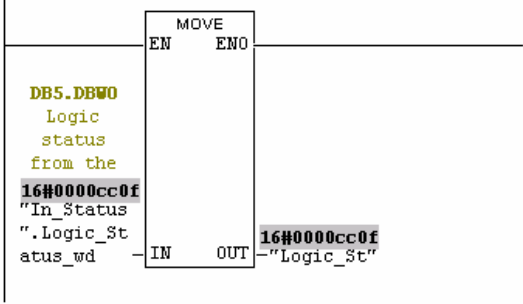
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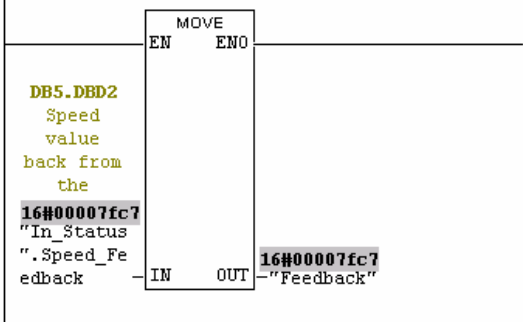
Network 15: Display the contents of Logic Status word

Comment:



Network 16: Display the contents of Datalink A2 out which is Output Voltage

Comment:



Address	Name	Type	Initial value	Actual value	Comment
0.0	Logic_Control	INT	0	34	Logic Control word out to drive
2.0	Reference_out	DINT	L#0	L#32724	Reference out to the drive

Address	Name	Type	Initial value	Actual value	Comment
0.0	Logic_Status_wd	INT	0	-15345	Logic status from the drive
2.0	Speed_Feedback	DINT	L#0	L#32711	Speed value back from the drive

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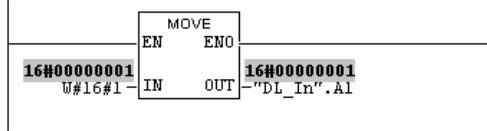
The program FC3 moves values to & from the datalinks.

FC3 : Title:

Comment:

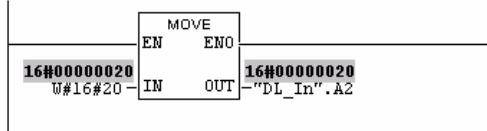
Network 1: Set datalinks in A1 for accel time

Comment:



Network 2: Set datalinks in A2 for decel time

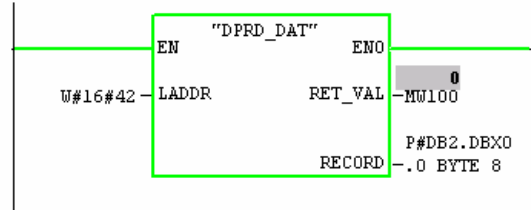
Comment:



Use the SFC 14 (DPRD_DAT) and SFC 15 (DPWR_DAT) functions to send a block of consistent data to/from DB2 & DB3.

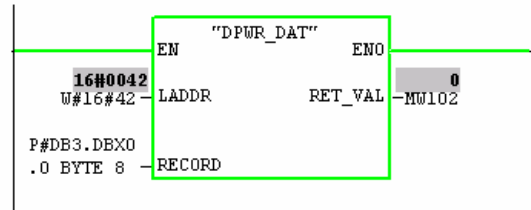
Network 3: Read drive data from datalinks A1 & A2

The PLC passes 6 bytes of data to/from the drive. To ensure the passing of data is not interrupted, it needs to be passed as a block. Passing data in a block is called consistent data. To READ consistent drive data, we use an SFC15 command.
 LADDR = start address where drive is mapped = 66d = 42h.
 RET_VAL = memory location to store error codes.
 RECORD = source address where we intend to store data after transfer. In this case DB2 will store the data, which is a 6 byte structure (2+4 bytes).



Network 4: Write drive data from datalinks A1 & A2

The PLC passes 6 bytes of data to/from the drive. To ensure the passing of data is not interrupted, it needs to be passed as a block. Passing data in a block is called consistent data. To WRITE consistent drive data, we use an SFC15 command.
 LADDR = start address where drive is mapped = 66d = 42h.
 RET_VAL = memory location to store error codes.
 RECORD = source address where we intend to store data ready for transfer. In this case DB3 will store the data, which is a 6 byte structure (2+4 bytes).



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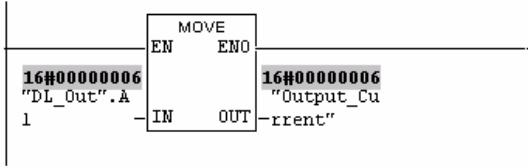
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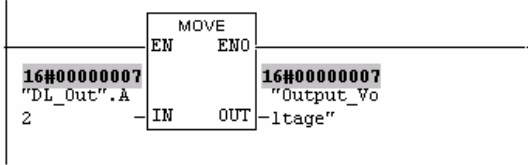
Network 5 : Display the contents of Datalink A1 out which is Output Current

Comment:



Network 6 : Display the contents of Datalink A2 out which is Output Voltage

Comment:



The values back from the drive are shown in Hex, whilst the value are shown in decimal the databases.

Address	Name	Type	Initial value	Actual value	Comment
0.0	A1	DINT	L#0	L#6	Data in from drive onto Datalink A1_Out
4.0	A2	DINT	L#0	L#7	Data in from drive onto Datalink A2_Out

Address	Name	Type	Initial value	Actual value	Comment
0.0	A1	DINT	L#0	L#1	Data out from drive onto Datalink A1_in
4.0	A2	DINT	L#0	L#32	Data out from drive onto Datalink A2_in

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