UNITRONICS ETHERNET/IP COMMS WITH A FENA-01/11/21 ADAPTER MODULE

Description:

This document describes demonstration programs that implement different types of Ethernet/IP communications links between a Unitronics UniStream OIP (Operator Interface Panel) and an ABB drive that utilize the FENA-01/11/21 communications module. The UniStream panel operates as the master and the drive operates as a slave device.

It is assumed that the users of these demo programs are fluent in UniLogic programming as it is not the intent of this paper to provide a touchscreen programming tutorial, its purpose is to demonstrate the communications interface between the UniStream panel and ABB drives.

The programs differ in the amount and format of the information that is exchanged between the UniStream panel and drive. These formats are established by the "profile" referenced in the UniLogic program and are known as the "ABB Drives profile" and "ODVA profile". The ABB profile is unique to ABB drives and establishes a common structure for data exchange regardless of the type and model of drive. The ODVA profile is controlled by the "Open Device Vendors Association" and is a more simplistic structure for controlling a drive via a communications layer.

The ABB Drives profile is the best choice when needing both speed and torque control of a drive. The data format used for control and status of the drive are uniform over all ABB drive products, regardless of communications interface and the speed reference and actual are scaled to fit within a 16 bit integer word. This scaling provides for a common interface to all drives, regardless of the exact speed and torque range for each drive.

The ODVA profile provides for a more simplistic format of speed control of a drive along with a speed reference and actual that are in represented in direct rpm units. While the speed reference is rpm, torque units are also in direct units, Newton Meters. This is defined by the ODVA standard and cannot be changed. Since this value can be a very small number for a low power drive, there can be resolution issues and other data complications due to this behavior. Because of this unchangeable units behavior, we strongly recommend using the ABB Classic provide when needing to control torque.

The UniStream demo projects described by this document are:

Ethernet_IP ABB_1_51.ulpr	ABB Drives profile with set speed assembly
Ethernet_IP ABB_101_151.ulpr	ABB Drives profile with set speed plus drive parameters assembly
Ethernet_IP ABB_102_152.ulpr	ABB Drives profile with set speed and set torque assembly plus drive parameters assembly

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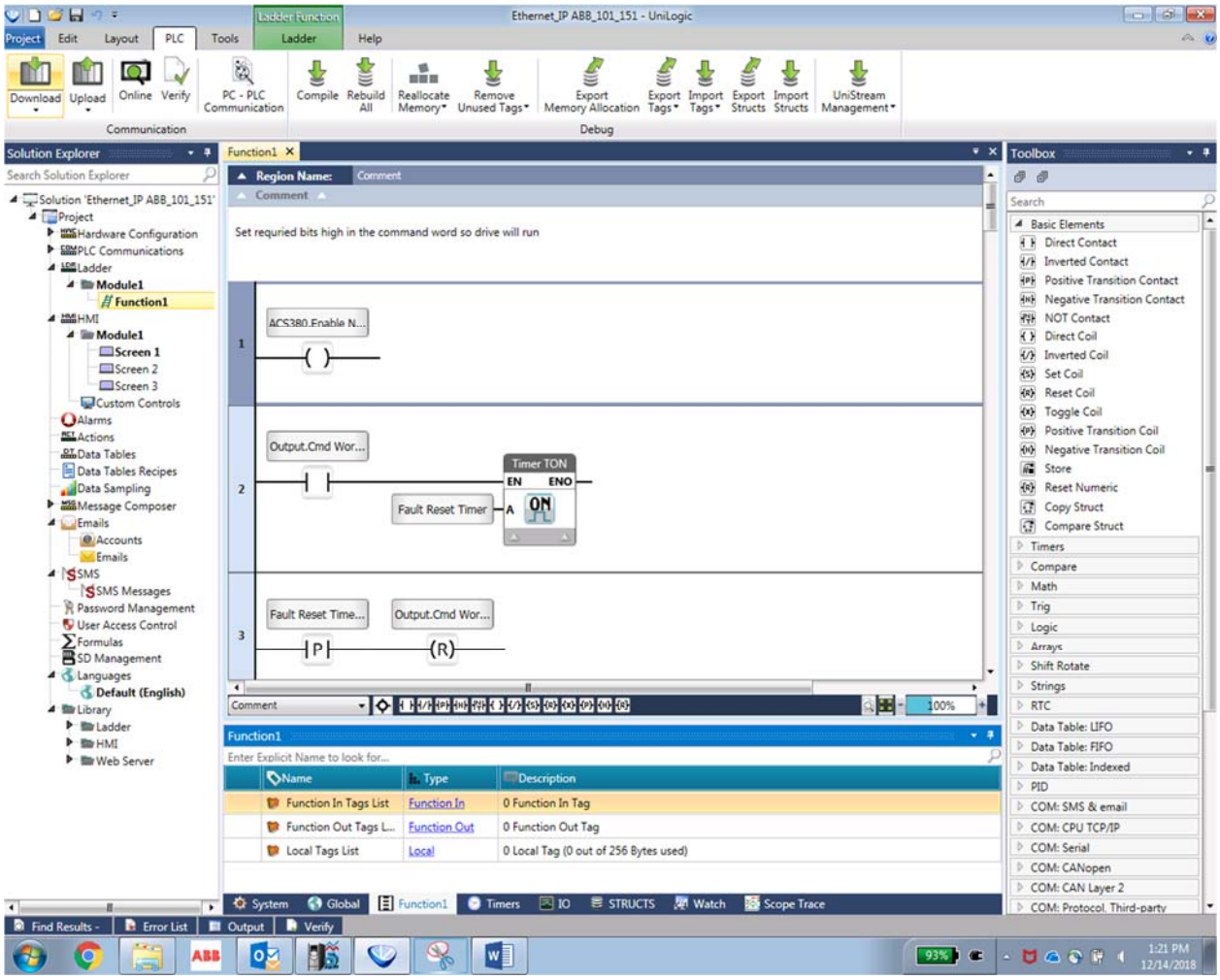
Ethernet_IP ODVA_20_70.ulpr	Basic speed control assembly
Ethernet_IP ODVA_121_171.ulpr	Extended speed control plus drive parameters assembly

We will use the program Ethernet_IP ABB_101_151.ulpr as our example as this will be the most commonly used program. Start with this as a tutorial, following this document for the details of the implementation. The other programs are similar in content and only vary in the profile used and the amount of data passed to and from the drive.

It is important to note that all profiles require the same communications overhead. Profiles adding the additional 10 words of data do not require any additional communications packets or time to exchange the data between the drive and UniStream panel.

Open Ethernet_IP ABB_101_151.ulpr and you should see this general view:

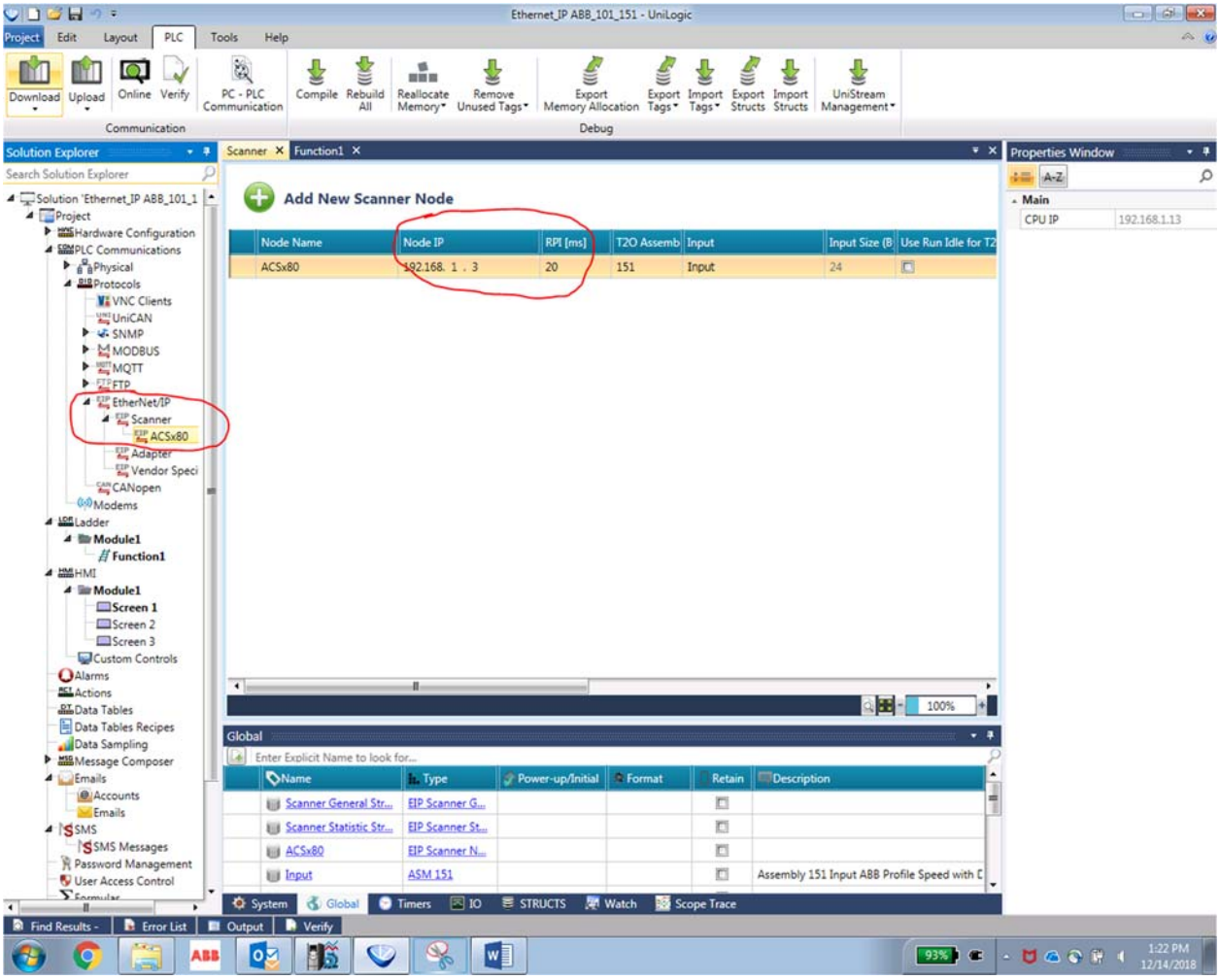


The areas of interest are the Solution Explorer in the left hand pane, the details in the top center view and the data structures that appear below in the Global window.

Navigate to the Solution Explorer and open

Project->PLC Communications->Protocols->Ethernet/IP->Scanner

You should see the entry that controls the link to the drive. The drive IP address is defined in the UniLogic scanner as well as the data structures that provide the links between the drive and the touchscreen. Set the desired IP address in the marked field and save the project. The RPI rate to the right controls the update speed and can be set per the application needs. A value higher than 100ms may result in sluggish speed response in high speed systems where the speed changes at high rates of rpm per second. Setting the RPI rate to a low number without the need for fast data updating will slow the overall system perform due to the processor overhead required for the communications processing.



Change the IP address shown in the scanner to suit your environment and save the program. You can then compile and download the application to the UniStream panel.

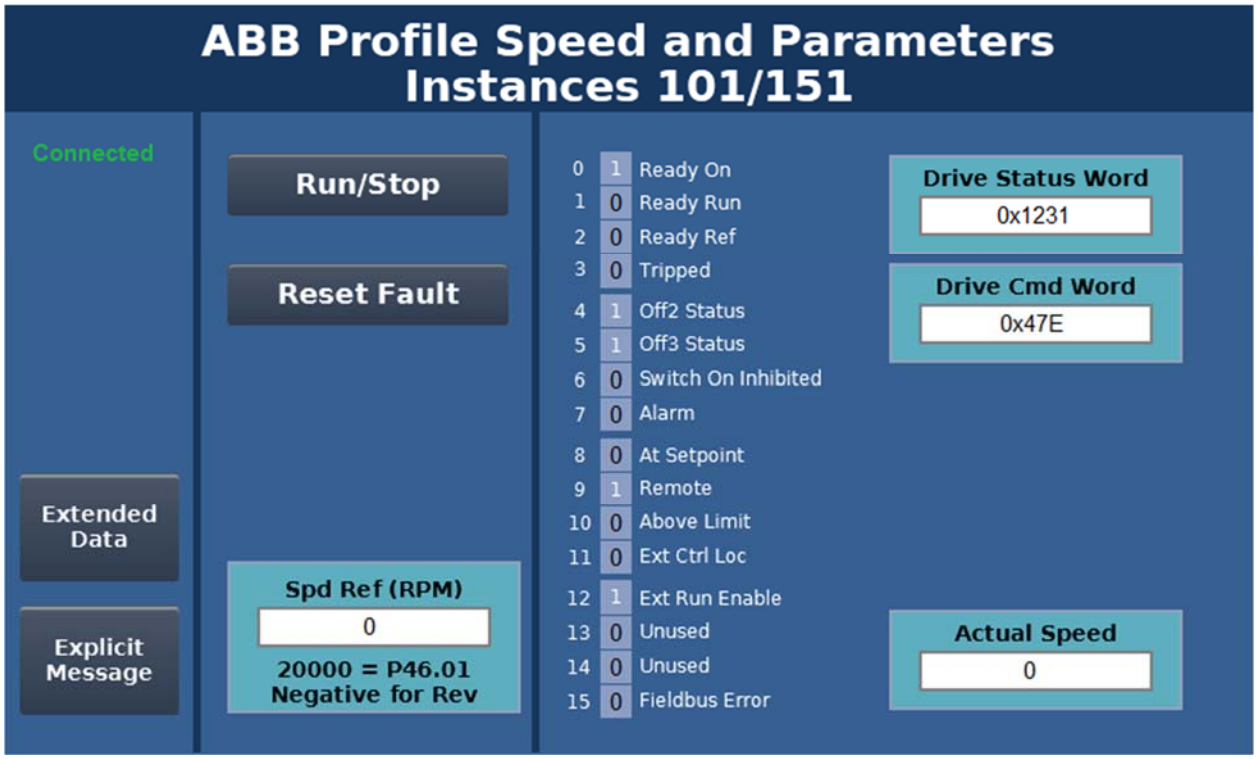
Once the panel has been updated, the program will attempt to communicate with the drive address defined in the scanner. The typical drive parameter setup required for this demo will be:

20.01 Ext1 Commands	Fieldbus A
22.11 Speed Ref1 Source	FBA A ref1
50.01 FBA A Enable	Slot 1 * (your actual configuration)
51.02 Protocol/Profile	EIP ABB Pro
51.05 IP Address 1	192 *
51.06 IP Address 2	168 *

51.07 IP Address 3	1 *
51.08 IP Address 4	3 *
51.09 Subnet CIDR	24

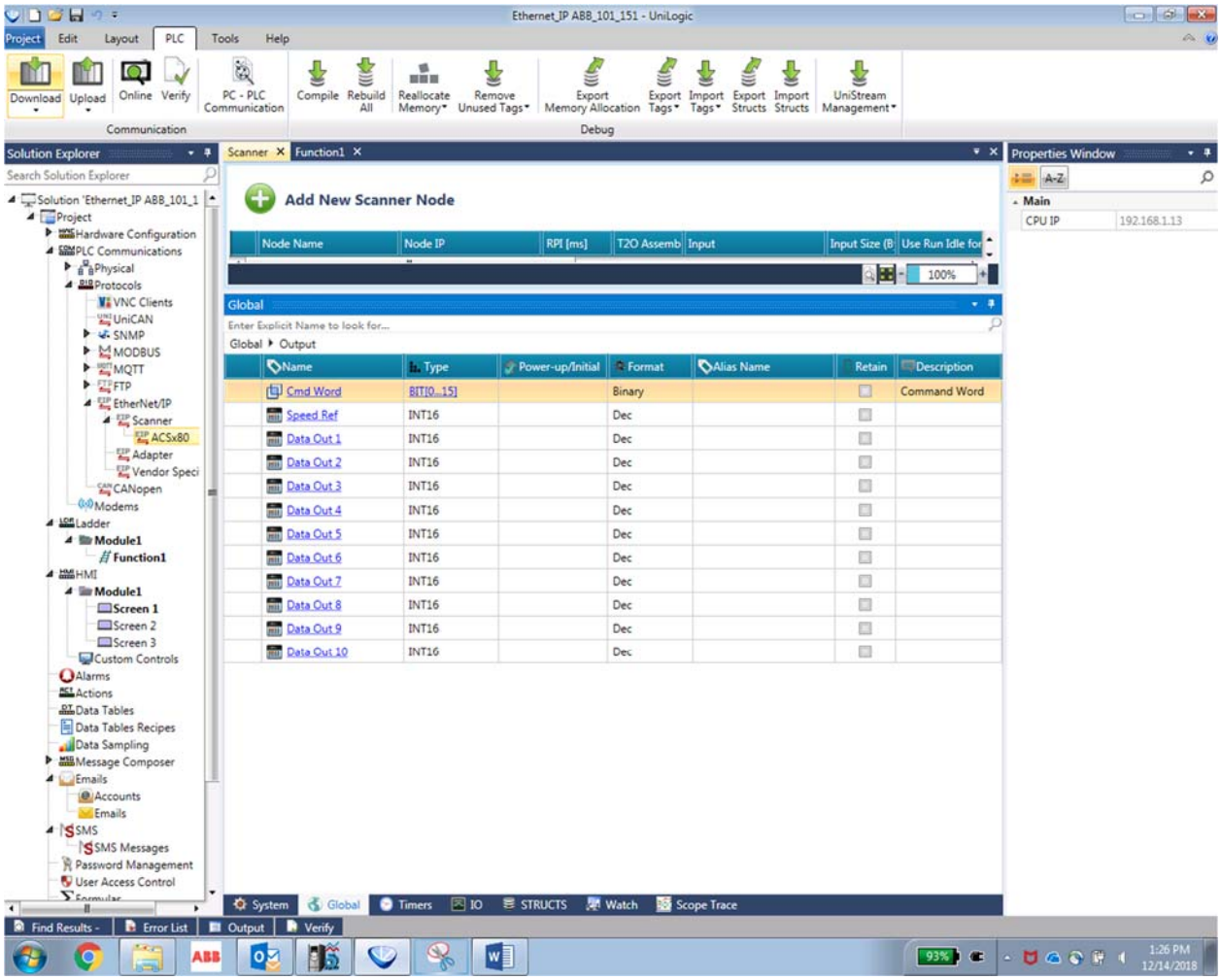
Once these parameters have been set, the drive communication interface must be reset by setting parameter 51.27 FBA A Par Refresh to Refresh and saving the change. The FENA module will reset and the parameters will be reloaded from the drives flash memory. Note that any changes made to the fieldbus interface do not take effect until either 51.27 is set to refresh or the drive is power cycled.

The drive should now be able to communicate with the UniStream panel and the drives FENA module on the drive should have three solid green LED's. Once the link is functional, the text in the upper left corner of the UniStream panel should change from "Disconnected" to "Connected" with the display appearing as:



The drive should run by pressing the Run/Stop button. Speed is controlled by the Spd Ref pushbutton. A value of 10,000 will result in half speed of the motor as set by parameter 46.01 and the limits in group 30. A value of 20,000 is full speed in the ABB profile, a negative value of -20,000 will result full reverse speed.

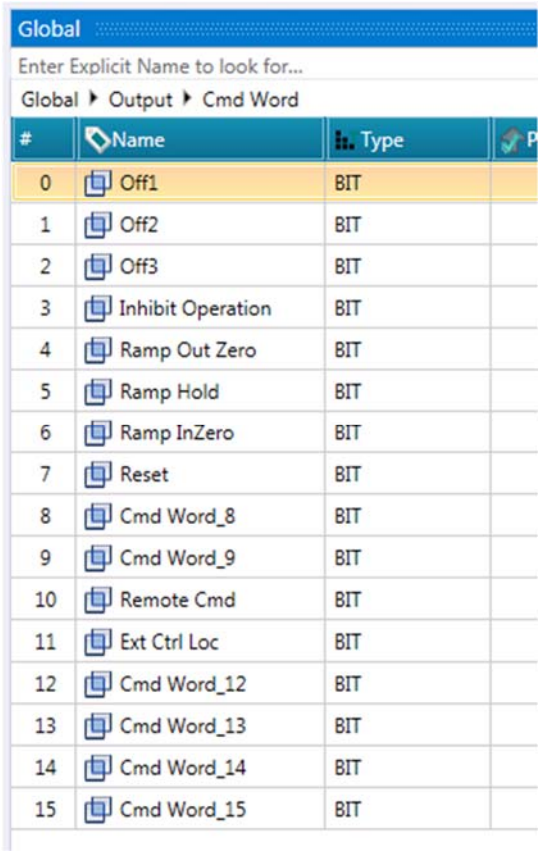
The main interface to the drive is achieved through two predefined data structures, named Input and Output. Navigating to the Global window and drag the window to consume most of the center of the screen. Scroll down to the variable "Output" and click on the structure tag "ASM101". This is the structure that is used by the PLC to control the drive. You should see the view below which details the tag names.



The “Cmd Word” and “Speed Ref” are contained in all profiles. The “Data Out 1-10” variables are additional data values (specific to this profile) are written to the drive at the RPI rate defined in the scanner.

The first variable in this structure is “Cmd Word” which is a 16 bit variable that controls operation of the drive when it is in Remote mode and the necessary parameters are referenced to the Fieldbus module. Clicking on the Type field to the right BIT[0…15] will show the pre-defined bit definitions used by the ABB profile.

The bit fields will display as:



#	Name	Type
0	Off1	BIT
1	Off2	BIT
2	Off3	BIT
3	Inhibit Operation	BIT
4	Ramp Out Zero	BIT
5	Ramp Hold	BIT
6	Ramp InZero	BIT
7	Reset	BIT
8	Cmd Word_8	BIT
9	Cmd Word_9	BIT
10	Remote Cmd	BIT
11	Ext Ctrl Loc	BIT
12	Cmd Word_12	BIT
13	Cmd Word_13	BIT
14	Cmd Word_14	BIT
15	Cmd Word_15	BIT

While these bits may appear confusing at first, all that is required to control the drive in normal operation is to write a value of 0x47E (1150 decimal) to the command word by setting the following bits high:

Output.Cmd Word[Off2]
Output.Cmd Word[Off3]
Output.Cmd Word[InhibitOperation]
Output.Cmd Word[Ramp Out Zero]
Output.Cmd Word[Ramp Hold]
Output.Cmd Word[Ramp In Zero]
Output.Cmd Word[Remote Cmd]

With these bits set, to start the drive, set Output.Cmd Word[Off1] high. To stop the drive, set this bit back to a zero.

In the demo program, the bits above have been preset in the program. To see where and how this was done, navigate to Ladder->Module1->Function1 to view this code. The start/stop function of the drive is achieved with a bit toggle pushbutton that turns the Off1 bit on and off.

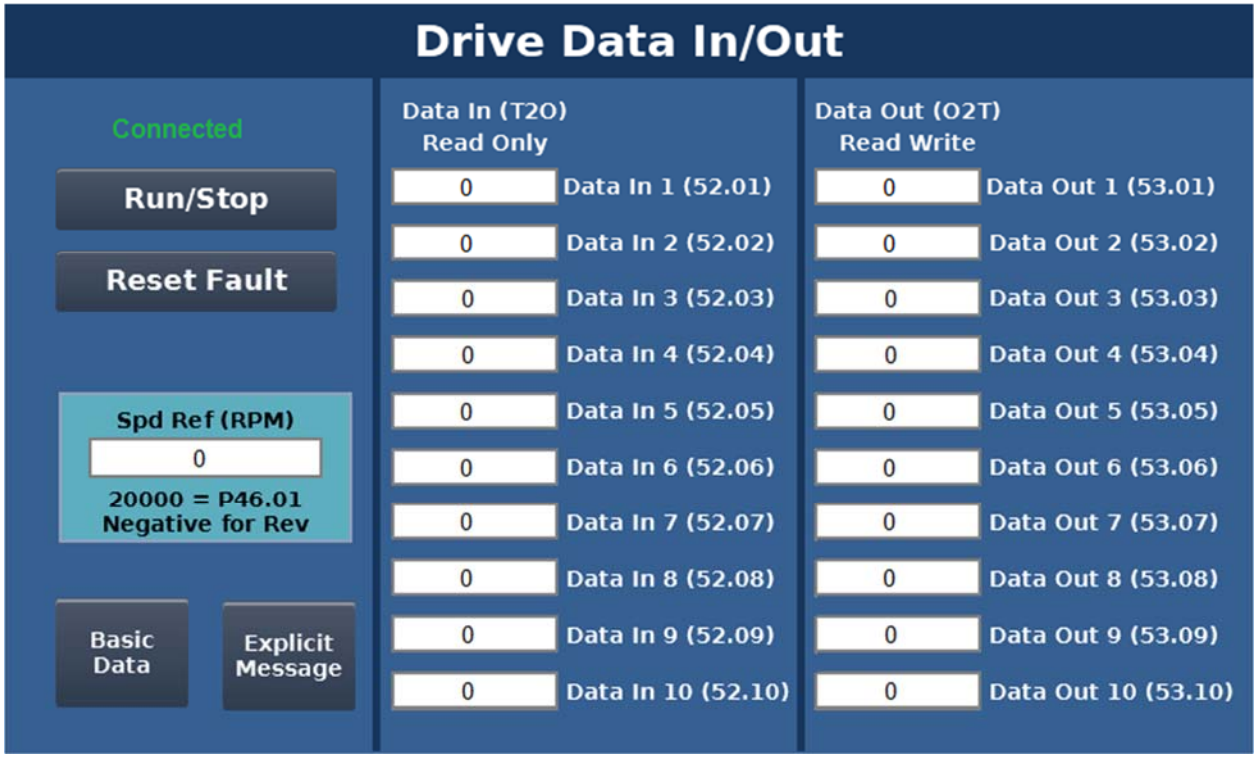
Note that the drive “Command Word” (written to the drive) and the “Status Word” (received from the drive) are shown on screen 1 of the demo program. When the drive is stopped, you’ll see the command word is 0x47E and the status word is 0x1231.

The values coming from the drive are handled in a similar manner with the predefined structure variable named “Input” that has the type of “ASM 151”. Opening this structure definition will show the bit structure which is quite similar to the Output structure but represents data from the drive rather than data to the drive over the communications link.

Explore the data structures and bits to become familiar with the naming conventions. These names are consistent with the drive documentation and their use should be apparent from the naming and both words are described in great detail in the drive firmware manual under the “Fieldbus control through a fieldbus adapter” chapter.

Extended Data handling

Pressing the “Extended Data” pushbutton opens screen 2 which appears as:



The values that appear in the Data In registers are controlled by parameter group 52 in the drive. Setting 52.01 to 1.11 would cause the DC bus voltage to appear in the Data In 1 value shown above. Setting group 52 to the drive parameters you need to use on a regular, frequent basis within the UniLogic program will cause those parameters to be transmitted to the panel at the RPI rate defined in the scanner.

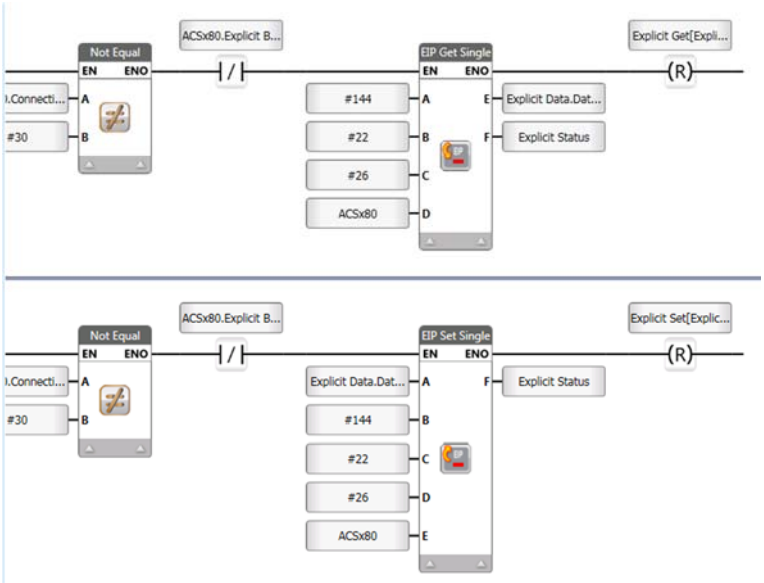
The values written to the “Data Out” values in turn are controlled by the parameters assigned in the drives parameter group 53. For example, if 53.01 is set to 30.20, the value written to Data Out 1 controls the Maximum Torque of the drive via parameter 30.20. Values in both group 52 ad 53 left at zero have no effect and create no errors.

Remember than changing any parameters in either group require that parameter 51.27 be set to refresh and saved for your changes to take effect.

Explicit Messaging

From either screen, there is a pushbutton titled “Explicit Message”. Pressing this button opens screen 3 which appears as:

This screen demonstrates the use of low frequency, on demand use data. This is done outside of the normal messaging between the drive and UniStream using the EIP Get and Set function blocks which appear in a program as:



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This code is provided within the demo program and can be extended (or reduced) to be used as your application dictates. All code is contained within the Function1 module which is found at

Ladder->Module1->Function1

The basic ladder code requires variables to control the operation based upon what the user touches on the touch screen. When a Get or Set pushbutton is activated, a message is generated to the drive either writing (Set) or reading (Get) a single parameter within the drive. The inputs to the code blocks are:

A	The value
B	Always #144
C	Parameter Group
D	Parameter Number
E	Scanner Variable name
F	Result value

Notes: The “B” input to the block is a constant #144 (hex 90) and is the message type required by the drive, do not change this input. Inputs C and D could be variables rather than hard coded numbers. This would allow the creation of a program that only required one Get and one Set block and just change the target parameter address in the variables. This was avoided for simplicity in the demo program and left for the programmer to implement.

The default parameters used in the demo are c

22.26 Constant Speed 1
30.20 Maximum Torque 1
47.01 Data Storage 1 Real 32
47.11 Data Storage 11 Int 32
47.21 Data Storage 21 Int 16

Documents or other reference material:

ACS880 Firmware Manual 3AUA0000085967

ACS580 Firmware Manual 3AXD0000016097

ACS380 Firmware Manual 3AXD50000029275

Basic Guide to ODVA Communications LVD-PNTG03U-EN

Corrective Actions:

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