Using an AIMCO Gen IV Controller on a Rockwell PLC with DeviceNet

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Contents

1 Introduction ............................................................................................................................... 2
2 Requirements ............................................................................................................................. 2
   2.1 Equipment/Software .......................................................................................................... 2
   2.2 Hardware Setup ................................................................................................................. 2
   2.3 Initial PLC Communication ................................................................................................. 3
3 Configuring the System .............................................................................................................. 4
   3.1 Defining the CompactLogix L32E Module for the PLC ....................................................... 4
   3.2 Defining the DeviceNet Module for the PLC .................................................................... 5
   3.3 Setting up the Connection .................................................................................................. 6
       3.3.1 Configuring the Module ............................................................................................. 6
   3.4 Configure the AcraDyne Controller .................................................................................... 8
       3.4.1 Default Gen 4 IO Configuration ................................................................................ 10
   3.5 Configure the DeviceNet Scanner in RSNetworx ............................................................. 10
   3.6 Generate the EDS file ....................................................................................................... 11
       3.6.1 Generate the EDS file from the Gen4 Controller ..................................................... 11
       3.6.2 Generate the EDS file from RSNetworx ................................................................. 13
   3.7 Add the controller to the network ....................................................................................... 15
   3.8 Add the network settings to the DeviceNet module .......................................................... 18
   3.9 Run the network .............................................................................................................. 19
   3.10 Downloading the configuration ....................................................................................... 20
1 Introduction
AIMCO torque controllers have the option of a DeviceNet interface. A common use is interfacing them to an Allen-Bradley PLC for error proofing and data collection. This document is intended to show the steps required to setup the PLC and AIMCO controller for DeviceNet communication.

2 Requirements

2.1 Equipment/Software
- DeviceNet capable controller from AIMCO (iEC4EGVD).
- DeviceNet Scanner Master Module (1769-SDN).
- RSLogix 5000 Rev v16.3.
- RSNetworx Rev 25.00.00
- 2 – Ethernet cables.
- DeviceNet cable.

2.2 Hardware Setup
- Connect an Ethernet cable from the CompactLogix L32E to an Ethernet switch.
- Connect an Ethernet cable from the PC to an Ethernet switch.
- Set the PLC to programmer mode
- Connect the DeviceNet cable from the DeviceNet Module to the AIMCO controller.
- DeviceNet connector information:
  - The pinout of the Anybus DeviceNet connector:
    | Anybus Pin | Function     | Standard Color |
    |------------|--------------|----------------|
    | 1          | V-           | Black          |
    | 2          | CAN_L        | Blue           |
    | 3          | Drain/Shield | None/Bare      |
    | 4          | CAN_H        | White          |
    | 5          | V+           | Red            |
  - The line resistance across CAN_L and CAN_H needs to be 50-60Ω
  - Attach a terminating resistor to each end of the CAN_L and CAN_H wires (blue, white)
2.3 Initial PLC Communication

These instructions assume the PLC and PC have already been configured and are communicating correctly.
3 Configuring the System

3.1 Defining the CompactLogix L32E Module for the PLC

After the RSLogix5000 software is initialized, you will choose to create a new project. Make sure that the ‘Type’ and ‘Revision’ fields match the PLC controller being used. After a ‘Name’ and ‘Description’ are created, select a destination where you will save the project (see Figure 1). Click OK.

![Figure 1. Create a new Project with CompactLogix L32E Controller](image)
3.2 Defining the DeviceNet Module for the PLC

3.2.1 Add the Module

In order to define a module on the PLC, you will need to be ‘Offline’ of the PLC controller. Navigate the tree view in the “Controller Organizer” window pane and right click on the ‘CompactBus Local’ item under the ‘Backplane, CompactLogix System’ tree view (see Figure 2). Select ‘New Module’ and search for ‘1769-SDN/B’ under the ‘Communications’ tree view. Click OK.

Shortly after ‘OK’ has been selected, a dialog box will appear and require a major revision. This is located on the scanner module itself and is provided in the image below.

Figure 2. Define New 1769-SDN/B Module

Figure 3. Major Revision
3.2.2 Configuring the Module

Configuring the connection will require you to define several pieces of information.

- **Name of the Module**
  - This will be used as an RSLogix references for Tags.

- **Description of the Module**

- **Minor Revision**
  - Change to a value of 2.

- **Select the slot where the DeviceNet module resides.**
  - This example has the DeviceNet module in the fifth slot on the PLC bus (it is farthest away from the CompactLogix controller).

- **Input and Output Size**
  - Default values will work.

![Figure 4 Defining the DeviceNet Module](image)

Click the ‘OK’ button when you have defined the module.

Verify that the next prompt has the ‘Major Fault On Controller If Connection Fails While in Run Mode’ box checked (see Figure 4). Click OK after this has been verified.
Figure 5 Defining the DeviceNet Module
3.3 Configure the AcraDyne Controller

Using the ‘System Port’ navigate to the IP address of the Gen 4 controller (AcraDyne Controllers have a default IP Address of 192.168.1.4). This step can also be done from the AcraDyne LCD touchscreen. From the Home screen, click ‘Controller’, ‘Communication Interfaces’, and ‘ANYBUS’ to bring up the Anybus settings of the controller. For this example we have changed the Anybus node to 5. Click the green checkmark to enable your settings.

![Figure 6 Gen 4 Controller Communication Settings](image)
While in the ‘Controller’ menu select ‘I/O’ and either ‘ANYBUS Inputs’ or ‘ANYBUS Outputs’ will bring up the input and output default parameters. These are shown in Figure 7.
3.3.1 Default Gen 4 IO Configuration

The Gen 4 Controller has a default IO image preset as shown below. The IO can be changed but the defaults are assumed in this document.

The Gen 4 controller’s default input image.

<table>
<thead>
<tr>
<th>Bit</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Stop</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Select Job</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Reset Job</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-9</td>
<td>Set ID</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-13</td>
<td>Set Date/Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Gen 4 controller’s default output image.

<table>
<thead>
<tr>
<th>Bit</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Angle High</td>
<td>Angle Low</td>
<td>Torque High</td>
<td>Torque Low</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>External Controlled</td>
<td>Job Complete</td>
<td>Error</td>
<td>Tool En.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-7</td>
<td>Angle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8-9</td>
<td>Torque (x10)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-11</td>
<td>Angle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12-13</td>
<td>Angle</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.4 Configure the DeviceNet Scanner in RSNetworx

Open the RSNetworx for DeviceNet software. After the software initializes, select ‘File’ and create a new file for DeviceNet Configuration. Click ‘OK’ when finished.
Before proceeding to the next step, be sure to save the file in an accessible place. It will need to be referenced in RSLogix5000 when the configuration is complete. The first step is to add the scanner device to the graph. From the treeview, expand ‘Vendor’, ‘Rockwell Automation/Allen-Bradley’, ‘Communications Adapter’, ‘1769-SDN Scanner Module’, and drag ‘Major Rev 2’ into the graph field.

### 3.5 Generate the EDS file

In order to communicate with the Gen 4 controller slave module, an EDS file will need to be created. This file defines the input and output data sizes. If the data sizes set up on the PLC do not match those sent by the controller then the PLC will generate an error condition. Rockwell DeviceNet modules may flash ‘77’ on their display which means there is a data size mismatch. There are two methods to do this. A file can be generated within RXLogix or generated from the controller.

#### 3.5.1 Generate the EDS file from the Gen4 Controller

The controller has the ability to generate an EDS file for DeviceNet. The controller will create this file based on the current Anybus IO setup so it is important to configure the IO settings before generating the EDS file. If the Anybus IO changes then this EDS file will need to be re-generated and uploaded to the PLC.
This file can then be registered as a new device under ‘Tools’ and then ‘EDS Wizard...’ and select ‘Register an EDS file’.
3.5.2 Generate the EDS file from RSNetworx

The EDS file can also be generated from within RxNetworx. The following procedure will create and EDS file that matches the default IO of the controller.

To generate the file click ‘Tools’ and ‘EDS Wizard...’. Click ‘Next’ on the first prompt and select ‘Create an EDS file’.

![Figure 10 Create EDS File](image)

Insert values according to the image below. Select ‘Next’ when finished.

![Figure 11 Create EDS File](image)

In this example, the inputs and outputs are polled with a size of 14 each which matches the default settings in a Gen4 Controller. Click ‘Next’ for the following three menus. Select ‘Finish’ when complete.

- Note: The input and output size need to match the number of bytes set up in the Anybus IO configuration of the controller. The default sizes on the input and output are 14 but if those settings are modified then this EDS file will need to be regenerated with correct sizes.
There should now be an AIMCO treeview at the top (or near) of the vendor list. Expand ‘AIMCO’, ‘Generic Device (keyable)’, and drag ‘Gen 4 Controller DeviceNet’ to the graph field.
3.6 Add the controller to the network

Set the address of the scanner module to 1 (This value is shown in RSLinx). Change the product name to ‘Gen 4 Controller DeviceNet’ and the Anybus module address to 5 (This was set earlier on the Gen 4 controller). To do this, simply right click on each device and select ‘Properties...’. Be sure to change the slave device first as it may be currently occupying the specific address of the master.

![Figure 14 Module Addressing](image)

The last offline step is to right click on the scanner module and select ‘Properties...’ and navigate to the ‘Scanlist’ tab. Select ‘05, Gen 4 Controller DeviceNet’ and move to the scanlist. Apply and click ‘OK’ when finished.

![Figure 15 Anybus Module](image)

Under ‘Network’, select ‘Online’ and, using the treeview, navigate to the Port where the DeviceNet Scanner module resides and click ‘OK’. Save the changes and click ‘OK’ when the dialog message appears.
RSNetworx will begin browsing for any DeviceNet devices on the specified network. This may take a few minutes.

After the browse finishes, the graph should show something similar to the image below. If the slave device does not appear, proceed to the end of the document for troubleshooting. If the devices have identity mismatches, click on the device, select ‘Device’, and ‘Resolve Device Mismatch...’ as shown below.
Simply click ‘OK’ on the following screen to make the changes (the changes are highlighted in red). Be sure to resolve the device mismatch for both modules.

For now, ignore red icon on the slave device. Right click on the scanner module and select ‘Properties...’. Navigate to the ‘Scanlist’ tab and the following dialog will appear. Again, be sure the PLC is in the program mode and click ‘Download’. The I/O configuration will begin the download to the scanner module. Click ‘OK’ when finished.
Lastly, click on ‘Network’ and ‘Download to Network’.

3.7 Add the network settings to the DeviceNet module
Open RSLogix 5000 and right click on the DeviceNet module under the ‘CompactBus Local’ treeview. Click on ‘Properties’.
Navigate to the RSNetworx tab and browse for the configured RSNetworx file from the previous steps. In this example, the file was saved on the Desktop. Click ‘OK’ when finished.

![Figure 22 Scanner Module Properties](image)

3.8 Run the network
The last step is to add the following output on the ladder rung. This CommandRegister.Run bit controls whether the scanner is in run mode or idle mode. Turn this bit on after the controller has fully booted and is connected to the DeviceNet network. This status on the Anybus communication screen will then change to ‘Process Active’. Refer to the PLC documentation for more details on CommandRegister settings.
3.9 Downloading the configuration

Under the Communications tab at the top of the RSLogix 5000 screen, select ‘Communications’, ‘Who Active’. Expand the tree on the IP address that corresponds to the PLC controller you are using. Click on ‘00, CompactLogix Processor’ under the ‘Backplane, CompactLogix System’ and select ‘Download’ to the right of the menu.

Follow the prompts. Be sure to switch the PLC back into the ‘Run’ mode.