

Operation on EtherNet/IP network using Rockwell ControlLogix PLC

CFW300-CETH

Application Note





CFW300-CETH EtherNet/IP Application Note

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1 DESCRIPTION

This application note is intended to provide a description of how to program a CFW300 frequency converter with accessory CFW300-CETH to communicate in EtherNet/IP network using Rockwell ControlLogix PLC.

This document is meant for trained personnel working with the described equipment and EtherNet/IP network installation, besides a good knowledge of automation and programmable logic controllers, in particular about Rockwell Automation software.

1.1 REFERENCE DOCUMENTS

This application note was developed based on the following documents and tools:

Document / Tool	Version	Source
CFW300 User's Manual	10003325037 / 04	WEG
Micro Mini Drives Programming Manual	10006257370 / 02	WEG
CFW300 Ethernet User's Guide	10006453196 / 01	WEG
Media Planning and Installation Manual - EtherNet/IP	PUB00148R0	ODVA
RSNetWorx for EtherNet/IP	21.00	Rockwell Automation
Studio 5000 PLC programming software	26.00	Rockwell Automation
WPS	2.50	WEG

1.2 ARCHITECTURE

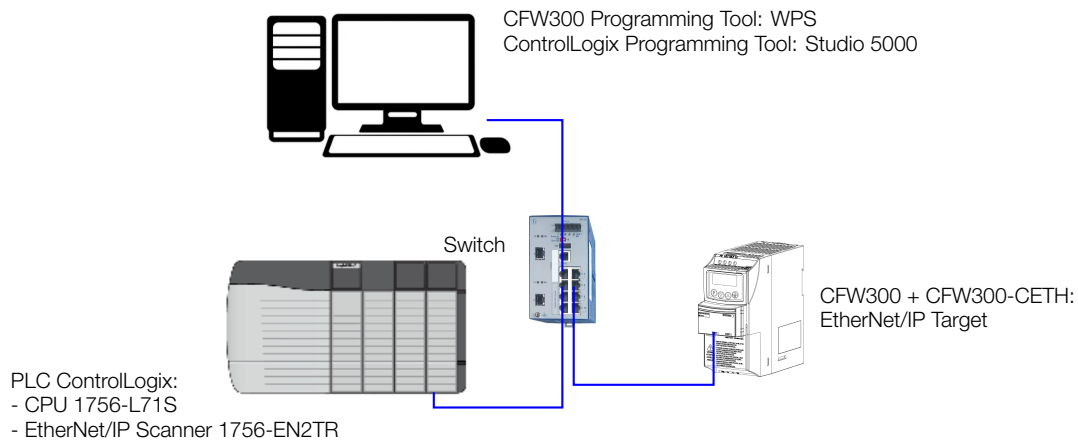


Figure 1.1: Network components

1.3 CFW300

- Equipment: CFW300 version 3.01.
- Accessory: CFW300-CETH.
- Programming tool: WPS version 2.50.

1.4 CONTROLLOGIX

- CPU: 1756-L71S version 26.013
- EtherNet/IP Scanner: 1756-EN2TR version 10.003
- Programming tools:

- RSNetWorx For EtherNet/IP version 21.00
- Studio 5000 Logix Designer version 26.01

1.5 PASSIVE NETWORK COMPONENTS

For passive network components - cables, ethernet switch - we recommend using certified components for industrial applications. Please refer to the product documentation for information about the proper network installation.

2 IP ADDRESS AND NETWORK CONFIGURATION

To allow communication among the devices, they need to have an compatible IP address configuration. It means the IP address must be at the same range, according to network mask. For this example, we will use the following IP addresses:

- Subnet mask: 255.255.255.0
- IP addresses: each device must have a different IP address.

PC: 192.168.0.2

ControlLogix: 192.168.0.71

CFW300: 192.168.0.11 (as described at item 3).

2.1 PC IP ADDRESS CONFIGURATION

To configure this options at Windows platform, go to “Network Connections” and open “Properties” of the desired Ethernet interface:

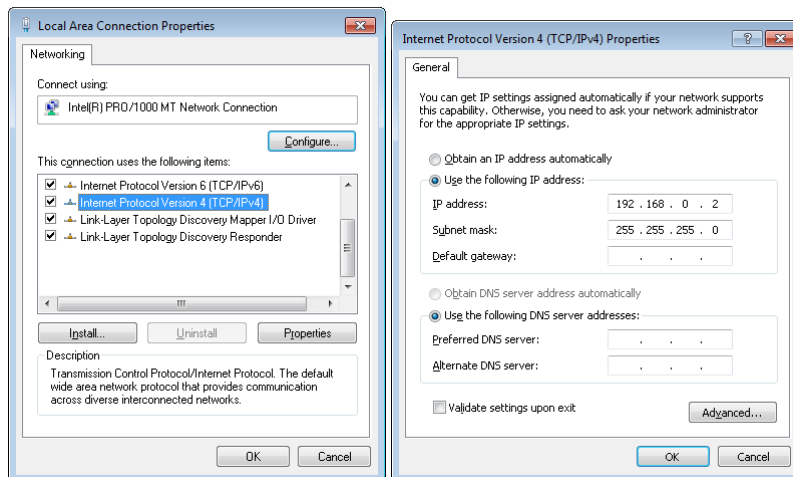


Figure 2.1: PC IP Address Configuration

2.2 CONTROLLOGIX IP ADDRESS CONFIGURATION

User can set IP Address for ControlLogix using Rockwell configuration tools. Check ControlLogix documentation to obtain information about how to perform this configuration.

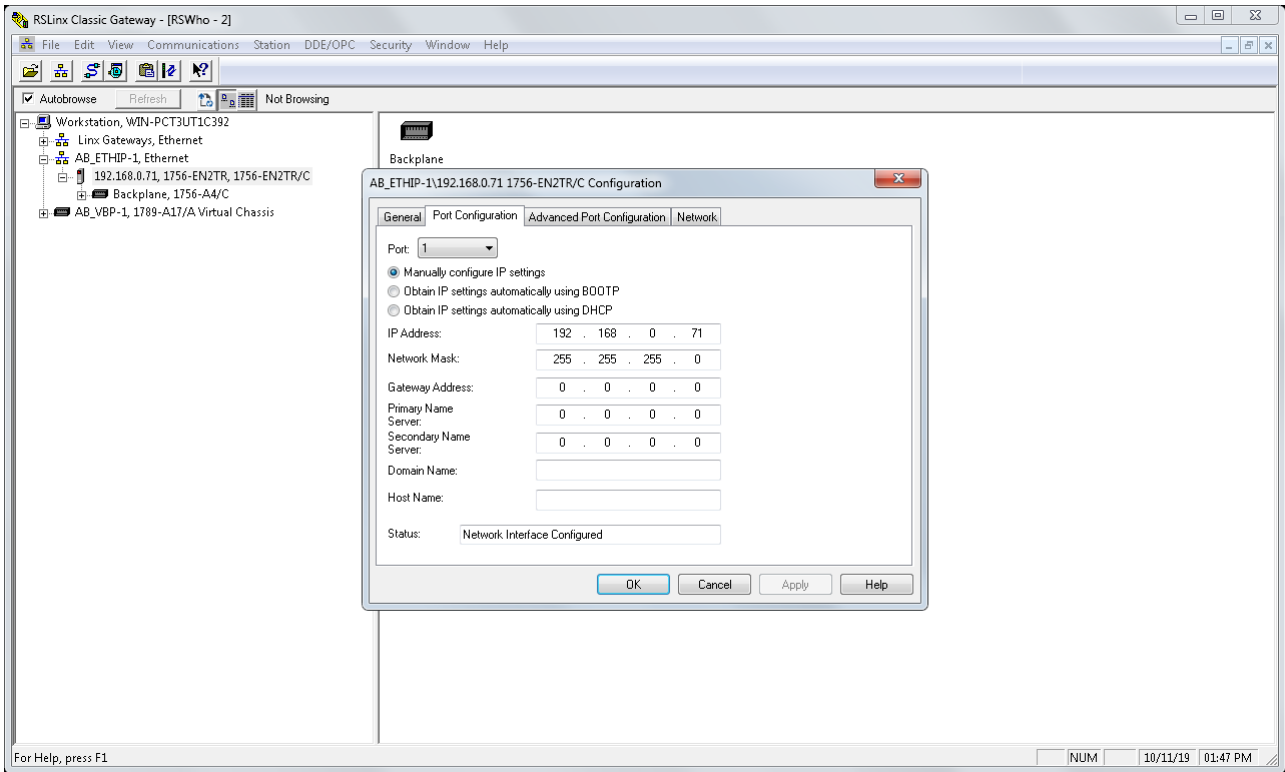


Figure 2.2: ControlLogix IP Address Configuration

3 SERVER CONFIGURATION - CFW300

This section describes the main configurations for CFW300 frequency converter operation with accessory CFW300-CETH in EtherNet/IP network. Some of the described configurations are only available if CFW300-CETH accessory is properly installed.

Refer to the CFW300 programming manual for the necessary configurations related to other device functions, like motor configuration, protections, etc.

3.1 ETHERNET INTERFACE

For this application, the following configurations have been done via keypad to allow Ethernet communication to WPS:

- P850 IP Address Config: **0** (Parameters).
- P851 ... P854 IP Address: **192.168.0.11**.
- P855 CIDR: **24** (255.255.255.0).
- P856 ... P859 Gateway: **0.0.0.0**.



NOTE!

After changing these configurations, for the modification to be effective, the equipment must be turned off and then turned on again.

When communication configuration is done, it is also possible to create a WPS configuration and connect to it via Ethernet, to access the parameter list and configuration wizards:

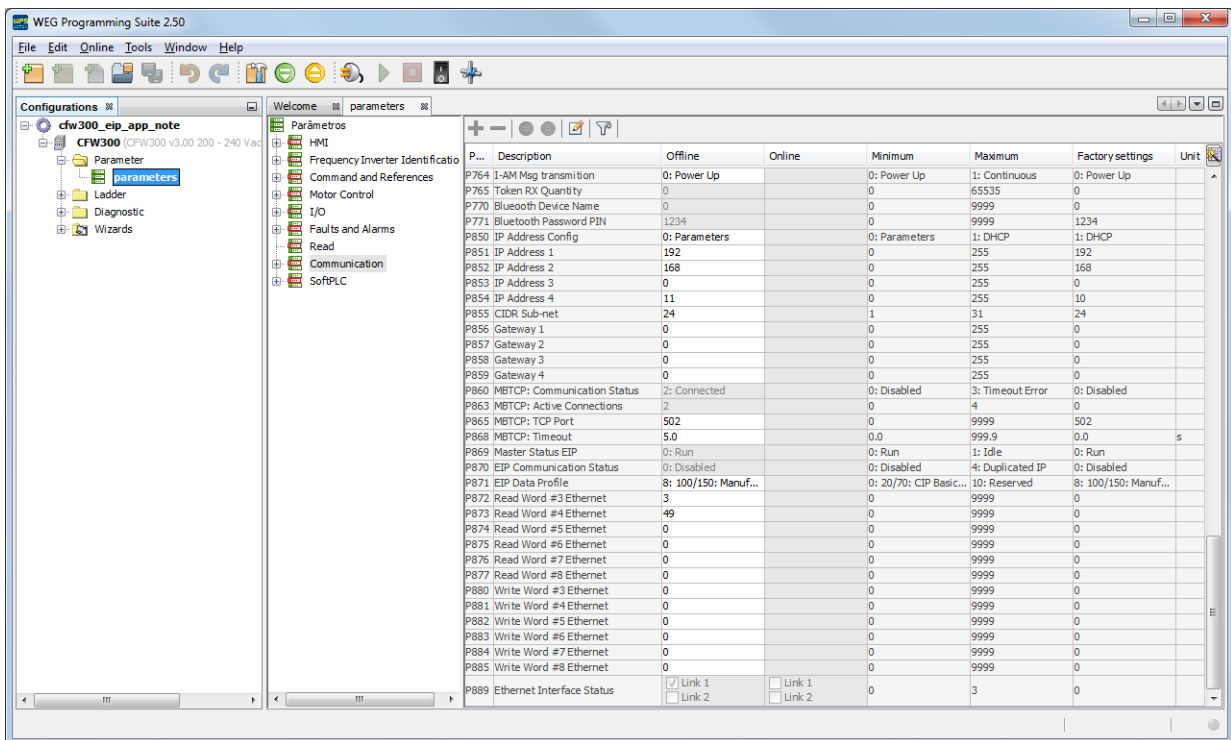


Figure 3.1: WPS - Parameter list

3.2 LOCAL/REMOTE

CFW300 has two operation modes: local and remote. For each operation mode, it is necessary to define the source that it will use to receive commands, like start/stop, fault reset. For this application, considering CFW300-CETH accessory installed, the following control sources have been defined:

- Local: keypad will control CFW300 in local mode.
- Remote: CFW300-CETH will control CFW300 in remote mode.
- Local/Remote transition: the definition if the device is in local or remote mode will be controlled by CFW300-CETH commands (remote mode at power on).

Based on this, the following configurations have been programmed:

- P220 LOC/REM Selection Source: CO/DN/DP/ETH (REM). ❶
- P222 REM Reference Selection: CO/DN/DP/ETH. ❷
- P227 REM Run/Stop Selection: CO/DN/DP/ETH. ❸
- P226 REM FWD/REV Selection: CO/DN/DP/ETH (FWD). ❹
- P228 REM JOG Selection: CO/DN/DP/ETH. ❺

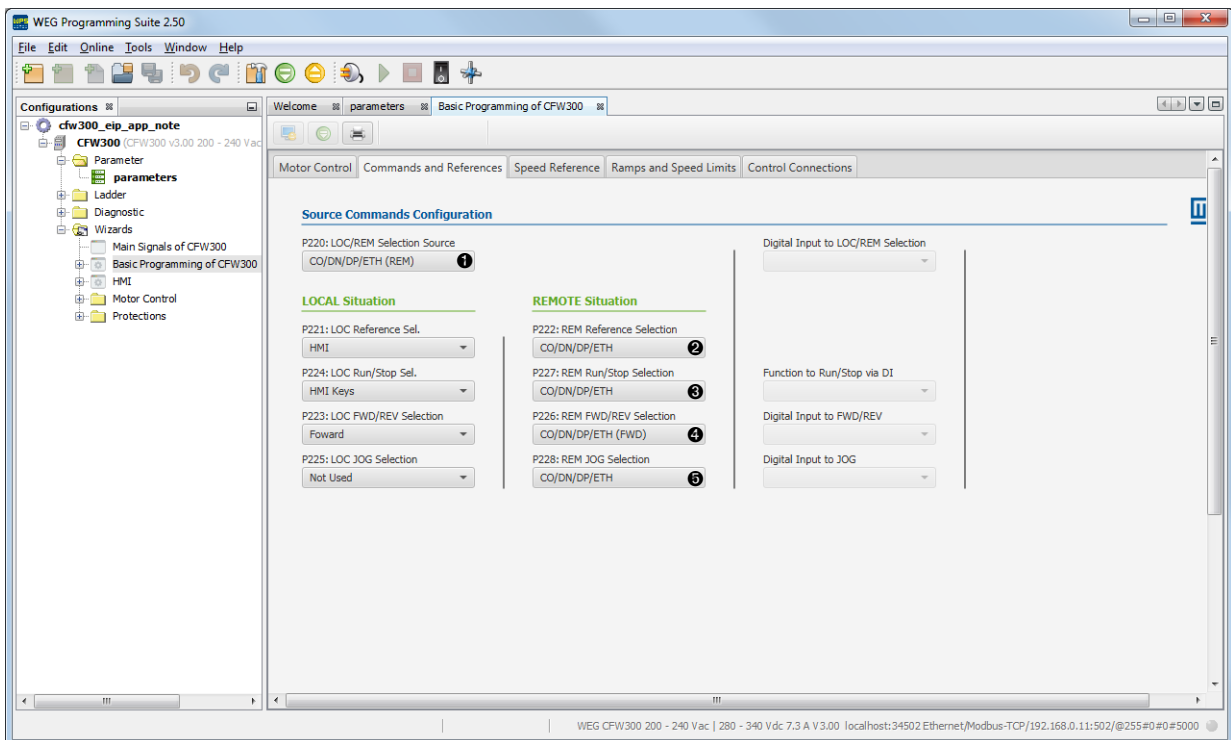


Figure 3.2: WPS - Local/Remote configuration

3.3 COMMUNICATION ERROR

For CFW300, the following events lead to error indication:

- When cyclic communication is active and it is interrupted.
- When cyclic communication is active and master is in "Run" mode, and then it goes to "Idle" mode.

For both situations, CFW300 will indicate A147 ou F247 (EtherNet/IP Communication Offline). It is important to define the action CFW300 will take in case of communication error. If CFW300 was running the motor via network command, CFW300 should also perform a general disable. Based on this, the following configurations have been programmed:

- P313 Action for Communic. Error: 2 (General Disable).

3.4 I/O DATA CONFIGURATION

Choose assembly instance, to define data profile for control, status and speed variables, and also program additional parameters to read/write from/to device:

- Assembly instances: 100/150 (Manufacturer Specific Profile).
- Read parameters:
 - P003 - Motor Current
 - P049 - Present Fault
- Write parameters: no additional write parameters will be included to write area.

So the following parameters must be programmed:

- P871 EIP Data Profile: 100/150: 8 (Manufac. Speed + I/O).
- P872 Ethernet Read Word #3: 3 (P003)
- P873 Ethernet Read Word #4: 49 (P049)

Using such parametrization, the device has the following I/O data to communicate cyclically with master:

CFW300 Parameters at Read Area	Size	Total: 8 bytes
P680 Logical Status	16-bit (2 bytes)	
P681 13-Bit Speed	16-bit (2 bytes)	
P003 Motor Current	16-bit (2 bytes)	
P049 Present Fault	16-bit (2 bytes)	

CFW300 Parameters at Write Area	Size	Total: 4 bytes
P684 CO/DN/DP/ETH Control	16-bit (2 bytes)	
P685 CO/DN/DP/ETH Speed Ref	16-bit (2 bytes)	

4 MASTER CONFIGURATION - CONTROLLOGIX

Use Rockwell software to configure and program ControlLogix to communicate with CFW300. The main steps are described below.

4.1 RSNETWORX FOR ETHERNET/IP

4.1.1 Register EDS File

Use EDS Wizard to register EDS file for CFW300.

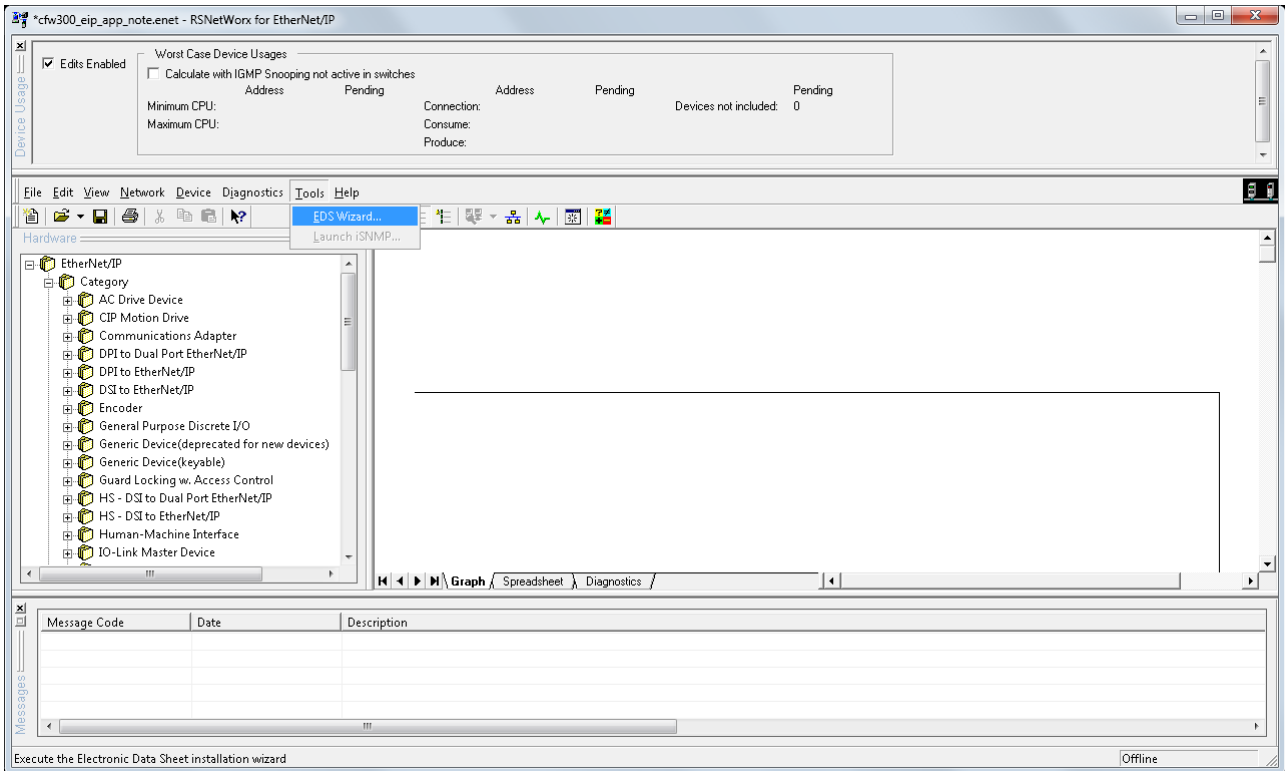


Figure 4.1: RSNetWorx For EtherNet/IP

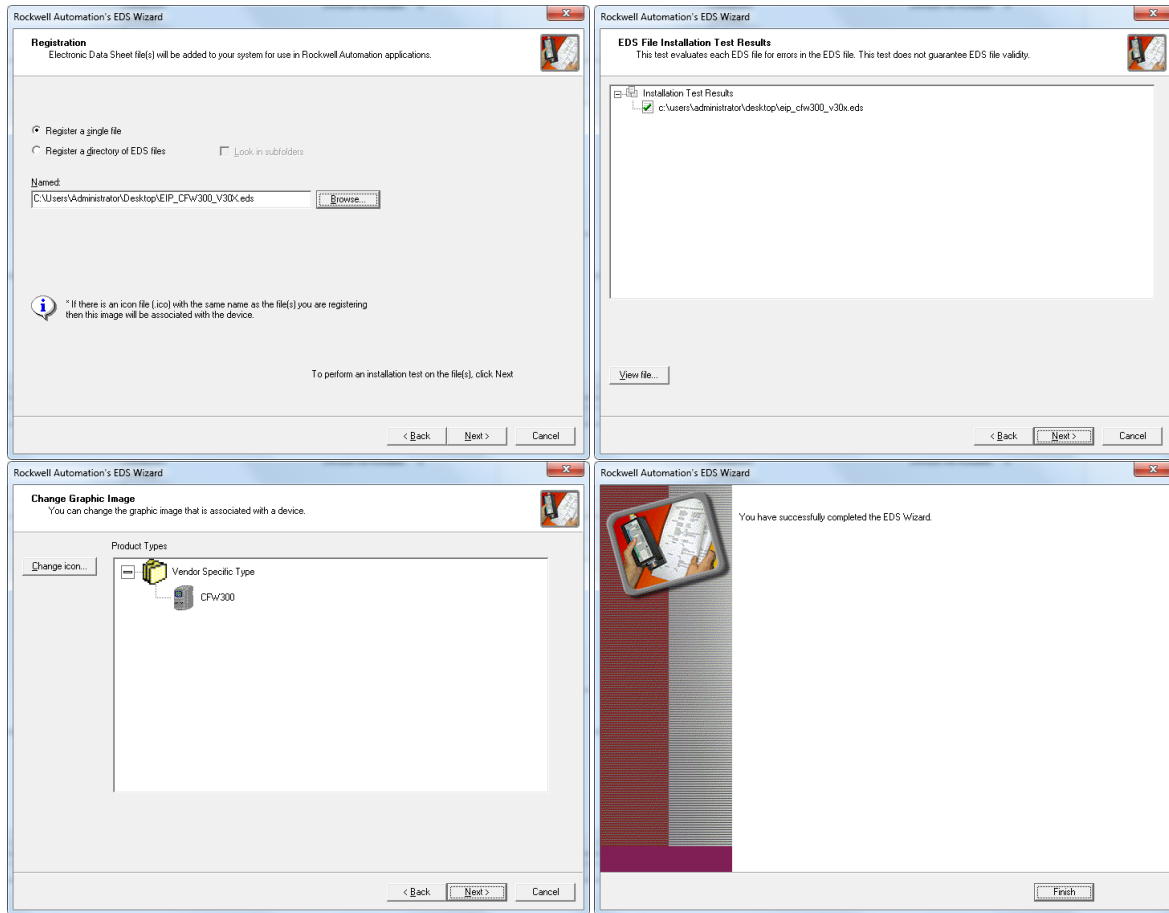


Figure 4.2: RSNetWorx - Register EDS File

4.1.2 Scan Devices

With devices connected at configuration tool, it is possible to scan devices to find nodes for communication. For this example, EtherNet/IP scanner (1756-EN2TR) is present at address 192.168.0.71. It is possible to save this configuration and link it during ControlLogix configuration.

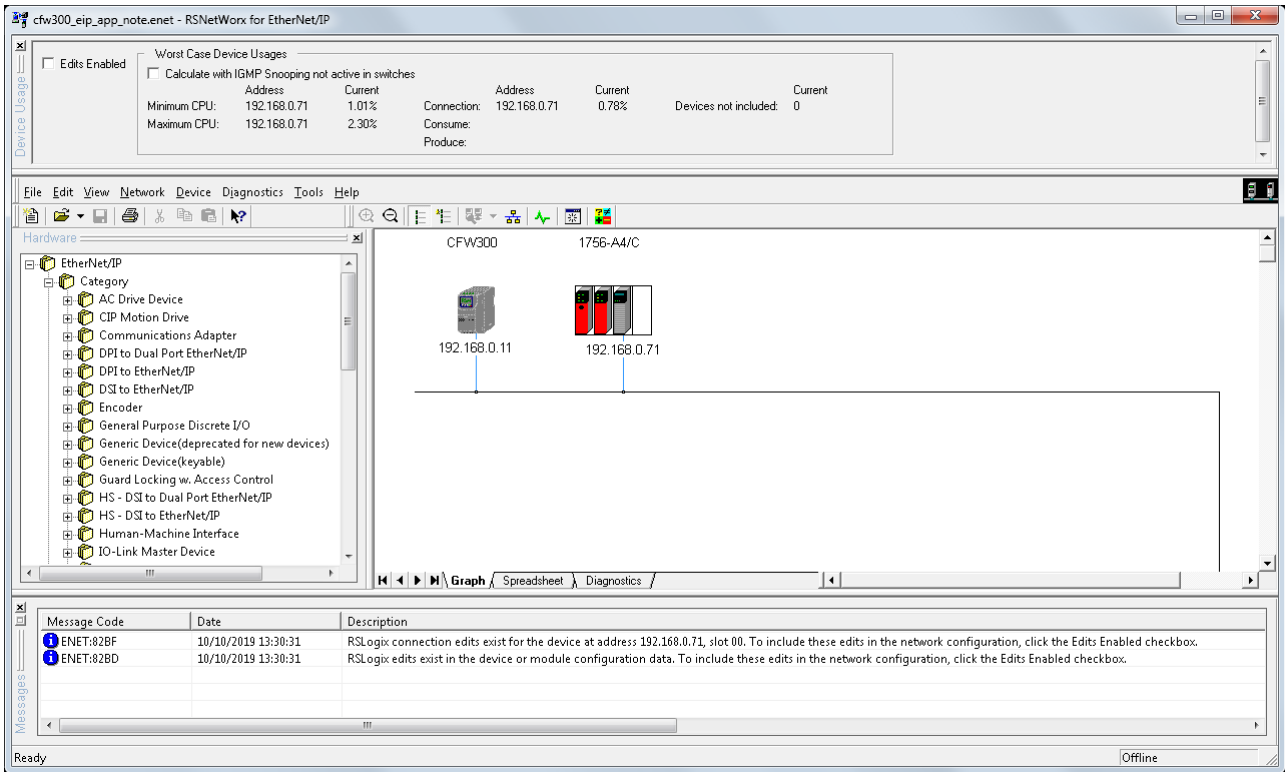


Figure 4.3: RSNetWorx for EtherNet/IP - Online Identification

4.2 STUDIO 5000 LOGIX DESIGNER

Open Studio Rockwell 5000 software and create a new project. Select ControlLogix CPU, chassis and EtherNet/IP scanner, according to available hardware and firmware version.

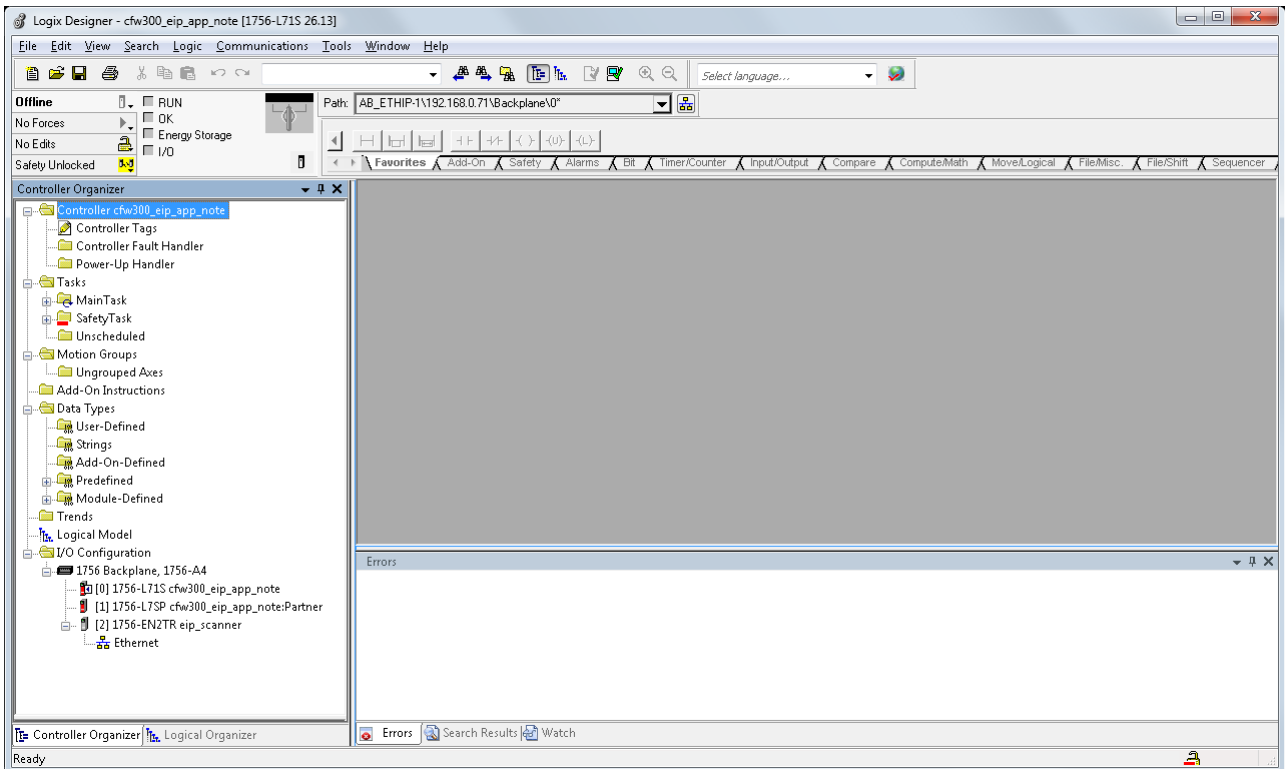


Figure 4.4: Studio 5000 Logix Designer - Create new project

4.2.1 Add New Module for CFW300

Create a new CFW300 module for Ethernet interface, and configure the instance and I/O size, as programmed at item 3.4.

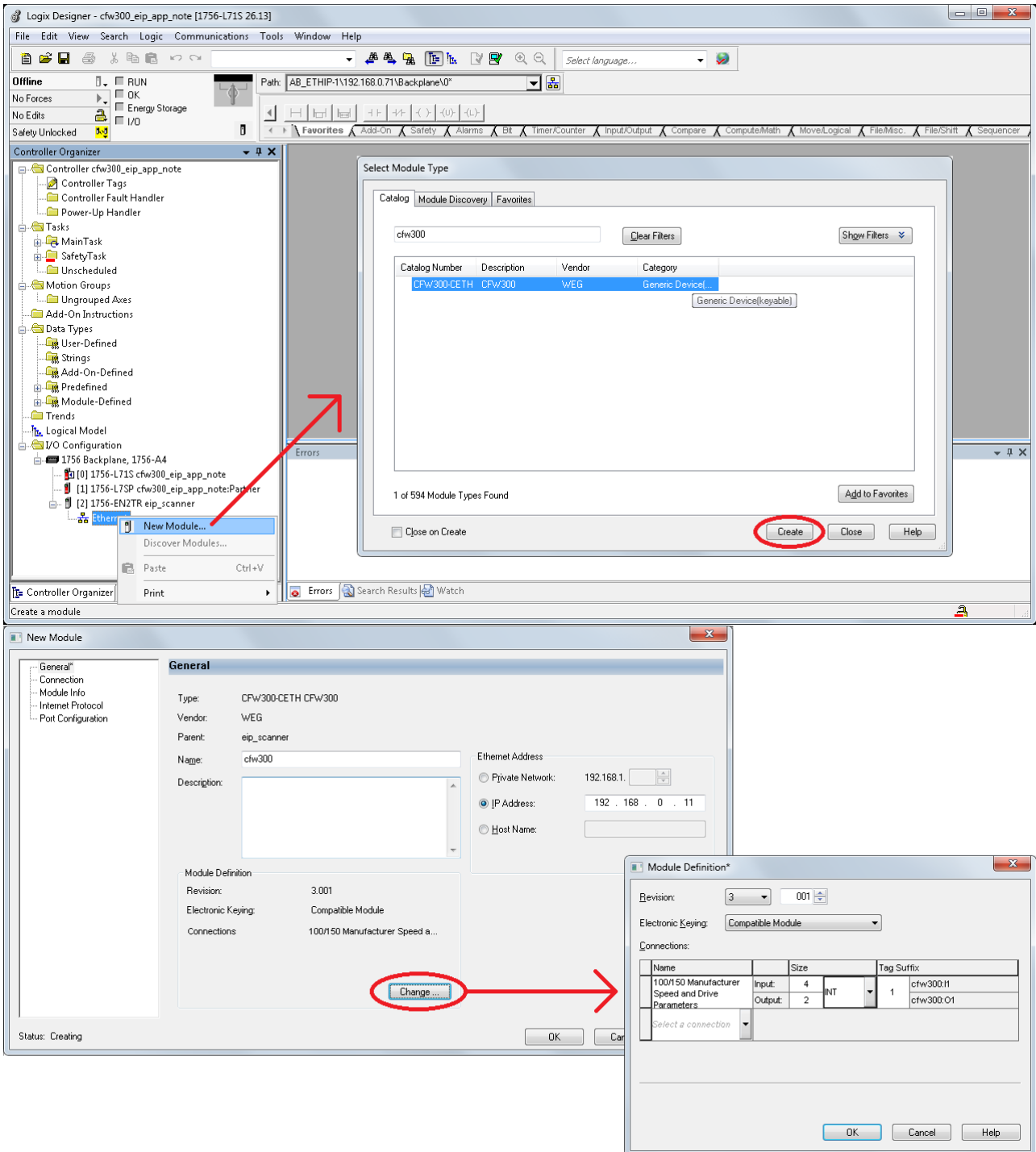


Figure 4.5: Studio 5000 Logix Designer - Add new CFW300 module

For this example, CFW300 will communicate 4 input words and 2 output words. Status and control data will follow the manufacturer specific profile. This must match the same configuration programmed at drive parameters.

4.2.2 Download and Monitor Configuration

With module created, device data should be available at Controller Tags. Using these tags, it is possible to view and edit online device I/O data, as well as creating a ladder logic to control and monitor the device.

Once the configuration is finished, download it to PLC in order to monitor CFW300 I/O data.

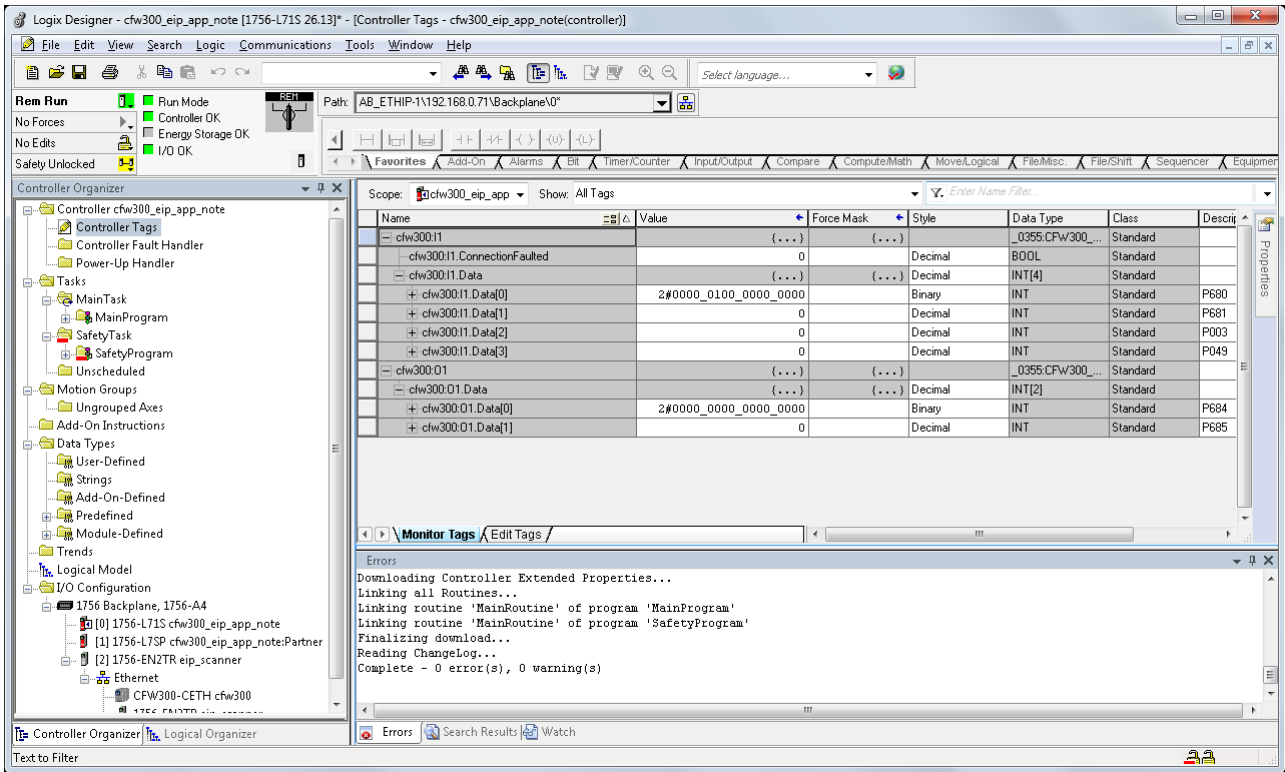


Figure 4.6: Studio 5000 Logix Designer - Download

5 CONTROL AND MONITORING

Once network configuration is done, it is possible to control and monitor the device. The main steps are described below.

5.1 VIEW AND EDIT READ AND WRITE DATA

In on line mode, at controller tags, it is possible to check input and write output data directly at controller memory.

Bit	Value/Description
Bit 0	Reserved
Bit 1	Run Command 0: there was no Run command 1: there was Run command
Bit 2	Fire Mode 0: fire Mode function Inactive 1: fire Mode function active
Bit 3 ... 4	Reserved
Bit 5	2nd Ramp 0: 1 st acceleration and deceleration ramp by P100 and P101 1: 2 nd acceleration and deceleration ramp by P102 and P103
Bit 6	Config. Mode 0: Inverter operating in normal conditions 1: Inverter in configuration state. It indicates a special condition in which the Inverter cannot be enabled, because it has parameterization incompatibility
Bit 7	Alarm 0: Inverter is not in alarm state 1: Inverter is in alarm state
Bit 8	Running 0: motor is stopped 1: Inverter is running according to reference and command
Bit 9	Enabled 0: Inverter is disabled 1: Inverter is enabled and ready to run the motor
Bit 10	Forward 0: motor is running in the reverse direction 1: motor is running in the forward direction
Bit 11	JOG 0: JOG function inactive 1: JOG function active
Bit 12	Remote 0: Inverter in Local mode 1: Inverter in Remote mode
Bit 13	Subvoltage 0: no undervoltage 1: with undervoltage
Bit 14	Reserved
Bit 15	Fault 0: Inverter is not in fault state 1: some fault registered by the Inverter

Figure 5.1: Read data, with highlight to the status word as described at CFW300 EtherNet/IP documentation

For inputs, as described at item 3.4, it is programmed to read the following information:

- cfw300:11.Data[0]: P680, value 5890 decimal (binary 0001 0111 0000 0010).
 - Bit 1 = 1 (run command).
 - Bit 8 = 1 (running).
 - Bit 9 = 1 (enabled).
 - Bit 10 = 1 (forward direction).
 - Bit 12 = 1 (at remote mode).
- cfw300:11.Data[1]: P681, value 2049 (≈ 1/4 motor nominal speed).
- cfw300:11.Data[2]: P003, value 70 (motor current = 7.0A).
- cfw300:11.Data[3]: P049, value 0 (fault code = 0, no fault present).

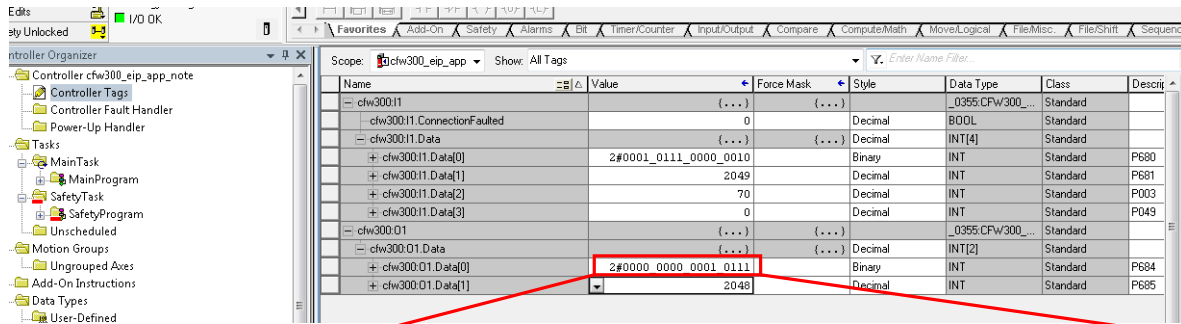


Table 4.3: P684 bits function

Bit	Value/Description
Bit 0 Ramp Enable	0: stops the motor by deceleration ramp 1: run the motor according to the acceleration ramp until reaching the speed reference value
Bit 1 General Enable	0: disables the Inverter, interrupting the power supply to the motor 1: enables the Inverter, allowing the operation of the motor
Bit 2 Run Forward	0: run the motor in the opposite direction of the reference signal (reverse) 1: run the motor in the direction of the reference signal (forward)
Bit 3 JOG Enable	0: disable JOG function 1: enable JOG function
Bit 4 Remote	0: Inverter goes into Local mode 1: Inverter goes into Remote mode
Bit 5 2nd Ramp	0: acceleration and deceleration ramp by P100 and P101 1: acceleration and deceleration ramp by P102 and P103
Bit 6 Reserved	-
Bit 7 Fault Reset	0: no function 1: If in fault state, reset the fault
Bit 8 ... 15 Reserved	-

Figure 5.2: Write data, with highlight to the command word as described at CFW300 EtherNet/IP documentation

For output, as described at item 3.4, it is programmed to write the following information:

- cfw300:O1.Data[0]: P684, value 23 decimal (binary 0000 0000 0001 0111).
 - Bit 0 = 1 (ramp enable).
 - Bit 1 = 1 (general enable).
 - Bit 2 = 1 (run forward).
 - Bit 4 = 1 (remote).
- cfw300:O1.Data[1]: P685, value 2048 (≈ 1/4 motor nominal speed).

These tags can be used during PLC program to create a logic in order to monitor and control devices.

5.2 ACYCLIC REQUESTS

Besides monitoring status data and writing control data, it is possible to create acyclic requests to access other device parameters. In order to do that, a ladder logic to send acyclic messages is necessary. A "MSG" instruction will be used to send such request.

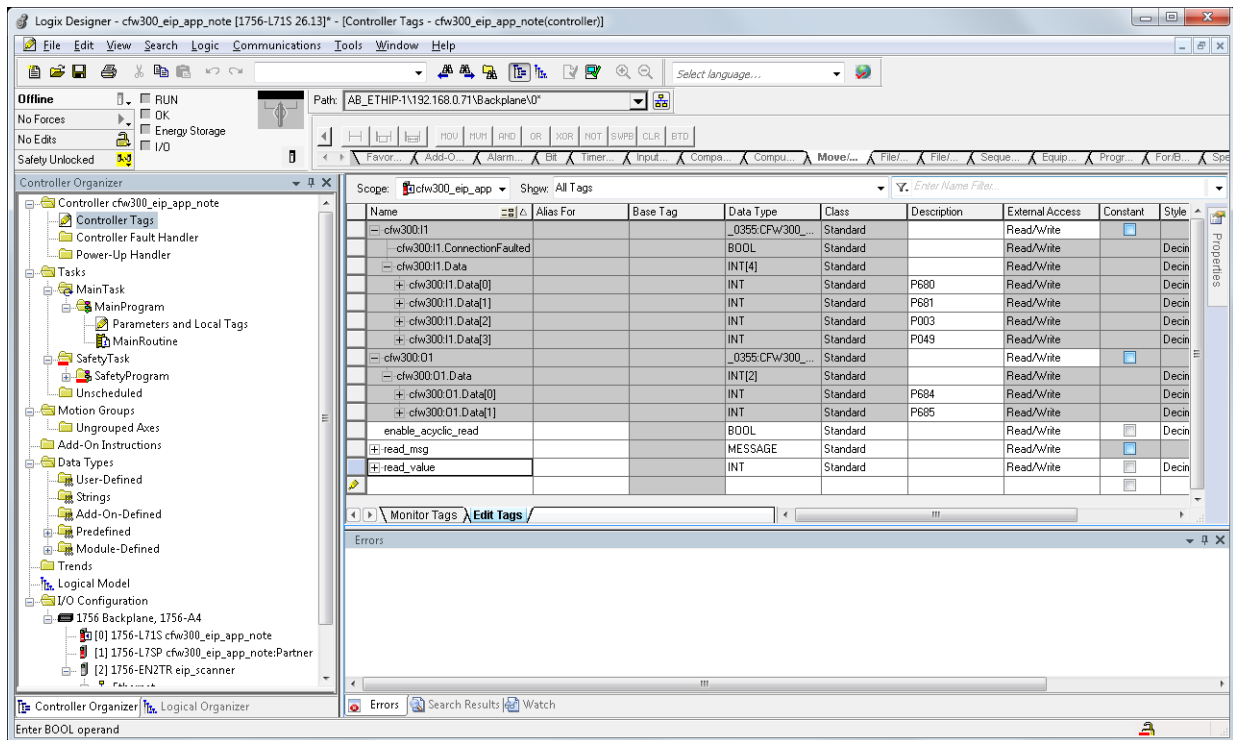


Figure 5.3: Tags to control acyclic messages

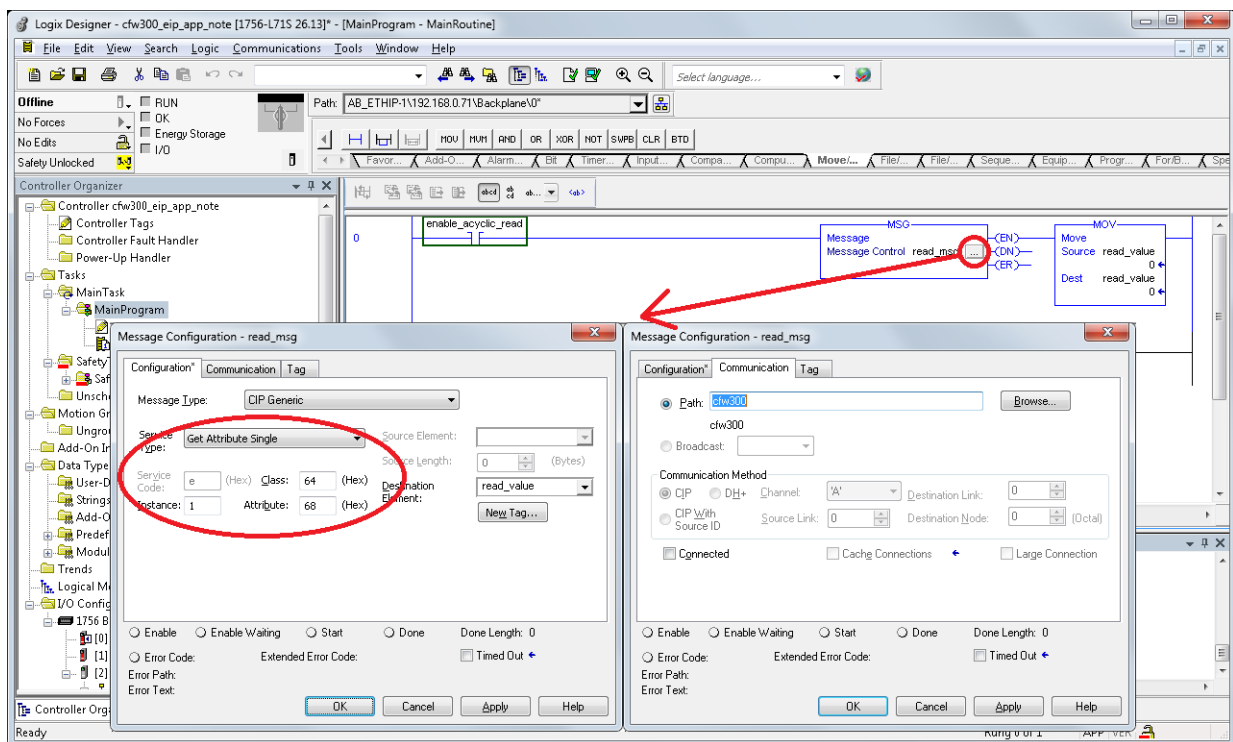


Figure 5.4: Program MSG instruction

Configure Service, Class, Instance and Attribute to address desired parameter. For this example, to read P004 (DC Link Voltage)¹, it is necessary to program the following values:

¹Use Manufacturer Specific Class table, described at Ethernet User's Guide, to know how to address entire parameter list.

- Service “Get Attribute Single” to read parameter.
- Class 100 (64 hex)
- Instance 1
- Attribute 104 (68 hex)

Once it is programmed, in on line mode, it is possible to enable the block to send an acyclic request to read the parameter value.

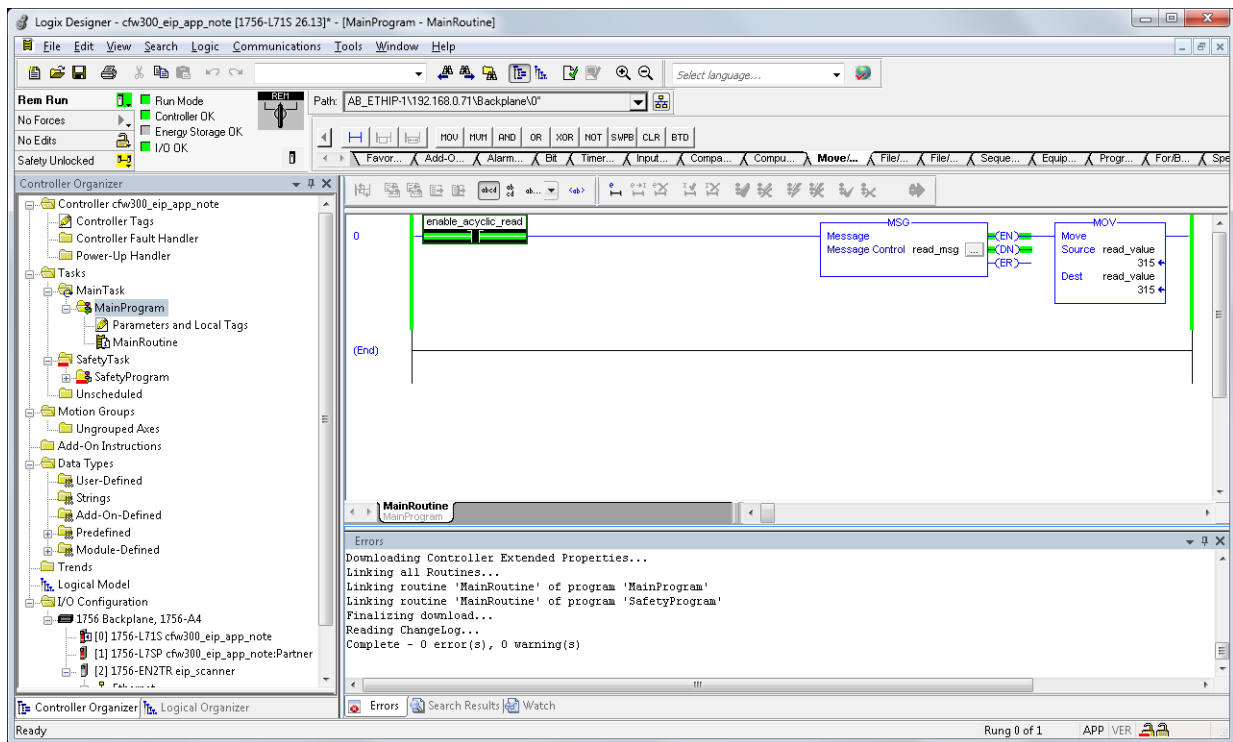


Figure 5.5: Enable MSG instruction



WEG Drives & Controls - Automação LTDA.
Jaraguá do Sul – SC – Brazil
Phone 55 (47) 3276-4000 – Fax 55 (47) 3276-4020
São Paulo – SP – Brazil
Phone 55 (11) 5053-2300 – Fax 55 (11) 5052-4212
automacao@weg.net
www.weg.net