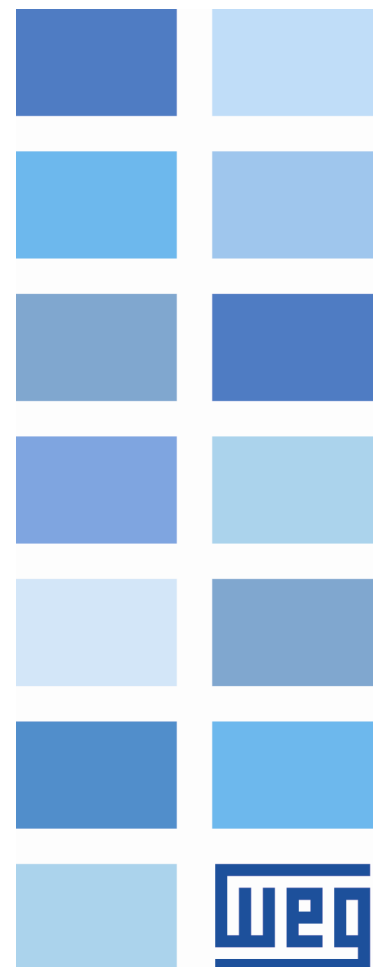


# Operation on Modbus TCP network using PLC300

## CFW320-CETH

### Application Note





# **CFW320-CETH Modbus TCP Application Note**

Series: CFW320

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The information below describes the reviews made in this manual.

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-	R00	First edition

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# 1 DESCRIPTION

This application note is intended to provide a description of how to program a CFW320 frequency converter with accessory CFW320-CETH to communicate in Modbus TCP network using PLC300.

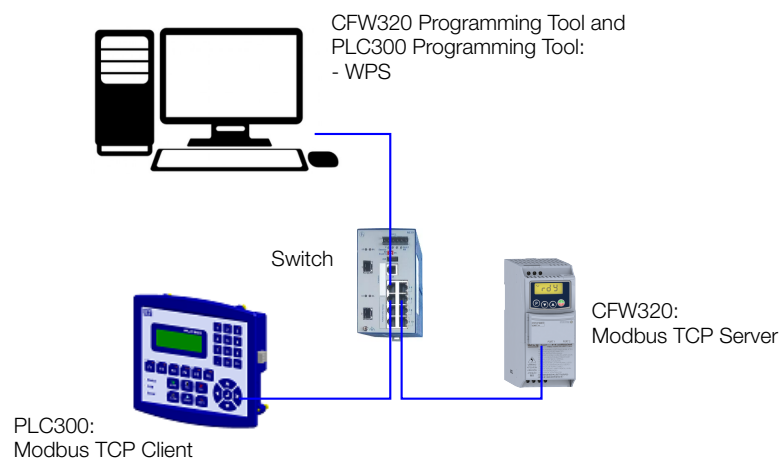
This document is meant for trained personnel working with the described equipment and Modbus TCP network installation, besides a good knowledge of automation and programmable logic controllers, in particular about WPS software.

## 1.1 REFERENCE DOCUMENTS

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

Document	Version	Source
CFW320 User's Manual	10008951055 / 00	WEG
Micro Mini Drives Programming Manual	10006257370 / 02	WEG
CFW320 Ethernet User's Guide	10009156409 / 00	WEG
PLC300 Modbus TCP user's manual	10002233461 / 00	WEG
WPS	3.00	WEG

## 1.2 ARCHITECTURE



**Figure 1.1:** Network components for this application

## 1.3 CFW320

- Equipment: CFW320 version 1.00.
- Accessory: CFW320-CETH version 1.01.
- Programming tool: WPS version 3.00.

## 1.4 PLC300

- CPU: PLC300HP version 4.13.
- Programming tool: WPS version 3.00.

## **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:

- Static IP (not DHCP)
- Subnet mask: 255.255.255.0
- IP addresses: each device must have a different IP address.

PC: 192.168.0.2

PLC300: 192.168.0.10

CFW320: 192.168.0.11 (as described in [Chapter 3 SERVER CONFIGURATION - CFW320 on page 8](#)).

### 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:

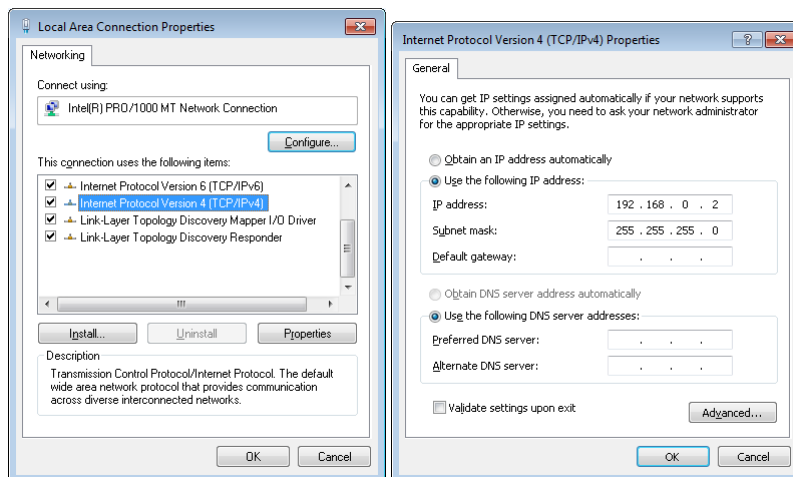


Figure 2.1: PC IP Address Configuration

### 2.2 PLC300 IP ADDRESS CONFIGURATION

The IP address for PLC300 can be set via SETUP menu using PLC300 keypad. This can also be done using the Setup Configuration tool in WPS.

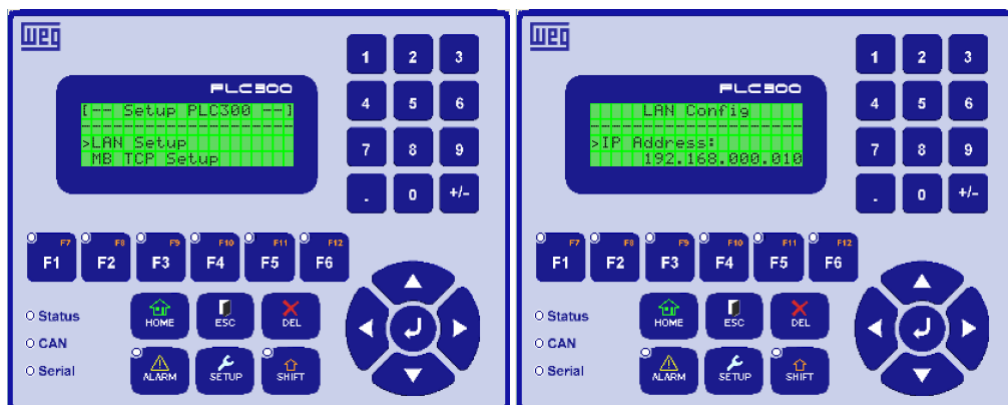


Figure 2.2: PLC300 IP Address Configuration

### 3 SERVER CONFIGURATION - CFW320

This section describes the main configurations for CFW320 frequency converter operation with accessory CFW320-CETH in Modbus TCP network. Some of the described configurations are only available if CFW320-CETH accessory is properly installed.

Refer to the CFW320 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:

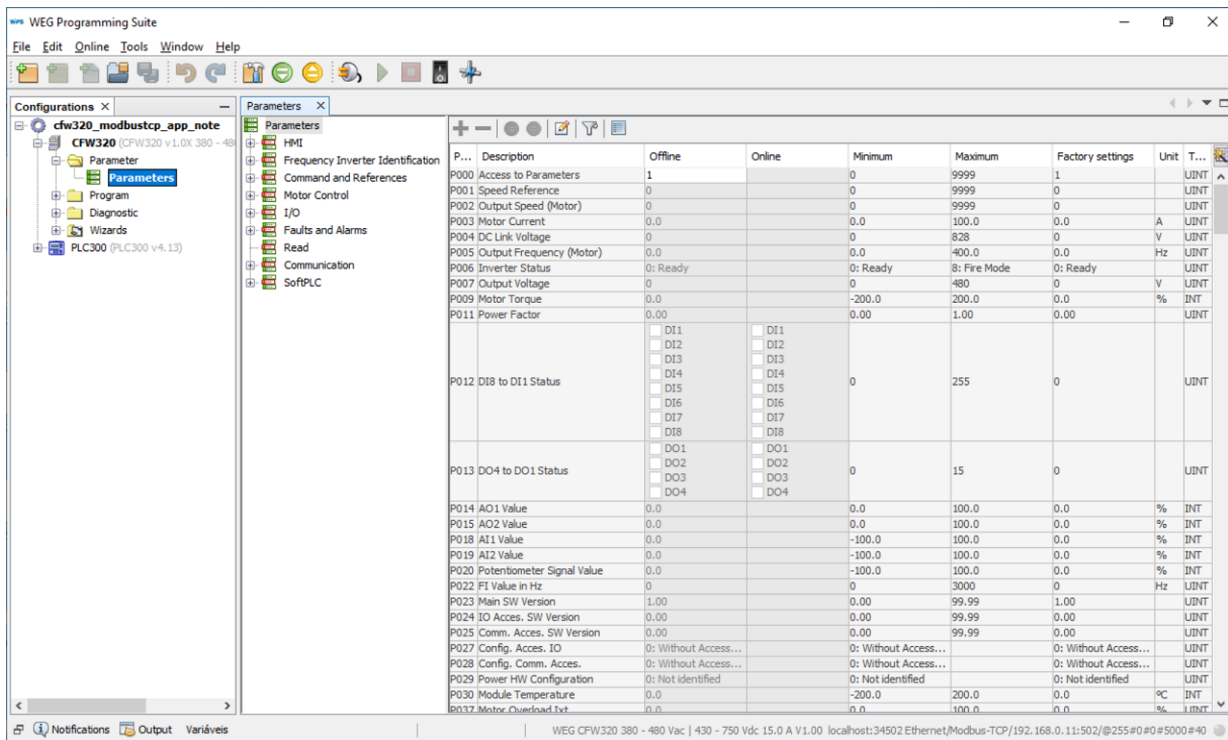


Figure 3.1: WPS - Parameter list

#### 3.2 LOCAL/REMOTE

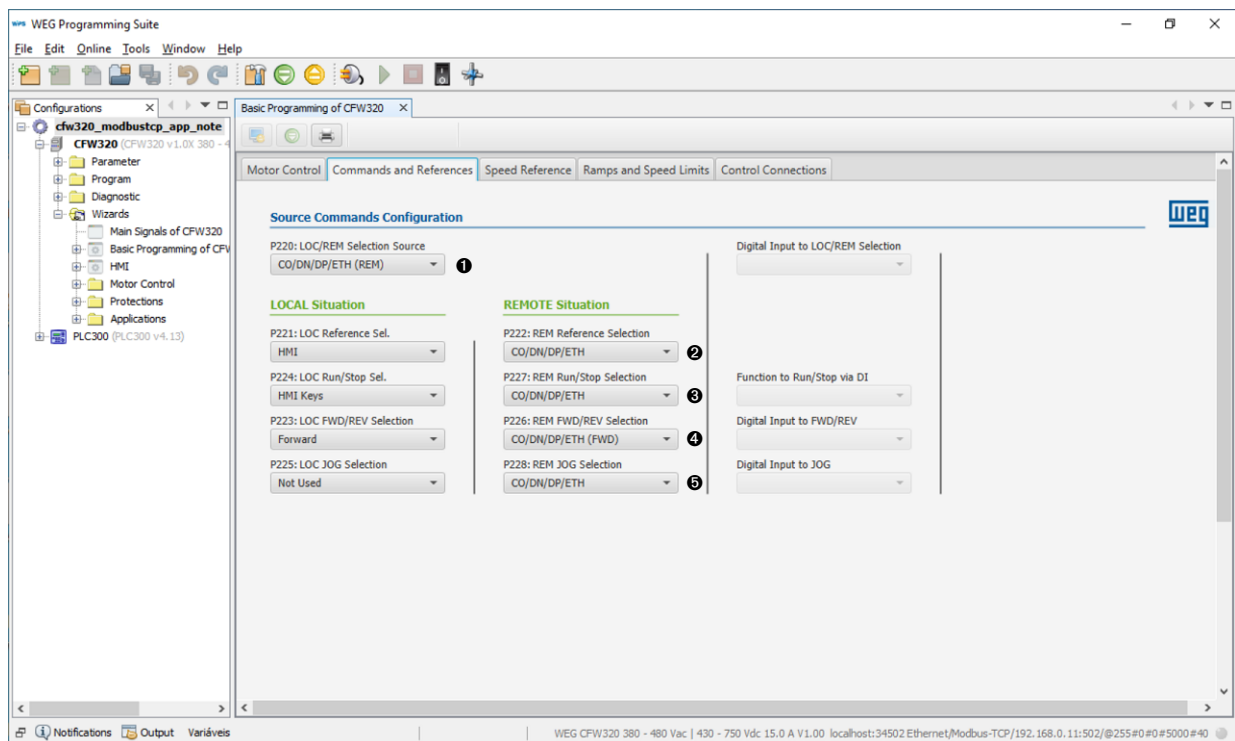
CFW320 has two operation modes: local and remote. For each operation mode, it is necessary to define the source that it will use to receive commands, like start/stop, fault reset. For this application, considering CFW320-CETH accessory installed, the following control sources have been defined:



- Local: keypad will control CFW320 in local mode.
- Remote: CFW320-CETH will control CFW320 in remote mode.
- Local/Remote transition: the definition if the device is in local or remote mode will be controlled by CFW320-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

It is important to define the action CFW320 will take in case of communication error. For this application, a communication error will be detected based on Modbus TCP Timeout of 5.0 seconds - if device stops receiving Modbus TCP telegrams for a period longer than 5.0 seconds, it will indicate an alarm. If CFW320 was running the motor via network command, CFW320 should also perform a general disable.

Based on this, the following configurations have been programmed:

- P868 MBTCP Timeout: 5.0s.
- P313 Action for Communic. Error: 2 (General Disable).

## 4 CLIENT CONFIGURATION - PLC300

To configure and program PLC300 to communicate with CFW320, use WPS software. The main steps are described below.

### 4.1 CREATE WPS RESOURCE

Add a new resource for the PLC300 to the WPS Configuration. We will use this configuration to develop a ladder logic to send and receive Modbus TCP Client requests to CFW320.

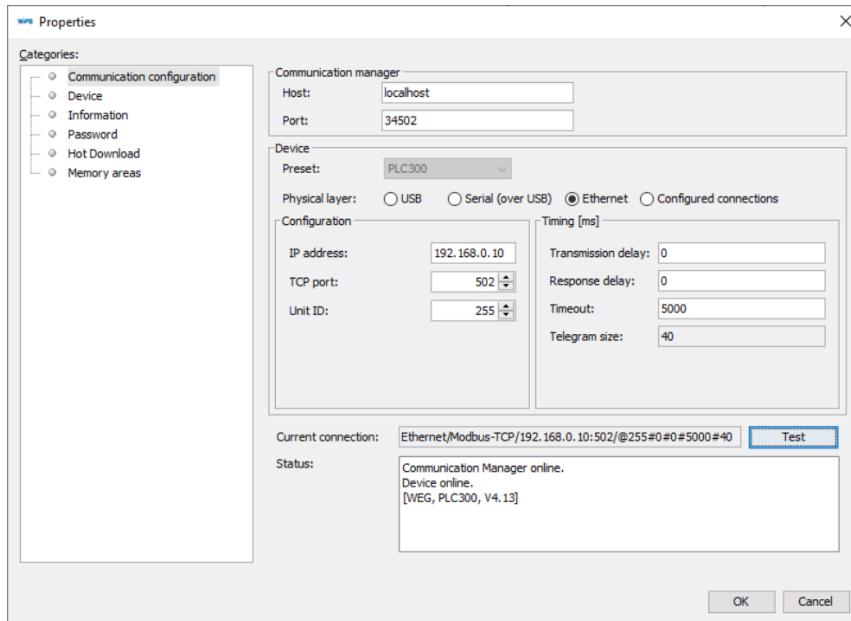


Figure 4.1: WPS - Add new resource

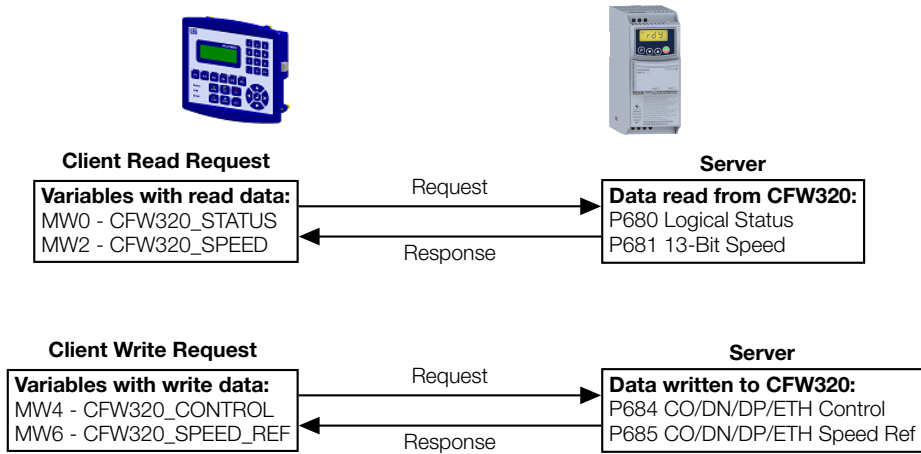
### 4.2 DATA ACCESS DEFINITION

For this application, CFW320 will exchange the following data with PLC300:

CFW320 Parameters to Read	Holding Register Address	Size
P680 Logical Status	680	16bit
P681 13-Bit Speed	681	16bit

CFW320 Parameters to Write	Holding Register Address	Size
P684 CO/DN/DP/ETH Control	684	16bit
P685 CO/DN/DP/ETH Speed Ref	685	16bit

After choosing the data, we will create PLC300 memory variables to link with these parameters.



These variables have been created as global variables, to use along the program:

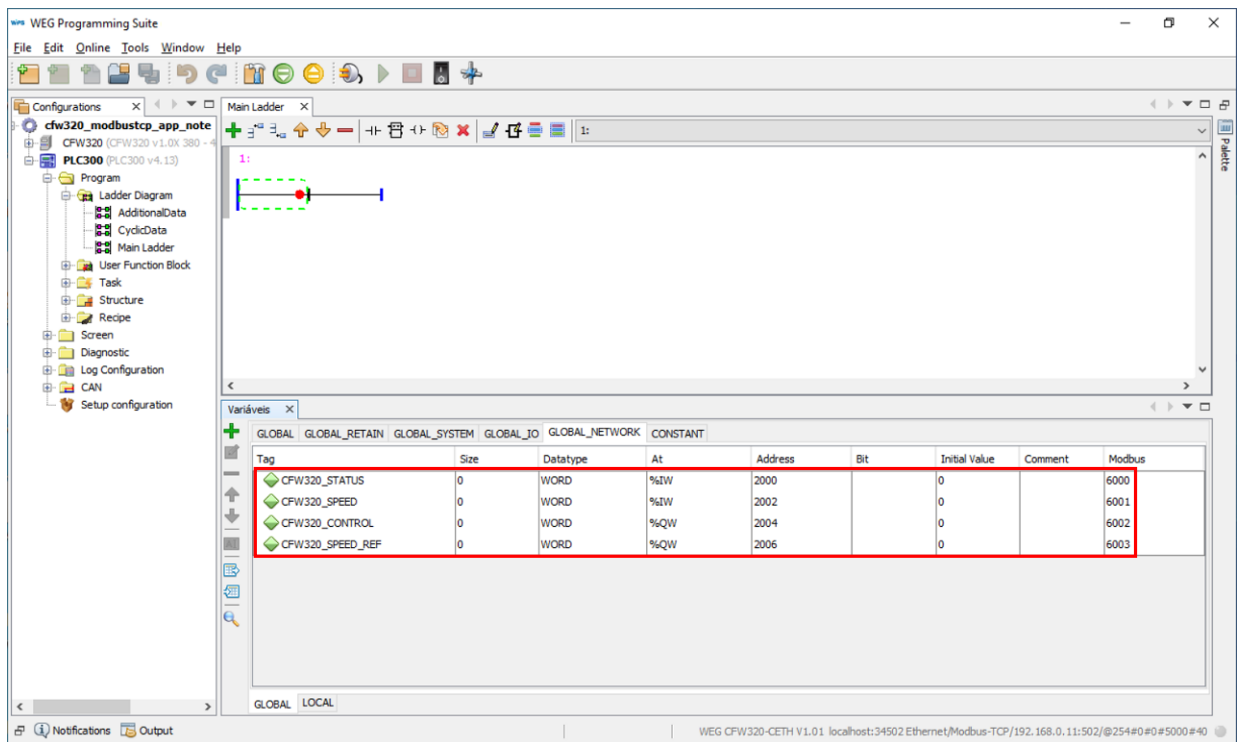


Figure 4.2: WPS - Create Variables

### 4.3 CONFIGURE CLIENT TO READ/WRITE SERVER DATA

PLC300 uses ladder logic to create and send Modbus TCP requests. There are ladder functions to send read and write Modbus TCP requests, where it is possible to program the IP address, unit ID, port, function code and registers to access.

According to defined in [Section 4.2 DATA ACCESS DEFINITION on page 10](#), it was programmed one ladder function to read data from CFW320, and other ladder function to write data to CFW320, with the following configuration:

- CFW320 Modbus TCP Server configuration:

- IP: 192.168.0.11;
- TCP Port: 502;
- Unit ID: 255;

- Read Words:
  - Modbus Function: 03 - Read Holding Registers;
  - Initial data address: 680 (Holding Register 680);
  - Number of data: 2 registers (Logical Status and Motor Speed);
- Write Words:
  - Modbus Function: 16 - Write Multiple Registers;
  - Initial data address: 684 (Holding Register 684);
  - Number of data: 2 registers (Control Word and Speed Reference);

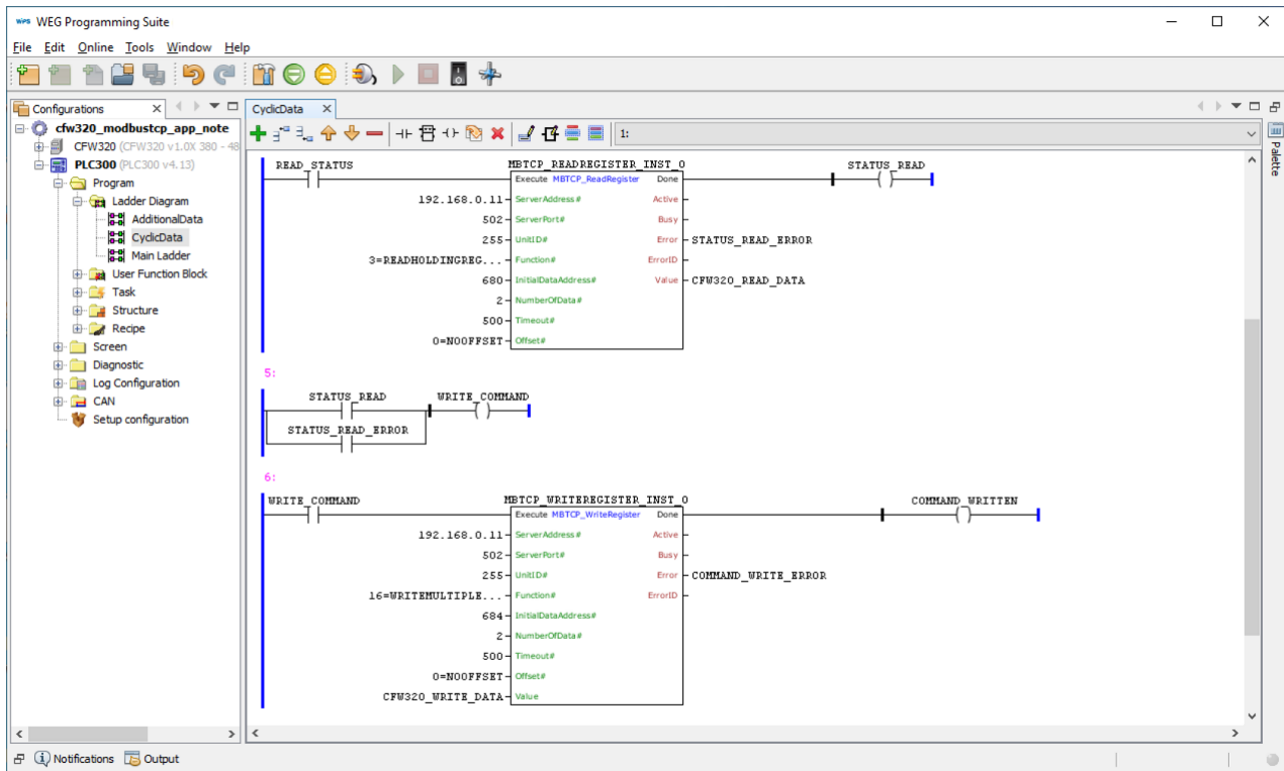


Figure 4.3: Ladder Logic to Read/Write Sever Data

The read and write commands are only transmitted in a positive transition of the “Execute” input. So, it is necessary to create a logic to control this transition, and repeat it cyclically in order to keep transmitting data constantly. For this example, a timer function using “POLL\_INTERVAL” variable, set to 1000ms, is the default time interval for triggering new requests.

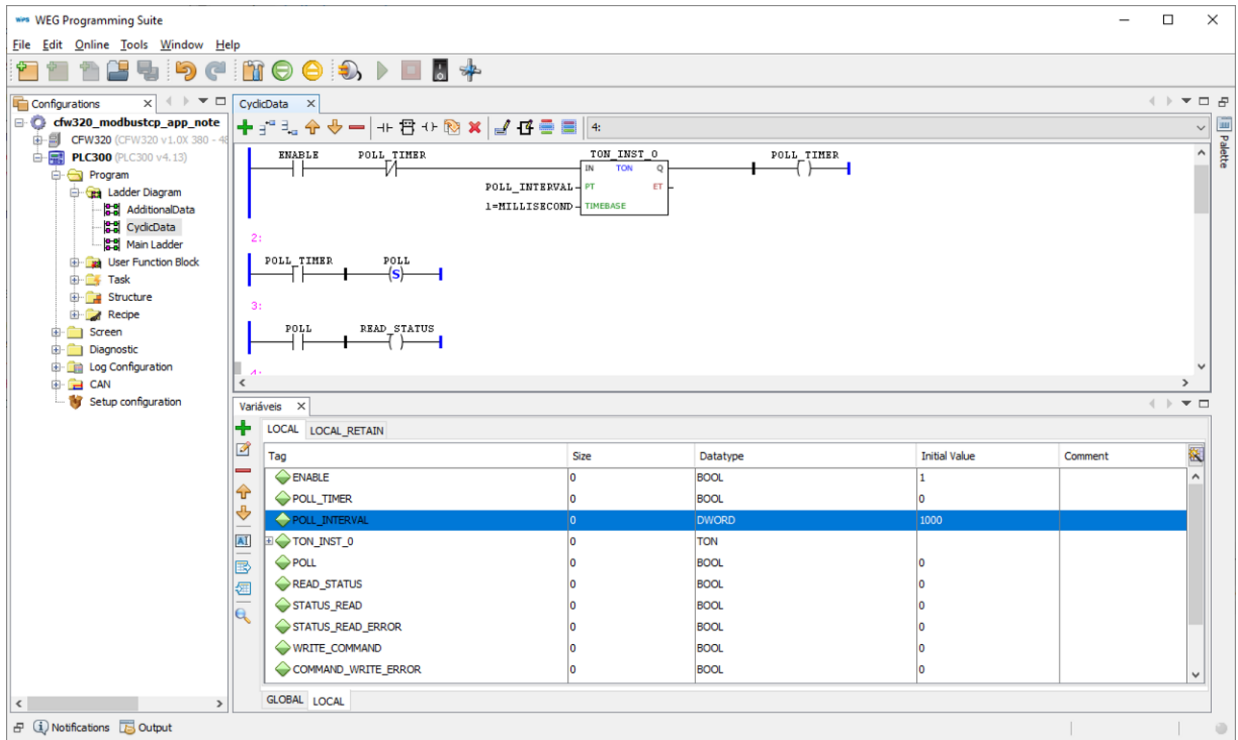


Figure 4.4: Logic for Timer Interval

## 4.4 DOWNLOAD AND MONITOR CONFIGURATION

Once the configuration is finished, download it to PLC from the WPS software. Go to the “Download Resource” option under the “Online” menu. When PLC300 is running the program, it is possible to monitor the ladder to view requests result.

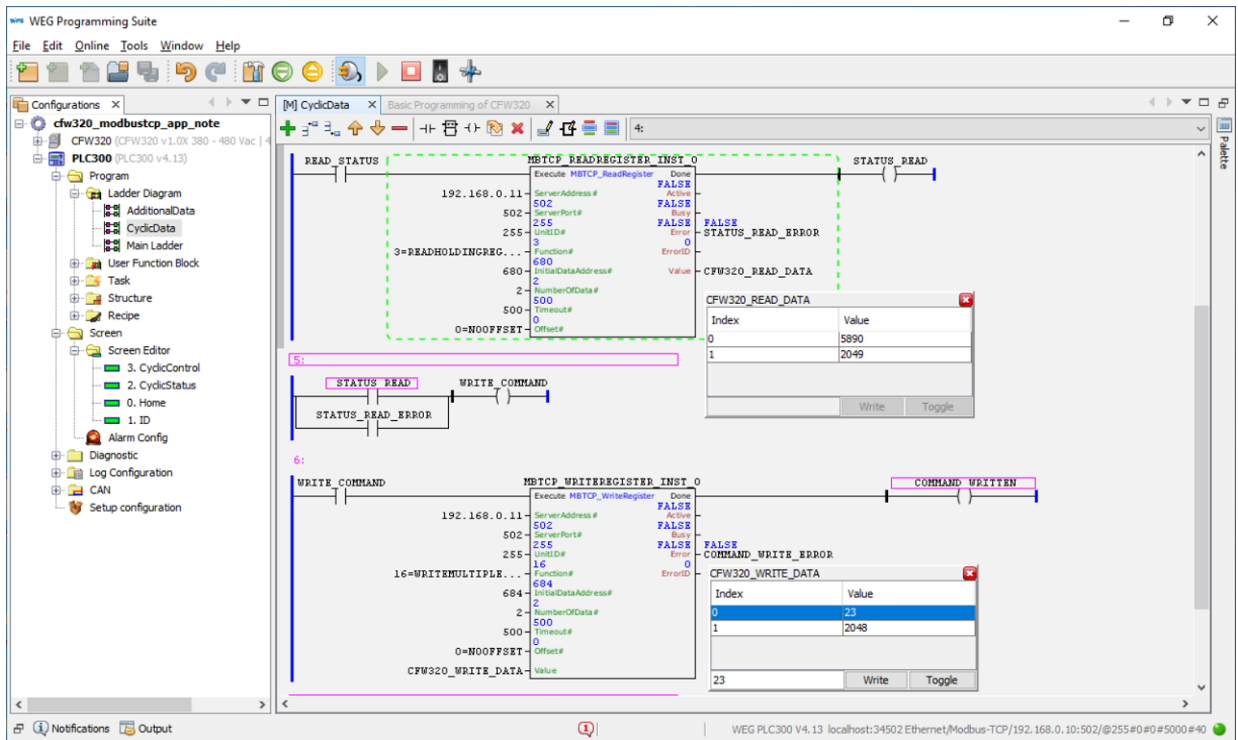


Figure 4.5: Online Monitoring

## 5 CONTROL AND MONITORING

Once network configuration is done, use WPS to access device data. The main steps are described below.

### 5.1 VIEW AND EDIT READ AND WRITE DATA

Under the “Configurations” tab, right-click “cfw320\_modbustcp\_app\_note/PLC300/Diagnostic/Monitoring Variable” and add a new file. Click at the plus sign, select the GLOBAL variables and press OK to add them to the monitoring file.

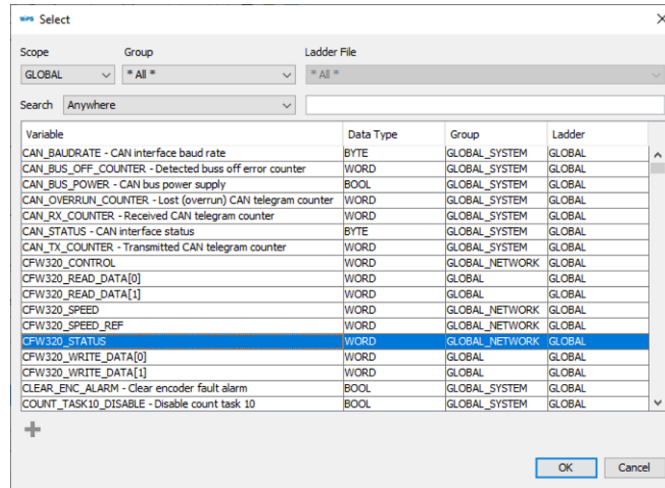


Figure 5.1: Monitoring Variable file

It is now possible to check input and write output data directly at controller memory.

Variable	Datatype	User	Monitoring	View as	Status
Global Variables					
CFW320_STATUS	WORD	0	1011100000010	Binary	OK
CFW320_SPEED	WORD	0	2049	Decimal	OK
CFW320_CONTROL	WORD	0	10111	Binary	OK
CFW320_SPEED_REF	WORD	0	2048	Decimal	OK

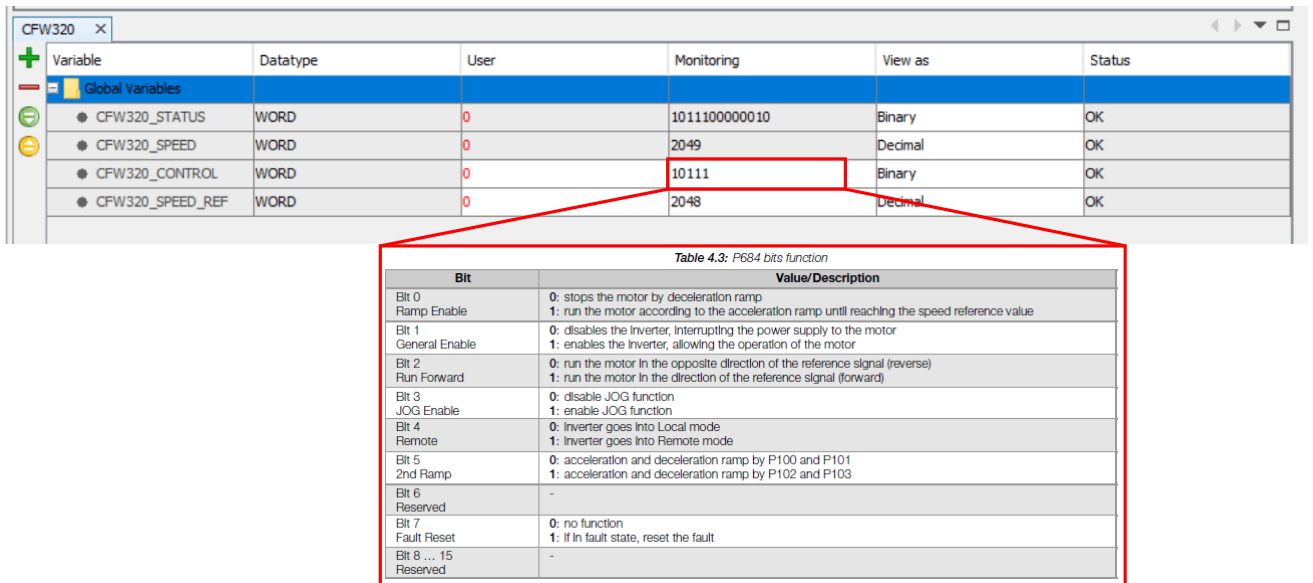
Table 4.2: P680 bits function

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 <sup>st</sup> acceleration and deceleration ramp by P100 and P101 1: 2 <sup>nd</sup> 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 5.2: Read data, with highlight to the status word as described at CFW320 Modbus TCP documentation

For inputs, as described in Section 4.2 DATA ACCESS DEFINITION on page 10, it is programmed to read the following information:

- CFW320\_STATUS: 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).
- CFW320\_SPEED: value 2049 ( $\approx$  1/4 motor nominal speed).



**Figure 5.3:** Write data, with highlight to the command word as described at CFW320 Modbus TCP documentation

For output, as described in [Section 4.2 DATA ACCESS DEFINITION on page 10](#), it is programmed to write the following information:

- CFW320\_CONTROL: 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).
- CFW320\_SPEED\_REF: value 2048 ( $\approx$  1/4 motor nominal speed).

## 5.2 LADDER LOGIC FOR ADDITIONAL DATA TRANSFER

Besides monitoring status data and writing control data, it is possible to create any other request to access server data.

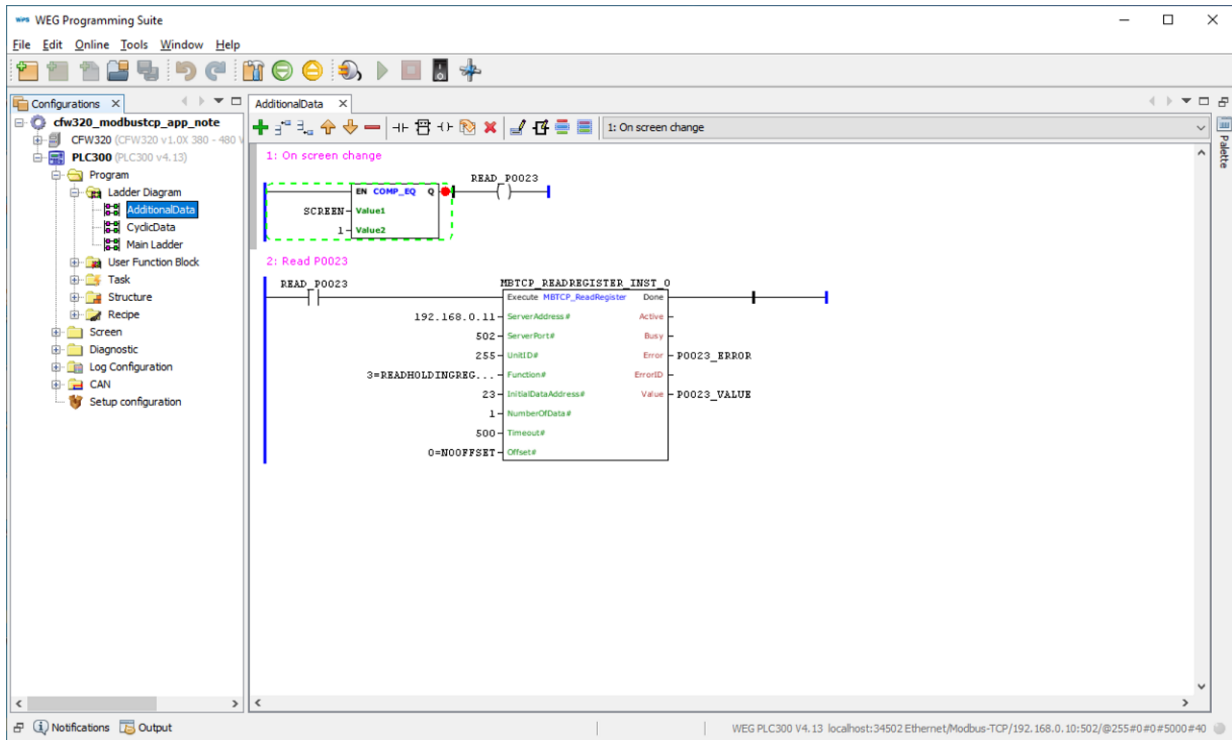


Figure 5.4: Additional message configuration





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