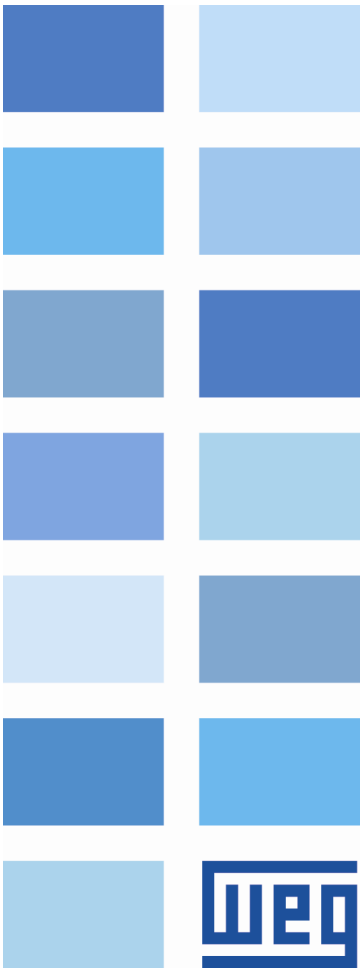
Operation on CANopen network using PLC300

SSW900-CAN-W

Application Note



SSW900-CAN-W CANopen Application Note

Series: SSW900

Language: English

Document: 10006261815 / 00

Build 5249

Publication Date: 01/2019

The information below describes the reviews made in this manual.

Version	Revision	Description
-	R00	First edition

CONTENTS

1 DESCRIPTION

This application note is intended to provide a description of how to program a soft-starter SSW900 with accessory SSW900-CAN-W to communicate in CANopen network using PLC300.

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

1.1 REFERENCED DOCUMENTS

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

Document	Version	Source
SSW900 User's Manual	10005616165 / 04	WEG
SSW900 Soft-Starter Programming Manual	10003989140 / 03 (1.2X)	WEG
SSW900-CAN-W CANopen User's Guide	10006223748 / 00 (1.2X)	WEG
WPS	2.40	WEG
Planning and Installation Manual - DeviceNet Cable System	PUB00027R1	ODVA

1.2 ARCHITECTURE

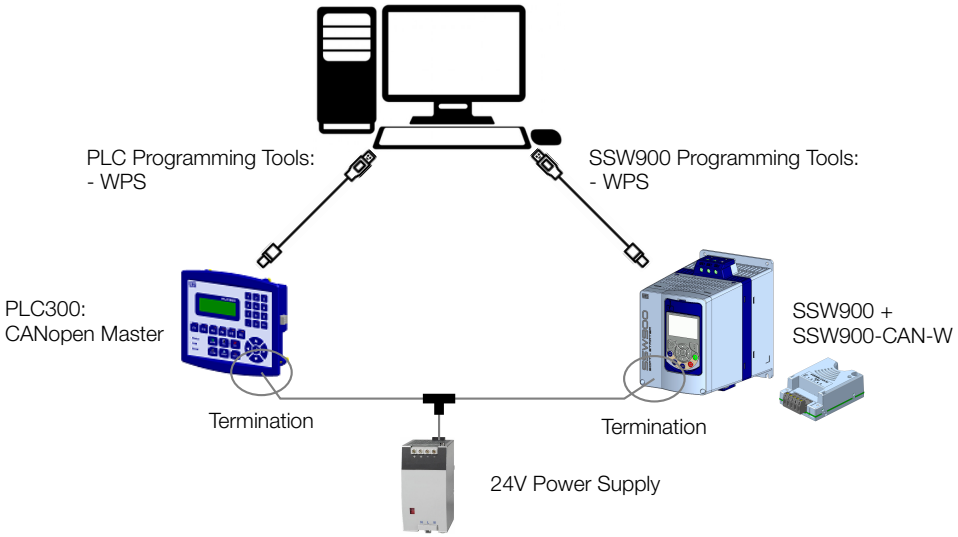


Figure 1.1: *Network components for this application*

1.3 SSW900

- Equipment: SSW900 with accessory SSW900-CAN-W installed at slot 1.
- Version: 1.20.
- EDS file: CO_SSW900_V12X.eds.
- Programming tools:
  - WPS version 2.40.

1.4 PLC300

- CPU: PLC300HP version 4.11.

- Programming tools:
  - WPS version 2.40.

1.5 PASSIVE NETWORK COMPONENTS

For passive network components - cables, connectors, terminating resistors, power supply - we recommend using certified components for DeviceNet network. Please refer to the product documentation for information about the proper network installation.

2 SLAVE CONFIGURATION

This section describes the main configurations for soft-starter SSW900 operation with accessory SSW900-CAN-W in CANopen network. Some of the described configurations are only available if SSW900-CAN-W accessory is properly installed.

Refer to the SSW900 programming manual for the necessary configurations related to other device functions, like motor configuration, protections, etc.

2.1 CANOPEN INTERFACE

For soft-starter SSW900 operation in the CANopen network, it is necessary to program the protocol, address (or Node-ID), and baud rate. For this application, the following configurations have been done:

- C8.4.1 CANopen/DeviceNet Protocol: CANopen. ❶
- C8.4.2 CANopen/DeviceNet Address: 2. ❷
- C8.4.3 CANopen/DeviceNet Baud Rate: 500 Kbps. ❸

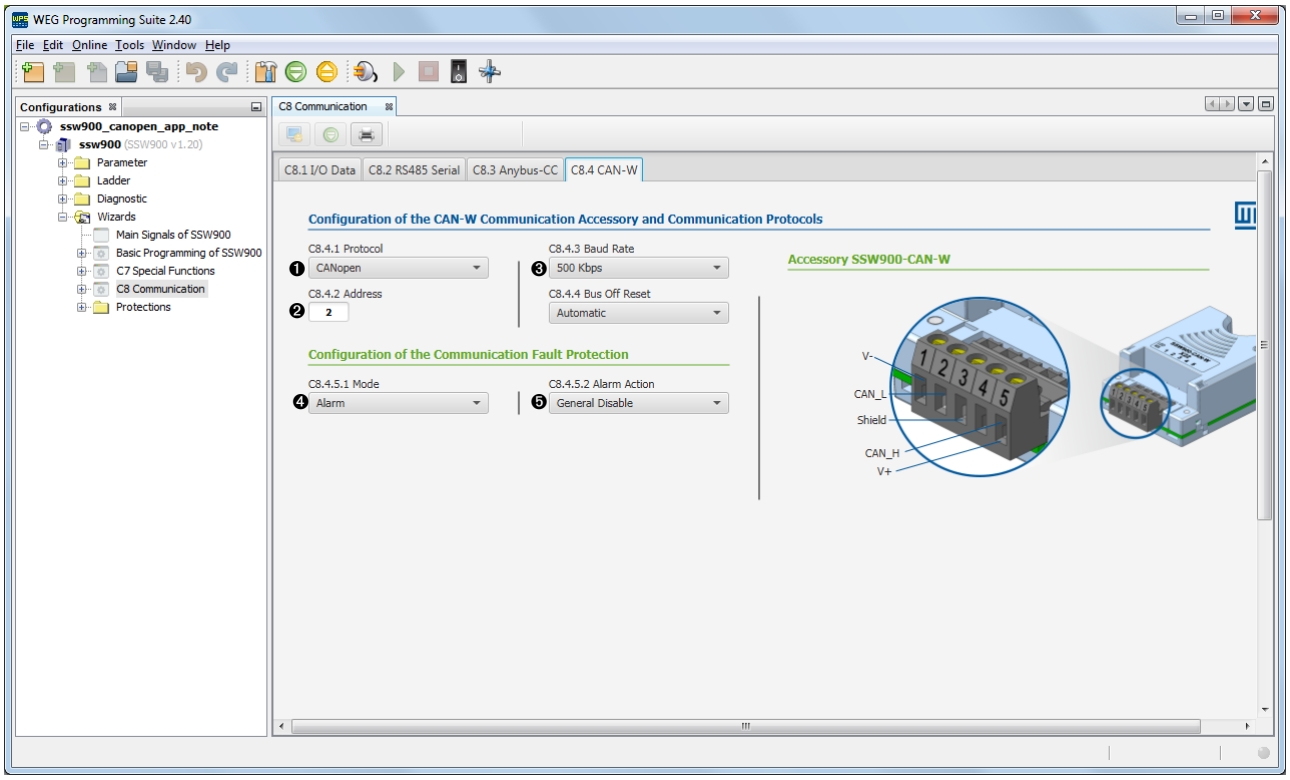


Figure 2.1: *WPS - CAN accessory configuration*

2.2 LOCAL/REMOTE

SSW900 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, error reset. For this application, considering SSW900-CAN-W accessory installed at slot 1, the following control sources have been defined:

- Local: keypad will control SSW900 in local mode.
- Remote: slot 1 (SSW900-CAN-W) will control SSW900 in remote mode.

- Local/Remote transition: the definition if the device is in local or remote mode will be controlled by slot 1 commands also, in remote mode by default (at power on).

Based on this, the following configurations have been programmed:

- C3.1 LOC/REM Selection Mode: Slot 1 REM. ❶
- C3.2 LOC/REM Selection LOC Command: HMI Keys. ❷
- C3.3 LOC/REM Selection REM Command: Slot 1. ❸

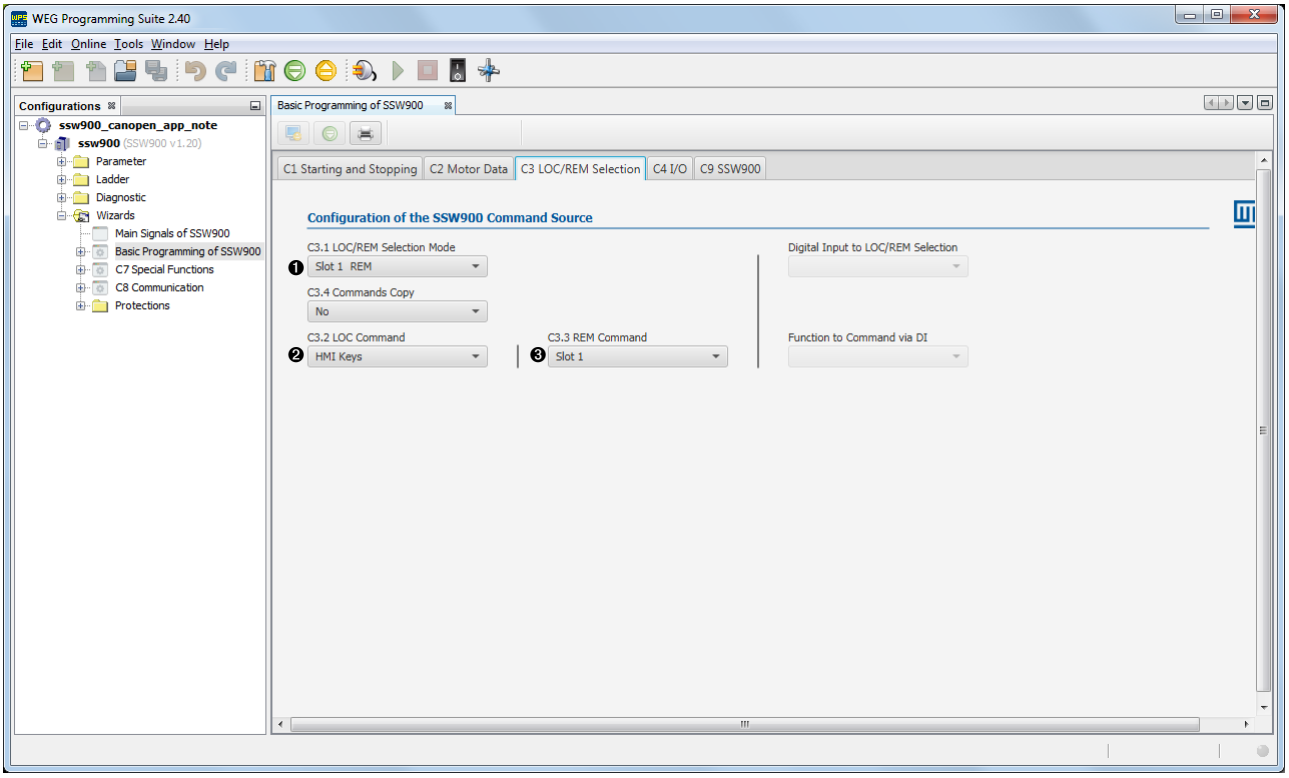


Figure 2.2: *WPS - Local/Remote configuration*

2.3 COMMUNICATION ERROR

It is important to define the action SSW900 must take in case of communication error. For this application, a communication error should lead to an alarm indication. If SSW900 was running the motor via network command, SSW900 should also perform a general disable.

Based on this, the following configurations have been programmed (refer to figure 2.1):

- C8.4.5.1 CAN Error Mode: Alarm. ❹
- C8.4.5.2 CAN Error Alarm Action: General Disable. ❺

3 CANOPEN NETWORK CONFIGURATION

For CANopen configuration, use WPS software. The main steps are described below.

3.1 CREATE WPS RESOURCE FOR PLC300

Add a new resource for the PLC300 CANopen master to the WPS Configuration. Then select the CANopen folder and open WPSCAN by double-clicking the CANopen configuration file.

- Select “PLC300 (Rev. 4.10)” as the network master.
- Change baudrate to 500 kbit/s and click OK.

3.2 ADD SSW900 TO THE NETWORK CONFIGURATION

Add the slave device by dragging and dropping the “SSW900 (Rev. 120)” available on the list of devices into the network structure area.

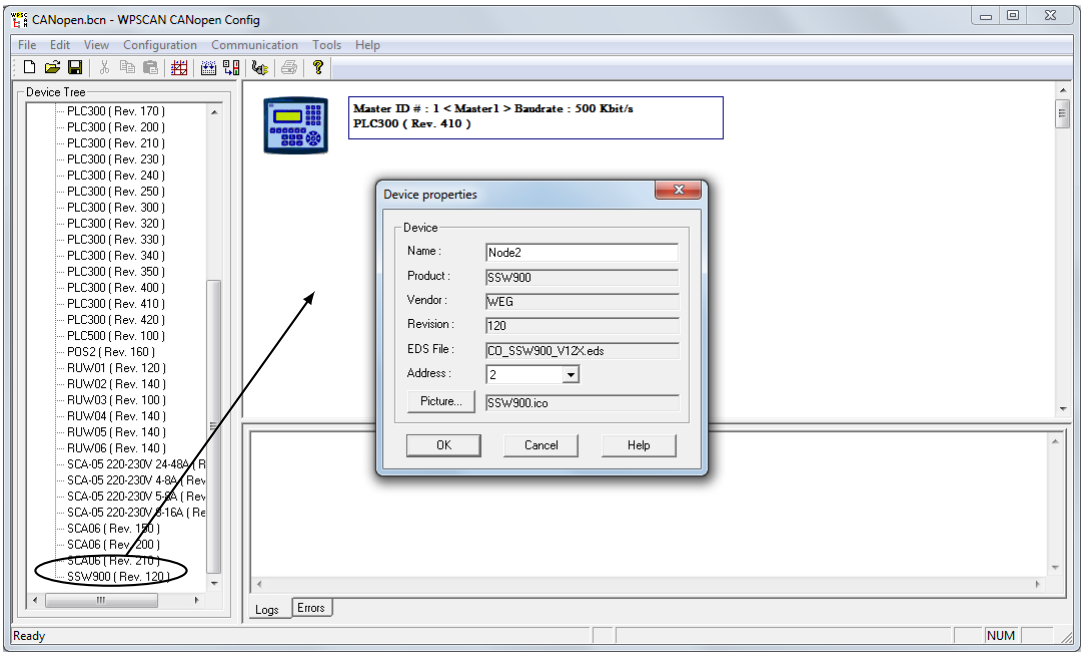


Figure 3.1: *Add slave device*

3.3 CONFIGURE SLAVE PDOS

SSW900 has a set of PDOs where it is possible to define any device data to exchange within the network. There is an appendix at CANopen User’s Guide describing the entire list of device data which can be programmed to PDOs.

Parameter	Description	Range of values	Decimal places	Index	Net Id	Size
S5.1	Status Word					
S5.1.1	SSW	Bit 0 = Running Bit 1 = Gener. Enabled Bit 2 = JOG Bit 3 = Initial Test Bit 4 = Ramp Up Bit 5 = Full Voltage Bit 6 = Bypass Bit 7 = Ramp Down Bit 8 = Remote Bit 9 = Braking Bit 10 = FWD/REV Bit 11 = Reverse Bit 12 = Ton Bit 13 = Toff Bit 14 = Alarm Bit 15 = Fault		22A8h	680	16bit

Figure 3.2: *List of available data described at SSW900-CAN-W CANopen User's Guide*

For each application, it is necessary to look at this appendix and define which data to communicate. Considering SSW900-CAN-W accessory installed at slot 1, for this application, SSW900 will exchange the following data:

Mapped Inputs	Net Id	Size	Index
S5.1.1 Status Word SSW	680	16bit	22A8h
S1.1.4 Current Average	24	32bit	2018h
S1.2.4 Main Line Voltage Average	4	16bit	2004h

Mapped Outputs	Net Id	Size	Index
S5.2.5 Command Word Slot1	685	16bit	22ADh

After choosing the data, we have selected the PDOs indicated below for a transfer of data every 100 ms.

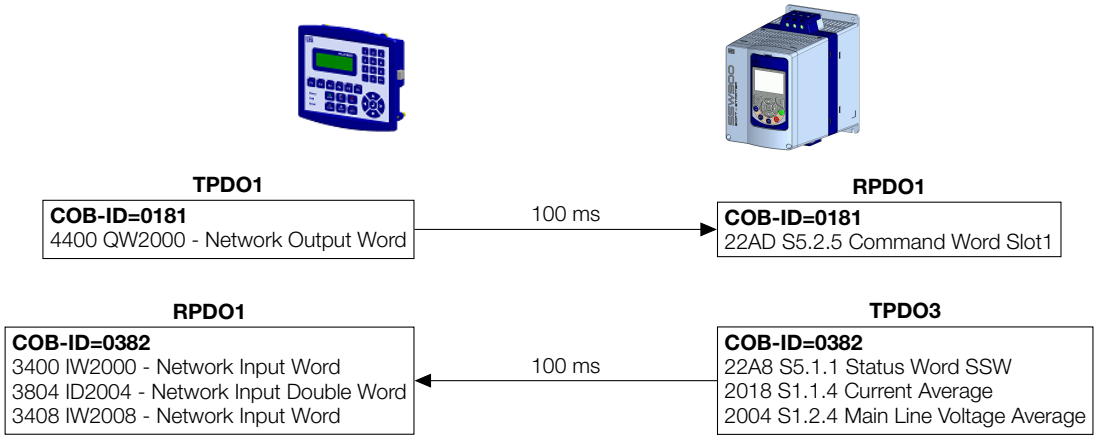


Figure 3.3: *PDO Configuration*

Based on these data, the following configurations have been programmed on the slave node:

Receive PDO configuration:

- In the PDOs configuration window, set 181h as the COB-ID for Receive PDO 1. This is the master's Transmit PDO 1 COB-ID. ❶
- The RPDO1 default configuration for the mapped objects is: ❷
  "22AD S5.2.5 Command Word Slot1".
- Disable Receive PDO 2 to 4.

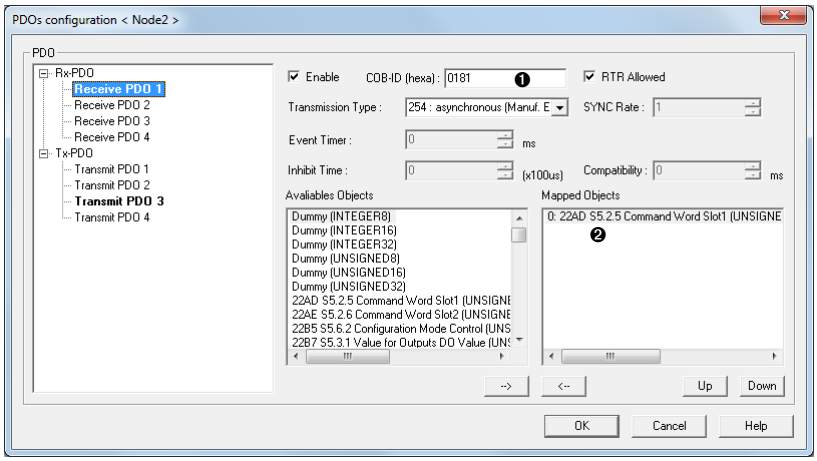


Figure 3.4: *Slave's Receive PDO Configuration*

Transmit PDO configuration:

- Set 100 ms as the Transmit PDO 3 Event Timer. ❶
- The TPDO3 default configuration for the mapped objects is: ❷
  "22A8 S5.1.1 Status Word SSW".
  "2018 S1.1.4 Current Average".
  "2004 S1.2.4 Main Line Voltage Average".
- Disable Transmit PDO 1, 2 and 4.

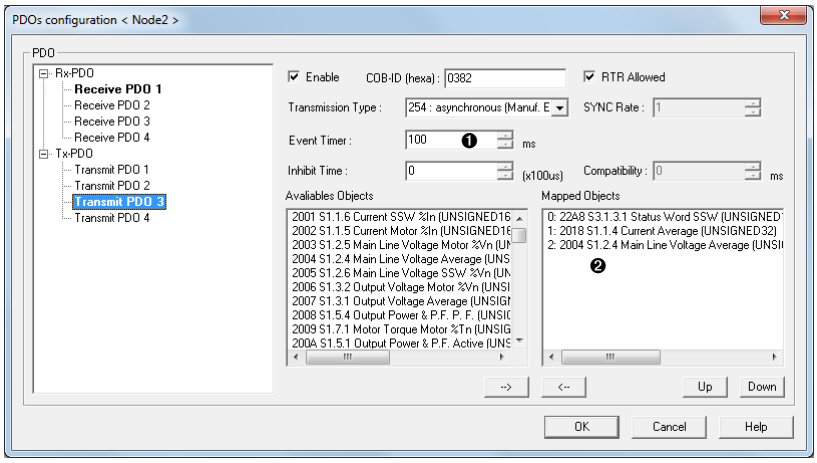


Figure 3.5: *Slave's Transmit PDO Configuration*

3.4 CONFIGURE MASTER PDOS

Now configure the master's PDOs to receive information from the slave's Transmit PDO and send commands to the slave's Receive PDO.

Use the PLC300 Manufacturer Specific objects to configure the PDOs. For this application, the following PLC300 objects were used to link the SSW900 objects:

Table 3.1: *Master/Slave Object relationship*

Slave data	Master Data
22A8 S5.1.1 Status Word SSW	3400 IW2000 - Network Input Word
2018 S1.1.4 Current Average	3804 ID2004 - Network Input Double Word
2004 S1.2.4 Main Line Voltage Average	3408 IW2008 - Network Input Word
22AD S5.2.5 Command Word Slot1	4400 QW2000 - Network Output Word

The PLC300 CANopen master configurations were programmed as follows:

Receive PDO configuration:

- In the PDOs configuration window, set 382h as the COB-ID for Receive PDO 1. This is the slave's Transmit PDO 3 COB-ID. ❶
- The RPDO1 configuration for the mapped objects is: ❷
  "3400 IW2000 - Network Input Word".
  "3804 ID2004 - Network Input Double Word".
  "3408 IW2008 - Network Input Word".
- Disable Receive PDO 2 to 4.

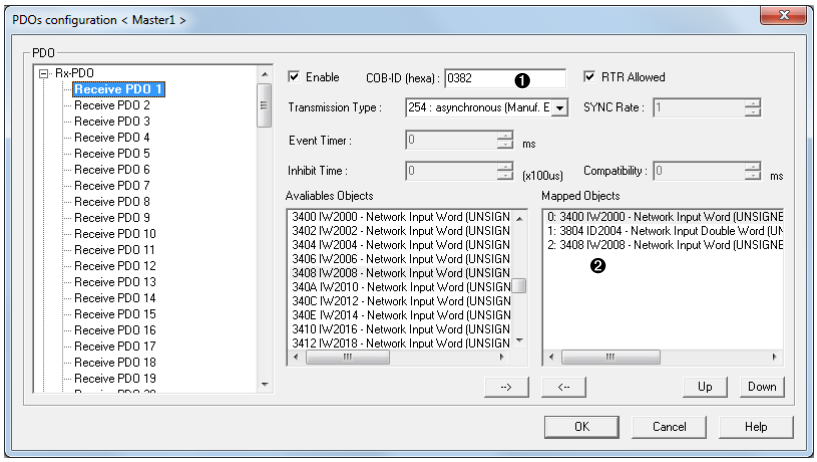


Figure 3.6: *Master's Receive PDO Configuration*

Transmit PDO configuration:

- Set 100 ms as the Transmit PDO 1 Event Timer. ❶
- TPDO1 configuration for the mapped objects is: ❷
  "4400 QW2000 - Network Output Word".
- Disable Transmit PDO 2 and 3.

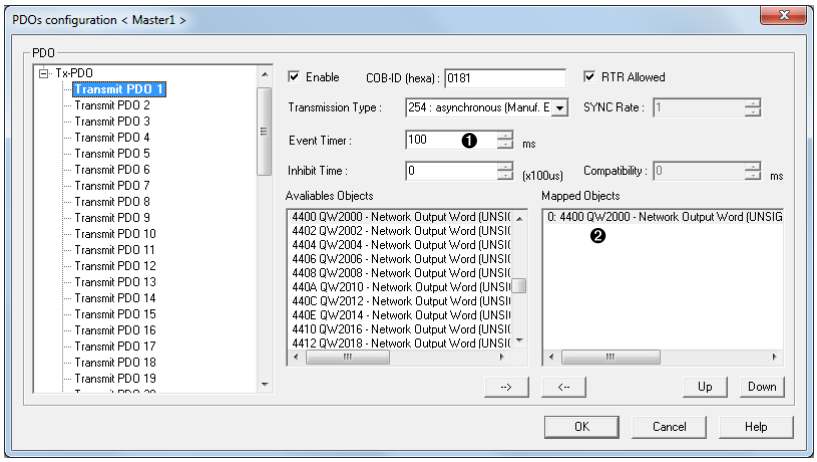


Figure 3.7: *Master's Transmit PDO Configuration*

Verify the PDO connections in the menu "Tools / PDOs Connections", press the "List Connections" button.

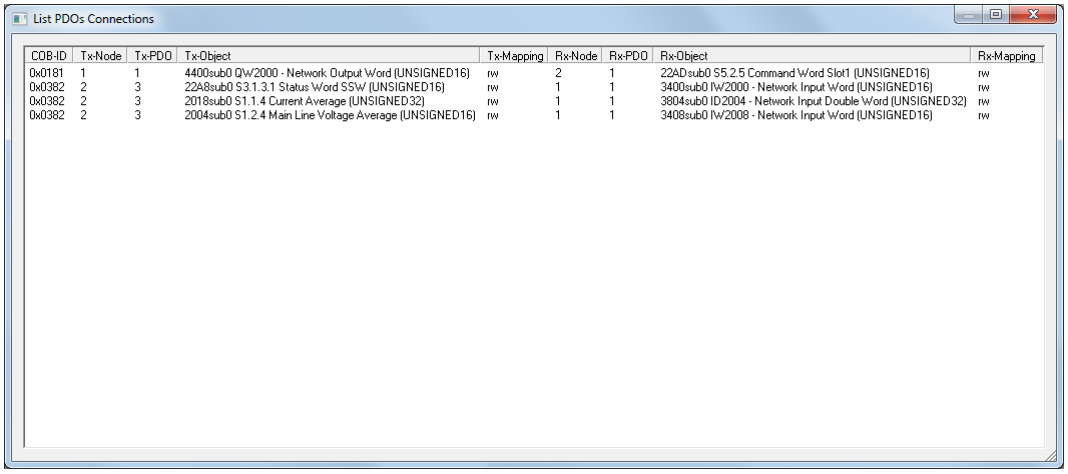


Figure 3.8: *Master/Slave PDO Connections*

The PLC300 Manufacturer Specific objects are mapped to the GLOBAL_NETWORK memory area. Using these data, it is possible to design a PLC program, creating variables representing device information, and a PLC logic to manipulate such data according to desired to the application.

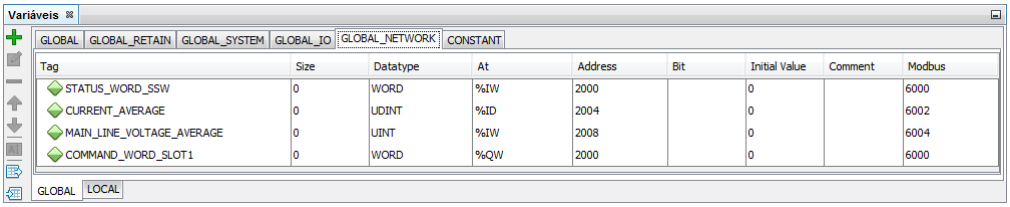


Figure 3.9: *Location of communication data*

3.5 CONFIGURE ERROR CONTROL

Click on the slave and select “Configuration”. At tab “NODE GUARDING” enable the node guarding service. This service is used to identify interruptions in the communication both by the master and the slave as well.

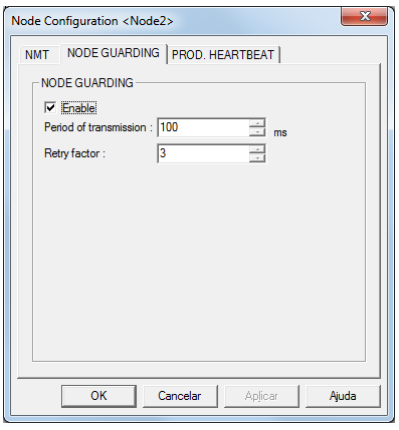


Figure 3.10: *Node guarding service*

3.6 DOWNLOAD CONFIGURATION

Once the configuration is finished, download it to PLC from the WPS software. Go to the “Download Resource” option under the “Online” menu.

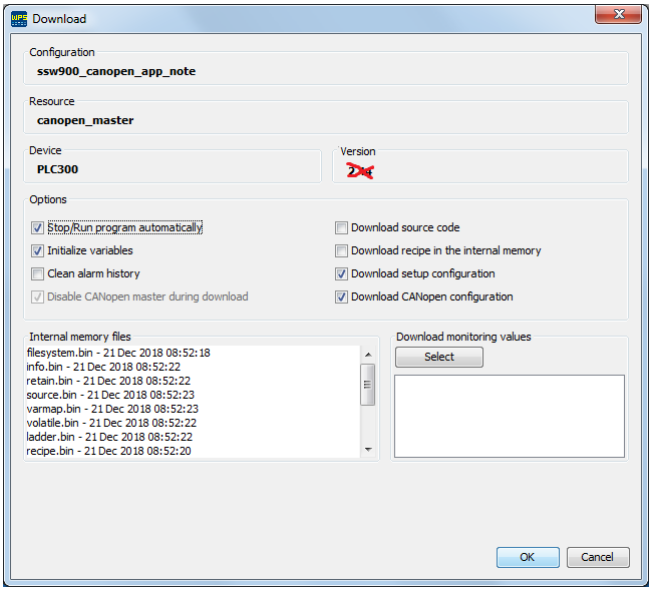


Figure 3.11: *Downloading WPS Configuration to the PLC300*

After transmitting the master configuration, monitor the devices to check if the device is connected to the network and effectively communicating. The indicators of all devices should be green, meaning that communication is active and without errors.

Go to the “Online Monitoring” option under the “Communication” menu.

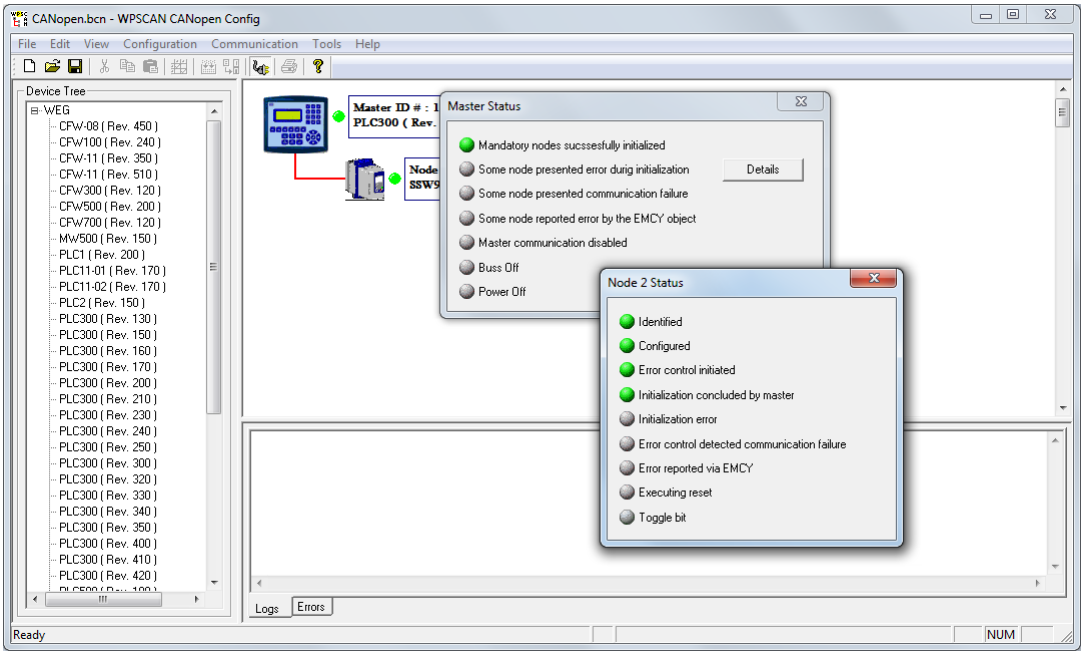


Figure 3.12: *Online monitoring*

4 CONTROL AND MONITORING

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

4.1 VIEW AND EDIT CYCLIC DATA

Under the “Configurations” tab, right-click “ssw900_canopen_app_note/canopen_master/Diagnostic/Monitoring Variable” and add a new file. Click at the plus sign, select the GLOBAL_NETWORK variables and press OK to add them to the monitoring file.

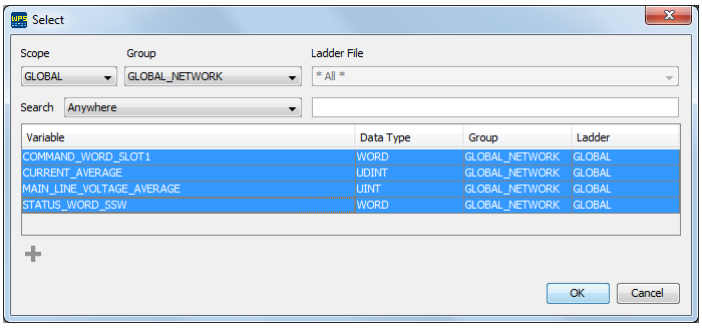


Figure 4.1: *Monitoring Variable file*

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

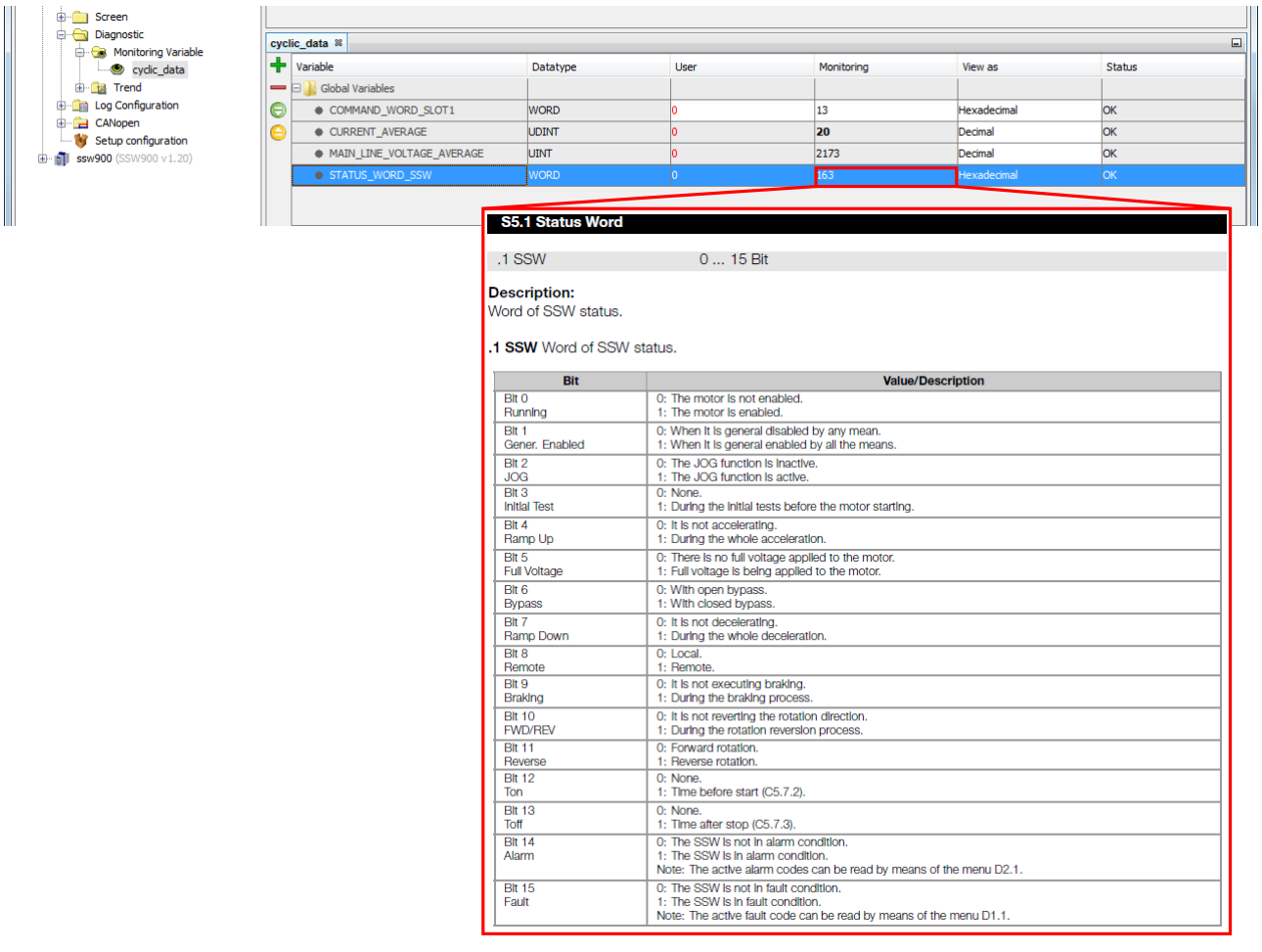


Figure 4.2: *Read data, with highlight to status word as described at SSW900 CANopen documentation*

For inputs, as described at table 3.1, it is programmed to read the following information:

- STATUS_WORD_SSW: value 163h.
  - Bit 0 = 1 (running).
  - Bit 1 = 1 (general enabled).
  - Bit 5 = 1 (at full voltage).
  - Bit 6 = 1 (bypass active).
  - Bit 8 = 1 (at remote mode).
- MAIN_LINE_VOLTAGE_AVERAGE: value 2173 (217.3V).
- CURRENT_AVERAGE: value 20 (2.0A).

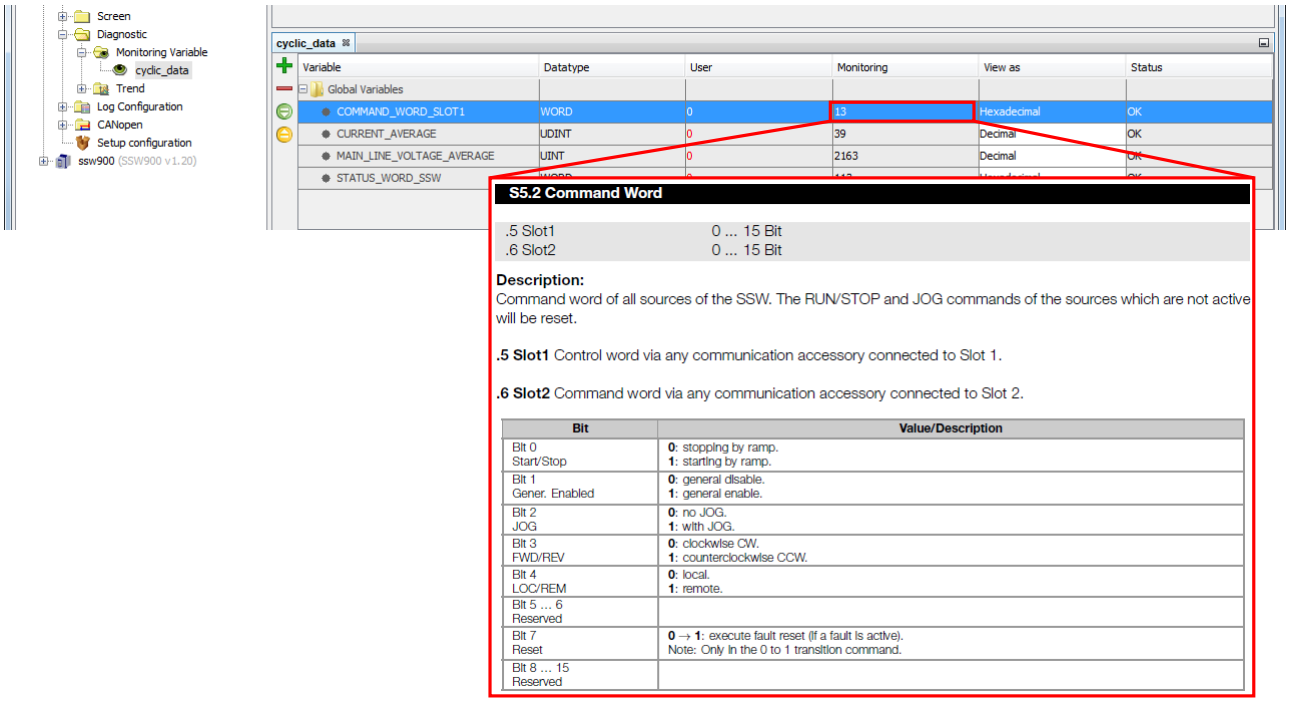


Figure 4.3: *Write data, with highlight to command word as described at SSW900 CANopen documentation*

For output, as described at table 3.1, it is programmed to write the following information:

- COMMAND_WORD_SLOT1: value 13h.
  - Bit 0 = 1 (ramp enable).
  - Bit 1 = 1 (general enable).
  - Bit 4 = 1 (remote mode).

4.2 LADDER LOGIC FOR ACYCLIC DATA TRANSFER

There is an appendix at CANopen User's Guide describing the entire list of device data that is possible to access via CANopen Interface. This list also indicates the Index of each data.

For this example, we will read the value of D1.1.1 - Actual fault FXXX.

Parameter	Description	Range of values	Decimal places	Index	Net Id	Size
	D1 Diagnostics\Fault					
D1.1	Actual					
D1.1.1	Fxxx	0 to 999	0	205Ah	90	16bit
D1.2	Fault History					
	D2 Diagnostics\Alarms					
D2.1	Actual					
D2.1.1	Axxx 1	0 to 999	0	205Bh	91	16bit
D2.1.2	Axxx 2	0 to 999	0	205Ch	92	16bit
D2.1.3	Axxx 3	0 to 999	0	205Dh	93	16bit

Figure 4.4: *SSW900 CANopen documentation describing Index for acyclic access*

Once defined the information for acyclic access, add a CO_SDORead block to the PLC logic. It will be necessary to configure the following information:

- NodeID#: slave address (for this example, SSW900 at address 2). ❶
- Index# as described by SSW900 CANopen documentation. ❷
- SubIndex# is always 0 (zero) for the SSW900. ❸
- Size#: size in bytes of the Value output variable. ❹
- Timeout#: waiting time in ms for the arrival of data starting from the beginning of the request. ❺
- Value: a variable to store the read value (must be compatible with the data size of the reading object). ❻

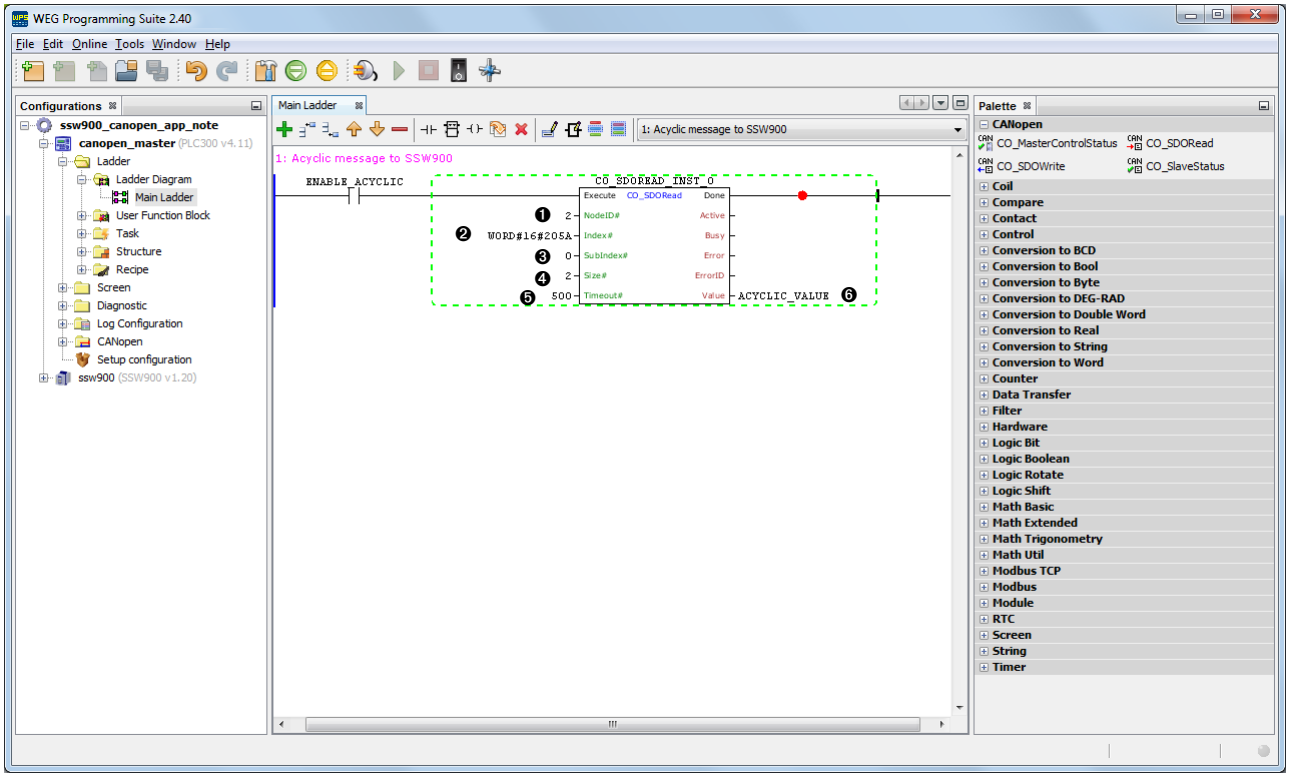


Figure 4.5: *Acyclic message configuration*

Activate CO_SDOREAD_INST_0 block Execute input ❶ to send an acyclic request to slave. For this example, the value read from D1.1.1 is “3” ❷, representing the active fault code (3 = Motor Start Phase Loss).

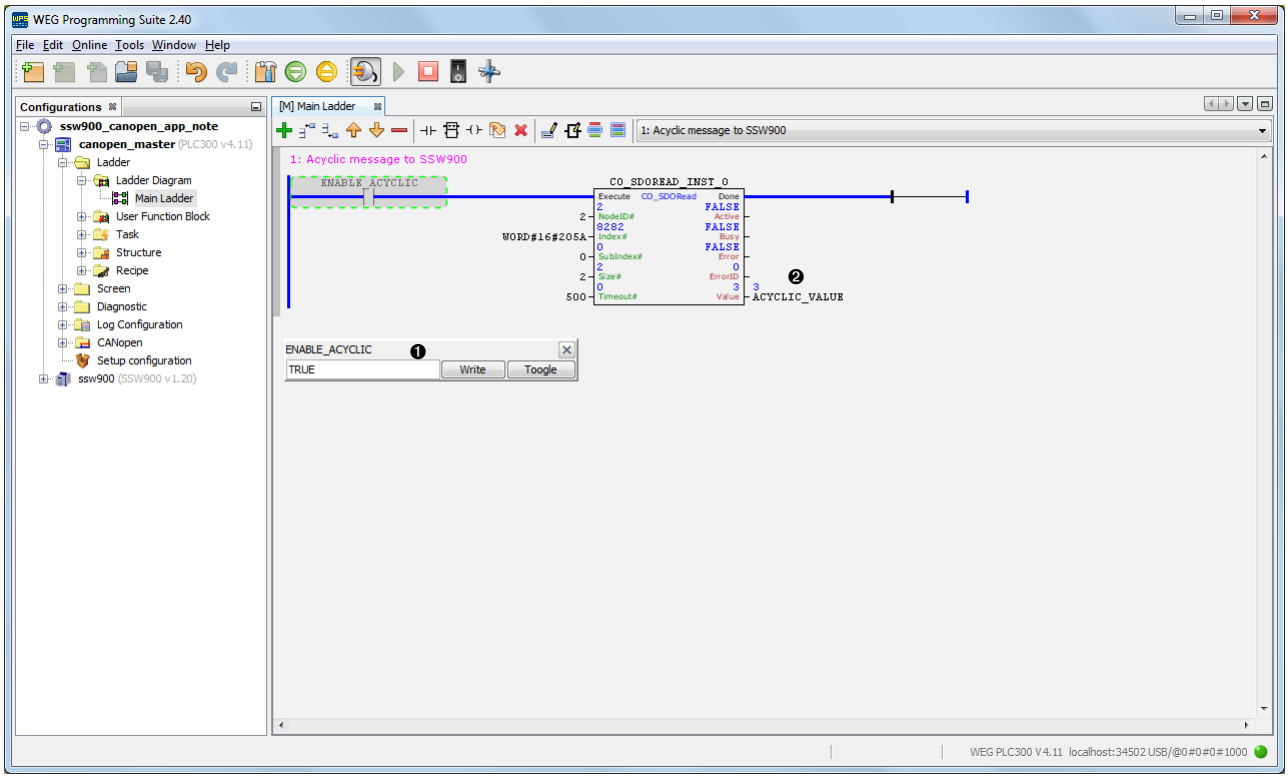


Figure 4.6: *Main ladder sending an acyclic message to the slave*

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