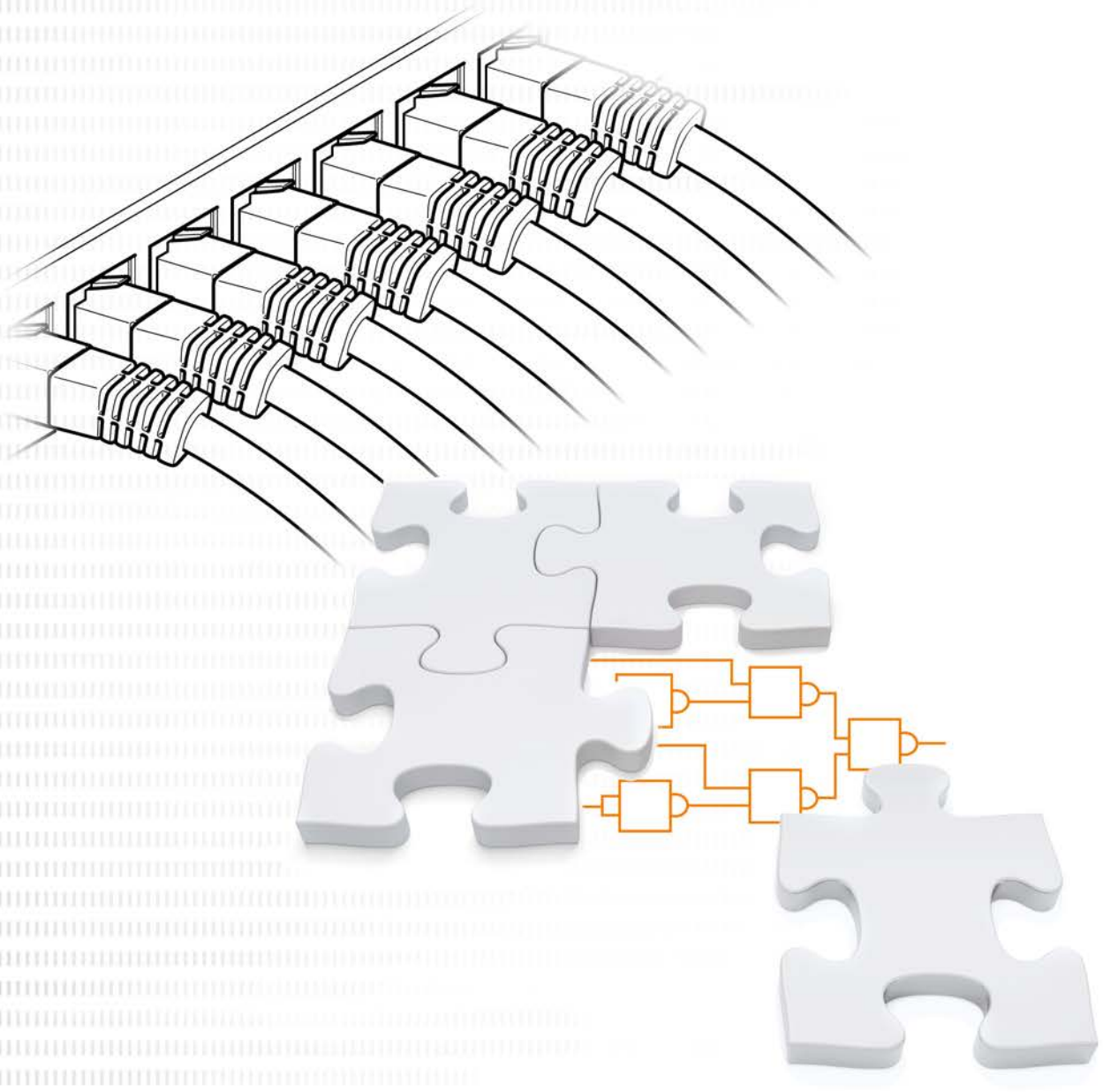

BU 0970 – en-US

RSLogix 5000® / Studio 5000® Add-On Instructions

Supplemental manual for frequency inverters

NORD DRIVESYSTEMS

Documentation

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Table A: Document History

Copyright notice

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1 Introduction

1.1 About this manual

This manual briefly explains the use and parameterization of the Add On Instructions which are intended for the integration of electronic drive technology products from NORD GmbH & Co. KG into Logix Designer®/Studio 5000®®/RS Logix 5000®. It is intended for qualified personnel who integrate and commission these products in a corresponding control system (Section 2.2 "Selection and qualification of personnel"). The information in this manual assumes that the qualified personnel who are entrusted with this work are familiar with the technology of the relevant field bus system and programmable logic controllers (PLC).

For more detailed description of the inverter parameters, please refer to the manual for the relevant frequency inverter. If it is necessary to state parameters to describe parameterization, the parameters stated here are in the issue status of JAN 2021.

This manual assumes that:

- The qualified personnel have commissioned and parameterized the frequency inverter for Ethernet communication. If this has not been completed, please refer to the relevant frequency inverter manual for commissioning and parameterization of the frequency inverter.
- The qualified personnel have commissioned and parameterized the Ethernet interface module with Ethernet specific settings. If this has not been completed, please refer to the relevant Ethernet module manual, the EtherNet/IP® fieldbus manual, or the supplementary Ethernet fieldbus manual for SK 550P for commissioning and parameterization of the Ethernet interface module.

Information **Discontinued modules**

All AOI‘s working with the SK CU4-ETH and SK TU4-ETH modules will also work with the discontinued SK CU4-EIP and SK TU4-EIP modules .

1.2 Other applicable documents

This manual is only valid in combination with the operating instructions for the frequency inverter, which is used and if necessary, the relevant special documentation for specific special functions or bus systems.

This documentation can be found under www.nord.com.

2 Safety

2.1 Intended use

The Add On Instructions from Nord Gear are modules for integrating Nord drive electronics in LogixDesigner®/Studio 5000®/RSLogix 5000®. They have been designed and configured for use with frequency inverters from the series NORDAC BASE (SK 180E) NORDAC FLEX (SK 200E … SK 235E), NORDAC PRO (SK 500E … SK 545E, SK 500P … SK 550P), NORDAC LINK (SK 250E … SK 280E) from Getriebebau NORD GmbH & Co. KG.

2.2 Selection and qualification of personnel

The standard modules, bus interface and frequency inverters may only be installed and started up by qualified personnel. These people must possess the necessary knowledge about the frequency inverter, the technology of the field bus system, as well as configuration software and the controller (bus master) which are used.

In addition, the qualified personnel must also be familiar with the installation, commissioning and operation of the bus interfaces and the frequency inverters as well as all the accident prevention regulations, guidelines and laws which apply at the place of use.

2.2.1 Qualified personnel

Qualified personnel include persons who, due to their specialist training and experience, have sufficient knowledge in a specialized area and are familiar with the relevant occupational safety and accident prevention regulations as well as the generally recognized technical rules.

These persons must be authorized to carry out the necessary work by the operator of the system.

2.2.2 Qualified electrician

An electrician is a person who, because of their technical training and experience, has sufficient knowledge with regard to

- Switching on, switching off, isolating, earthing and marking power circuits and devices
- Proper maintenance and use of protective devices in accordance with defined safety standards
- Emergency treatment of injured persons

2.3 Safety information

Only use Add On Instructions (AOI’s) from the NORD DRIVESYSTEMS Group for their intended purpose (Section 2.1 "Intended use").

To ensure safe operation observe all instructions in this manual, and in particular the warning information in the other applicable documents for the electronics drive technology which is used.

Work on and with electronic drive technology devices, e.g. bus interfaces and frequency inverters, must only be carried out by qualified personnel (Section 2.2 "Selection and qualification of personnel").

2.4 Exclusion of liability

This technical documentation is for users who wish to use the Add On Instructions from Getriebebau NORD GmbH & Co. KG. It is solely for information purposes and is only intended for qualified and adequately trained specialist personnel (Section 2.2 "Selection and qualification of personnel"). The information is intended as a guide and was compiled and produced in good faith. No claim is made with regards to the completeness of this documentation for the listing of directives and standards. The technical and schematic diagrams do not constitute binding solutions or application suggestions for the application. The illustrated application examples only relate to modules from Getriebebau NORD GmbH

and Co. KG. It is the sole responsibility of the user to check and comply with all the laws, directives and standards which are relevant for the application, design, manufacture and operation of the products. Users act independently at their own responsibility. Getriebebau NORD GmbH & Co. KG accepts no liability or warranties for solutions which are planned by the user.

3 Process modules

Process modules (Add On Instructions) are only used to control and monitor a frequency inverter and no parameters can be changed. Parameters can be accessed using other modules (Section 4 "Parameter modules")

Each respective Ethernet-IP device family (SK TU3-EIP, SK TU4-ETH/SK CU4-ETH, or SK XU5-EIP) has its own AOI process modules. Ensure the AOI process module in use matches the NORD hardware in the field.

The procedure to add a SK TU3-EIP, SK TU4-ETH/SK CU4-ETH, or SK XU5-EIP is identical in RSLOGIX 5000®/Studio 5000®, except for the process data size settings discussed in the Hardware Configuration section of each process module. The following will be the first steps to adding any NORD Ethernet-IP device.

1. Install the proper .eds files for the SK TU3-EIP, SK TU4-ETH/SK CU4-ETH, or SK XU5-EIP devices. These .eds files can be found on the NORD.com website.
2. Add the device to the project in the Select Module Type window. In this example, the SK TU3-EIP device is selected.

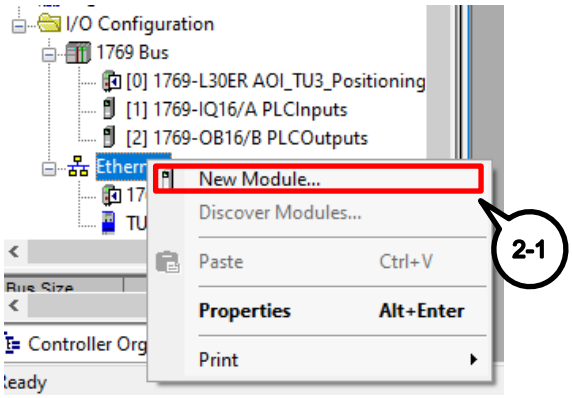

Figure 1: General Process Module Hardware Configuration Step 2A

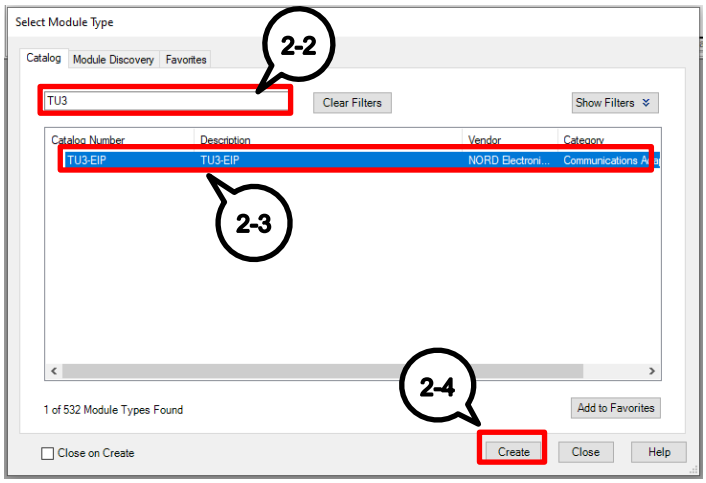

Figure 2: General Process Module Hardware Configuration Step 2B

3. Assign a name and an IP Address to the device in the project.

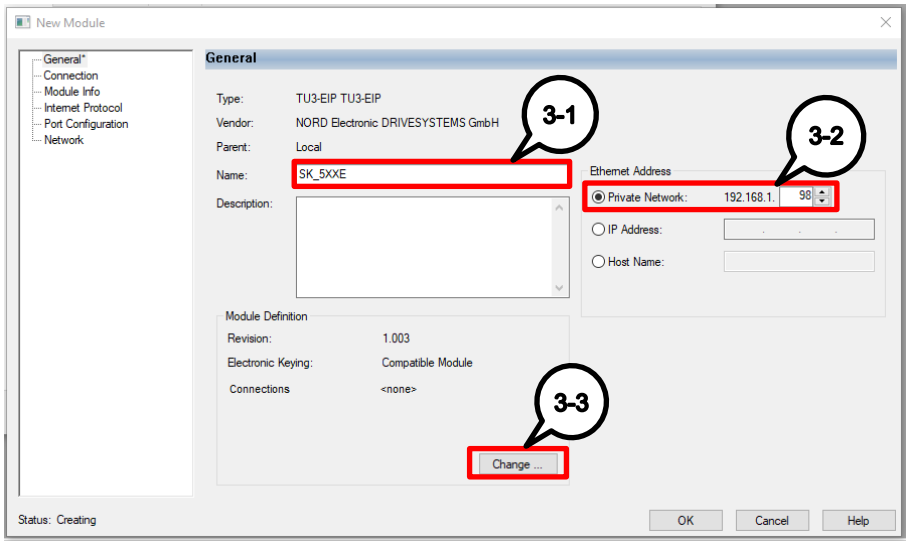

Figure 3: General Process Module Hardware Configuration Step 3

4. Under Module Definition>Change>Connections> Select “Exclusive Owner”.

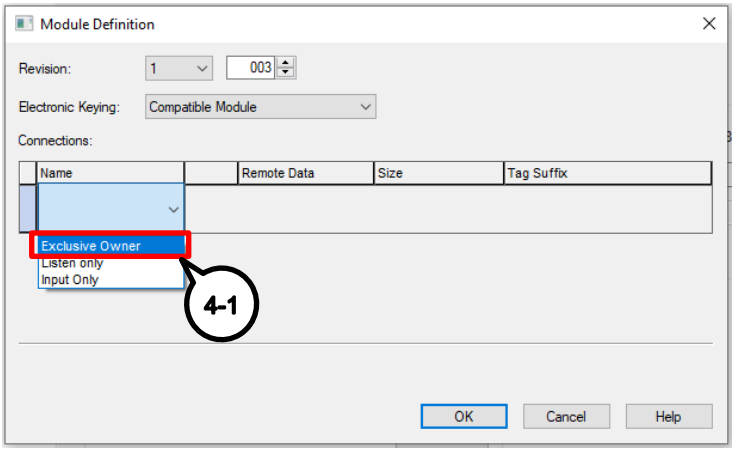

Figure 4: General Process Module Hardware Configuration Step 4

5. Next steps will define the process data size and will be discussed in the Hardware Configuration specific to each module and device.

Modules discussed in the next sections are specific to each NORD Ethernet-IP device and include:

TU3-EIP

- Process_TU3VFDControl_Instance100_101
- Process_TU3VFDControl_Instance102_103

TU4-ETH/CU4-ETH

- NORD_VFDcontrol_XU4_Inst100_101
- NORD_VFDcontrol_XU4_Inst110_111

XU5-EIP

- NORD_VFDcontrol_PRO_Inst100_101

CU6-ETH

- NORD_VFDcontrol_ON_Inst100_101

Follow the table below to select the correct process module for the desired setup.

Frequency Inverter (Interface Module)	No. of controlled VFDs	Fieldbus Interface I/O	Process Module	Section
SK 5xxE (SK TU3-EIP)	1	N/A	"Process_TU3VFDControl_Instance100_101"	3.1
	1…8	N/A	"Process_TU3VFDControl_Instance102_103"	3.2
SK 2xxE, SK 18xE, LINK FDS (SK TU4-ETH/ SK CU4-ETH)	1	No	"NORD_VFDcontrol_XU4_Inst100_101"	3.3
	1…4	Yes	"NORD_VFDcontrol_XU4_Inst110_111"	3.4
SK 5xxP (SK XU5-EIP)	1…8	N/A	"NORD_VFDcontrol_PRO_Inst100_101"	3.5
SK 300P (SK CU6-ETH)	1	N/A	"NORD_VFDcontrol_ON_Inst100_101"	3.6

Table B: Process Module Definition

Information — **Fieldbus Interface I/O**

Fieldbus Interface I/O refers to the NORD Ethernet interface digital inputs that are available directly on the device (only for SK TU4-ETH and SK CU4-ETH). These digital inputs and outputs are not directly accessible by the frequency inverter. When included in the hardware configuration, they are only transferred over the Ethernet network to the PLC master within the process data.

Device I/O availability:

- SK TU4-ETH – 2 digital outputs and 8 digital inputs
- SK CU4-ETH – 0 digital outputs and 2 digital inputs

For more information on the available fieldbus interface I/O, please refer to the EtherNet/IP® fieldbus manual (BU2100).

3.1 Process_TU3VFDControl_Instance100_101

3.1.1 Task

This Add On Instruction (AOI) is specific to the SK TU3-EIP technology unit, which is exclusively for the SK 5xxE frequency inverter product line. It is called up in the cyclic section of the program and requires the instances to be set to Input = 101 and Output = 100 (Section 3.1.3 "Hardware Configuration"). This AOI is used to control only one (1) frequency inverter with

- A 16-bit setpoint (integer format)
- Control signals (e.g. enabling, error acknowledgement) (Section 3.1.4 "Parameters")

3.1.2 Use

Frequency inverter	SK 5xxE (SK TU3-EIP)
Communication Path	EtherNet/IP®
Control	ControlLogix®
	CompactLogix™

3.1.3 Hardware Configuration

This section defines the type of connection and size of process data.

- Connection = Exclusive Owner
- Input Assembly Remote Data = 101
- Output Assembly Remote Data = 100
- Size = 6 INT for both Input and Output Data.

Continuing with the process of adding the NORD EtherNet/IP® interface module in Section 3 "Process modules":

6. Complete setting up the module definition.

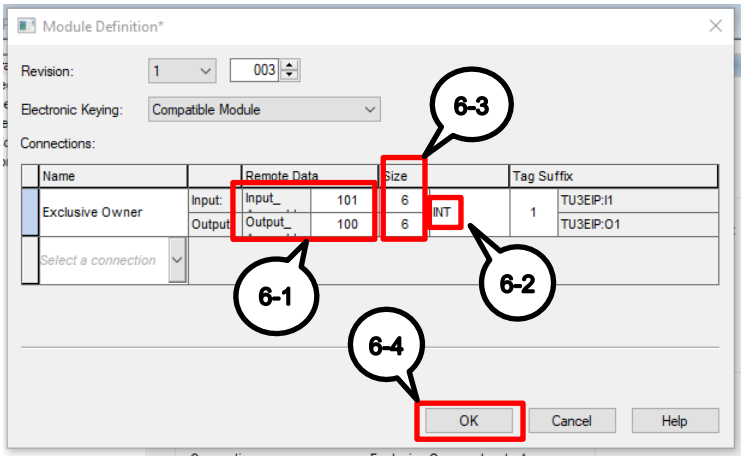

Figure 5: Process_TU3VFDControl_Instance100_101 Hardware Configuration Step 6

7. Click Apply, then OK to finalize definition.

3.1.4 Parameters

This AOI provides detailed information about the signal statuses between the PLC and the frequency inverter.

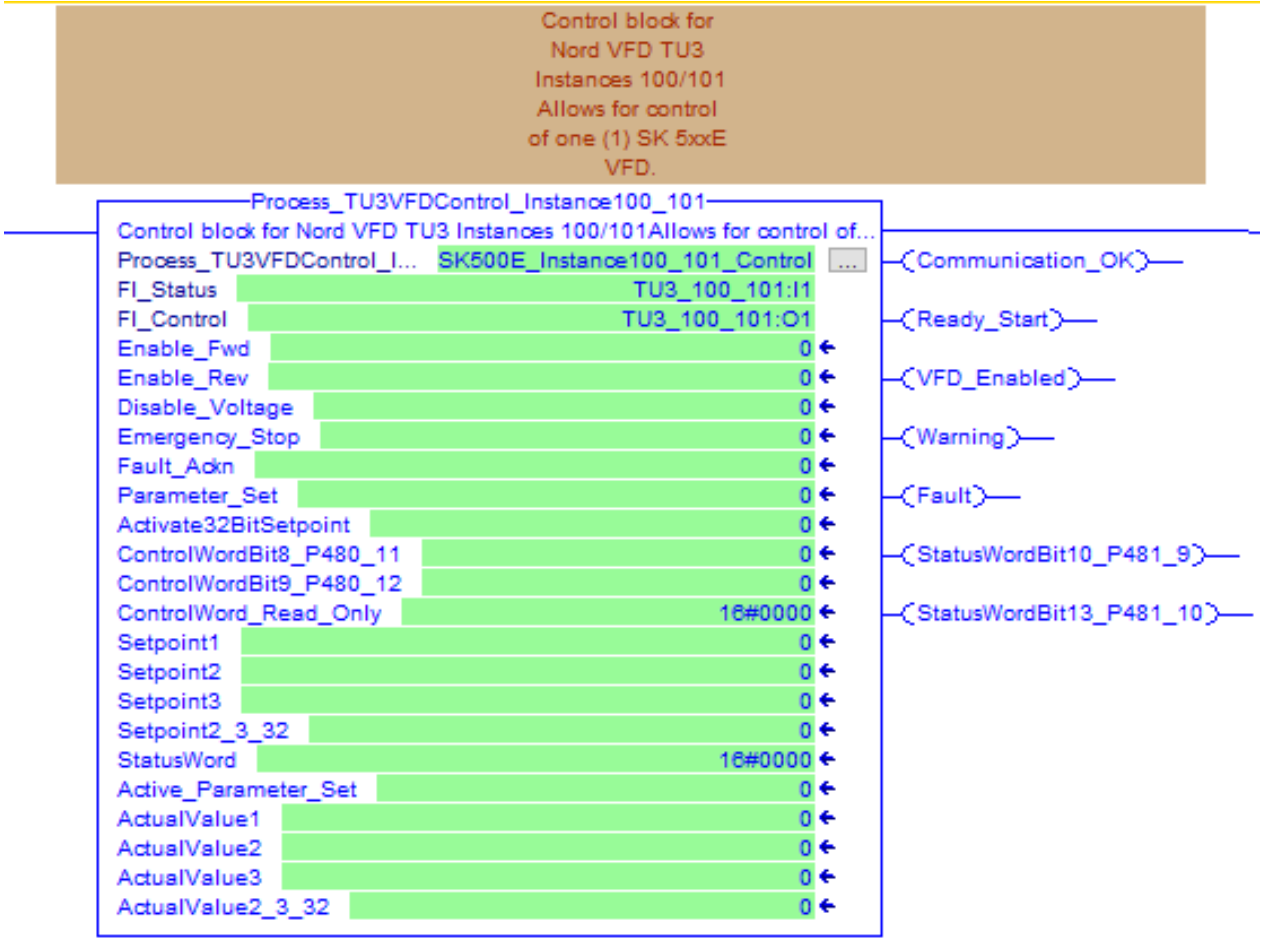

Figure 6: Process Module Process_TU3VFDControl_Instance100_101

3.1.4.1 Input Parameters

Parameter name	Type	Description
FI_Status	-	Input map of the VFD's process data (Status from VFD via ethernet module)
FI_Control	-	Output map of the VFD's process data (Control of VFD via ethernet module)
Enable_FWD	BOOL	When **TRUE**, direction of rotation set to CW by default.
Enable_REV	BOOL	When **TRUE**, direction of rotation set to CCW.
Disable_Voltage	BOOL	When **FALSE**, output voltage is disabled; motor coasts to stop and inhibits subsequent enable.
		When **TRUE**, voltage is not disabled.

Parameter name	Type	Description
Quick_Stop	BOOL	When **FALSE**, motor ramps to stop (P426 = quick stop ramp down time) quickly. **Information** Care must be taken to ensure appropriate braking resistors are used to stop the motor in this time, or else the VFD will fault with an E005 Overvoltage UD fault during the braking sequence and coast to stop.
		When **TRUE**, quick stop not active.
Fault_Ackn	BOOL	**RISING EDGE** resets faults that are no longer active on the VFD. **Information** If a digital input has been programmed for the “ackn.fault” function, this bit must not be permanently set to 1 via the bus (otherwise, flank evaluation would be prevented).
Parameter_Set	SINT	Several parameters within the VFD have four parameter sets. By changing this variable, these settings can be accessed.
Activate32BitSetpoint	BOOL	When **FALSE**, Setpoint2 and Setpoint3 are valid, while Setpoint2_3_32 is invalid (applications not requiring 32-bit positioning control).
		When **TRUE**, Setpoint2 and Setpoint3 are invalid, while Setpoint2_3_32 becomes valid. Setpoint2 and 3 are combined into a 32-bit position setpoint for positioning applications.
ControlWordBit8_P480_11	BOOL	For additional process data control, function of bit 8 in the Control Word can be programmed via P480[11].
ControlWordBit9_P480_12	BOOL	For additional process data control, function of bit 9 in the Control Word can be programmed via P480[12].
Setpoint1	INT	Function of Setpoint1 can be programmed in VFD parameters via P546. **Information** For setpoint value standardization, please refer to “Section 8.7 Standardization of setpoint/target values” in the SK 5xxE manual (BU 0500).
Setpoint2	INT	Function of Setpoint2 can be programmed in VFD parameters via P547.
Setpoint3	INT	Function of Setpoint3 can be programmed in VFD parameters via P548.
Setpoint2_3_32	DINT	32bit version of Setpoint2 and 3. Used to set 32bits of position setpoint data.

Table C: Input Parameters for Process_TU3VFDControl_Instance100_101 AOI

3.1.4.2 Output Parameters

Parameter name	Type	Description
ControlWord_Read_Only	INT	Shows the control word for the drive. Changing this value in PLC does nothing to control the drive.
StatusWord	INT	Shows the status word from the drive. The “Communication_OK” bit must be high for this data to be valid.
Active_Parameter_Set	SINT	Displays the active parameter set.
ActualValue1	INT	Function for Actual Value 1 can be programmed in VFD parameters via P543. **Information** For actual value standardization, please refer to “Section 8.7 Standardization of setpoint / target values” in the SK 5xxE manual (BU 0500).
ActualValue2	INT	Function for Actual Value 2 can be programmed in VFD parameters via P544.
ActualValue3	INT	Function for Actual Value 3 can be programmed in VFD parameters via P545.
ActualValue2_3_32	DINT	32bit version of Actual Value 2 and 3. Used to read 32bits of actual position data.
Communication_OK	BOOL	When TRUE, communication over network is OK.
Ready_Start	BOOL	When TRUE, VFD is in READY state.
VFDEnabled	BOOL	When TRUE, VFD is in RUNNING state and there is output voltage present.
Warning	BOOL	When TRUE, a warning is present. P700[2] contains warning code.
Fault	BOOL	When TRUE, an error/fault is present. P700[1] contains error code.
StatusWord_Bit10_P481_9	BOOL	Function of bit 10 in the Status Word can be programmed in P481[9] for additional status information.
StatusWord_Bit13_P481_10	BOOL	Function of bit 13 in the Status Word can be programmed in P481[10] for additional status information.

Table D: Output Parameters for Process_TU3VFDControl_Instance100_101 AOI

3.2 Process_TU3VFDControl_Instance102_103

3.2.1 Task

This Add On Instruction (AOI) is specific to the SK TU3-EIP technology unit, which is exclusively for the SK 5xxE frequency inverter product line. It is called up in the cyclic section of the program and requires the ethernet module instances to be set to Input = 103 and Output = 102 (Section 3.2.3 "Hardware Configuration"). This AOI is used to control up to eight (8) frequency inverters connected on the NORD-Systembus with

- A 16-bit setpoint (integer format)
- Control signals (e.g. enabling, error acknowledgement) (Section 3.2.4 "Parameters")

All SK 5xxE frequency inverters must have embedded CAN bus interfacing. Frequency inverters without CAN bus interface are not suitable to communicating over the Systembus.

Information **Device Address/Systembus Address**

For details of the device address (also known as P515 CAN bus address or Systembus address) settings, please refer to the manual for the frequency inverter as well as the EtherNet/IP® fieldbus manual (BU2100) for examples.

3.2.2 Use

Frequency inverter	SK 5xxE (SK TU3-EIP)
Communication Path	EtherNet/IP®
Control	ControlLogix®
	CompactLogix™

3.2.3 Hardware Configuration

This section defines the type of connection and size of process data.

- Connection = Exclusive Owner
- Input Remote Data = 103
- Output Remote Data = 102
- Size = 6 INT * Number of VFD’s being controlled per SK TU3-EIP. This number will be the same for both Input and Output Data.

Use the table below to select the correct data package size, FI_Status data type, and FI_Control data type. Use each value in the corresponding steps found above each column.

No. of Controlled VFDs	In Step 6-3 below Change Data Package Size to:	In Step 7-2 below Change FI_Status Data Type to:	In Step 7-3 below Change FI_Control Data Type to:
1	6	_0342:TU3_EIP_DE5BFA94:I:0	_0342:TU3_EIP_E8E6FFA2:O:0
2	12	_0342:TU3_EIP_D374B848:I:0	_0342:TU3_EIP_1CF890D4:O:0
3	18	_0342:TU3_EIP_72EF9B2E:I:0	_0342:TU3_EIP_BD63B3B2:O:0
4	24	_0342:TU3_EIP_34C541C8:I:0	_0342:TU3_EIP_FB496954:O:0
5	30	_0342:TU3_EIP_0923086A:I:0	_0342:TU3_EIP_C6AF20F6:O:0
6	36	_0342:TU3_EIP_DF7AEB77:I:0	_0342:TU3_EIP_10F6C3EB:O:0
7	42	_0342:TU3_EIP_814C97EF:I:0	_0342:TU3_EIP_4EC0BF73:O:0
8	48	_0342:TU3_EIP_20D7B489:I:0	_0342:TU3_EIP_EF5B9C15:O:0

Table E: Hardware Configuration Guide for Process_TU3VFDControl_Instance102_103

The example module definition below shows the setup for control of eight (8) frequency inverters. Adapt steps 6-3, 7-2, and 7-3 for the desired application needs based on the table above.

Picking up where we left off in the process of adding the NORD EtherNet/IP® interface module in Section 3 "Process modules":

6. Complete setting up the module definition. Utilize the “Data Package Size” value most appropriate for the application from Table E above in Step 6-3 below.

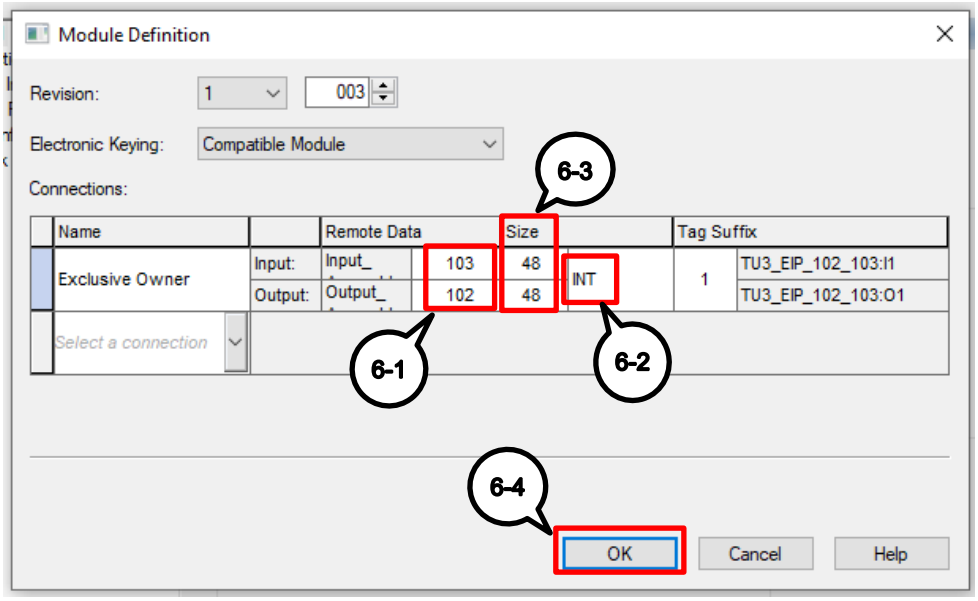

Figure 7: Process_TU3VFDControl_Instance102_103 Hardware Configuration Step 6A

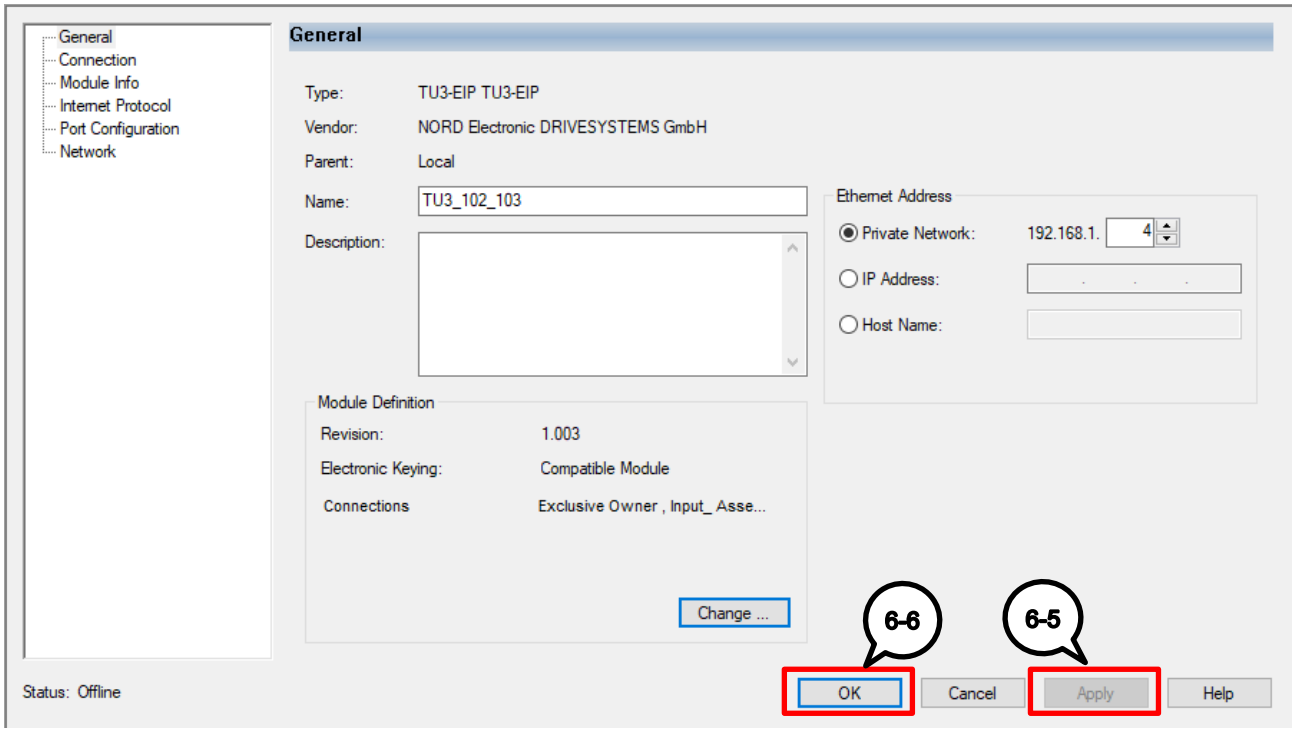

Figure 8: Process_TU3VFDControl_Instance102_103 Hardware Configuration Step 6B

7. Update the Add-On-Instruction's process data "Data Type" to match Table E above corresponding to the number of VFDs being controlled per ethernet network node. Utilize the FI_Status Data Type name in Step 7-2 and likewise utilize the FI_Control Data Type name in Step 7-3. When done click elsewhere in the "Parameters and Local Tags" list and then exit out.

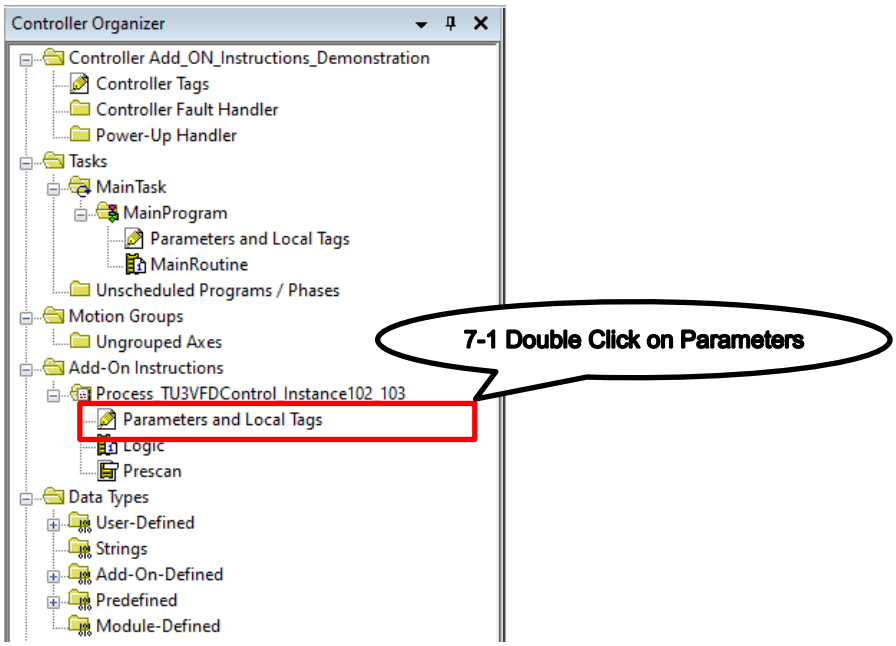

Figure 9: Process_TU3VFDControl_Instance102_103 Hardware Configuration Step 7A

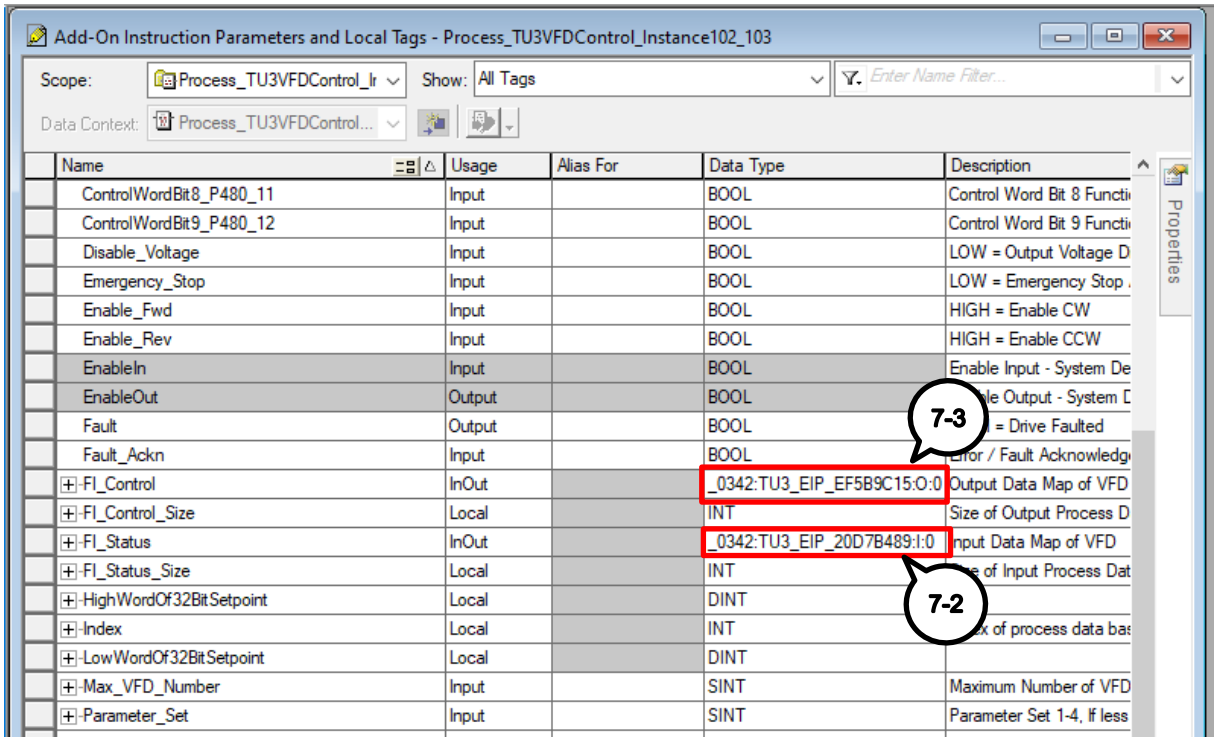

Figure 10: Process_TU3VFDControl_Instance102_103 Hardware Configuration Step 7B

3.2.4 Parameters

This AOI provides detailed information about the signal statuses between the PLC and the frequency inverter.

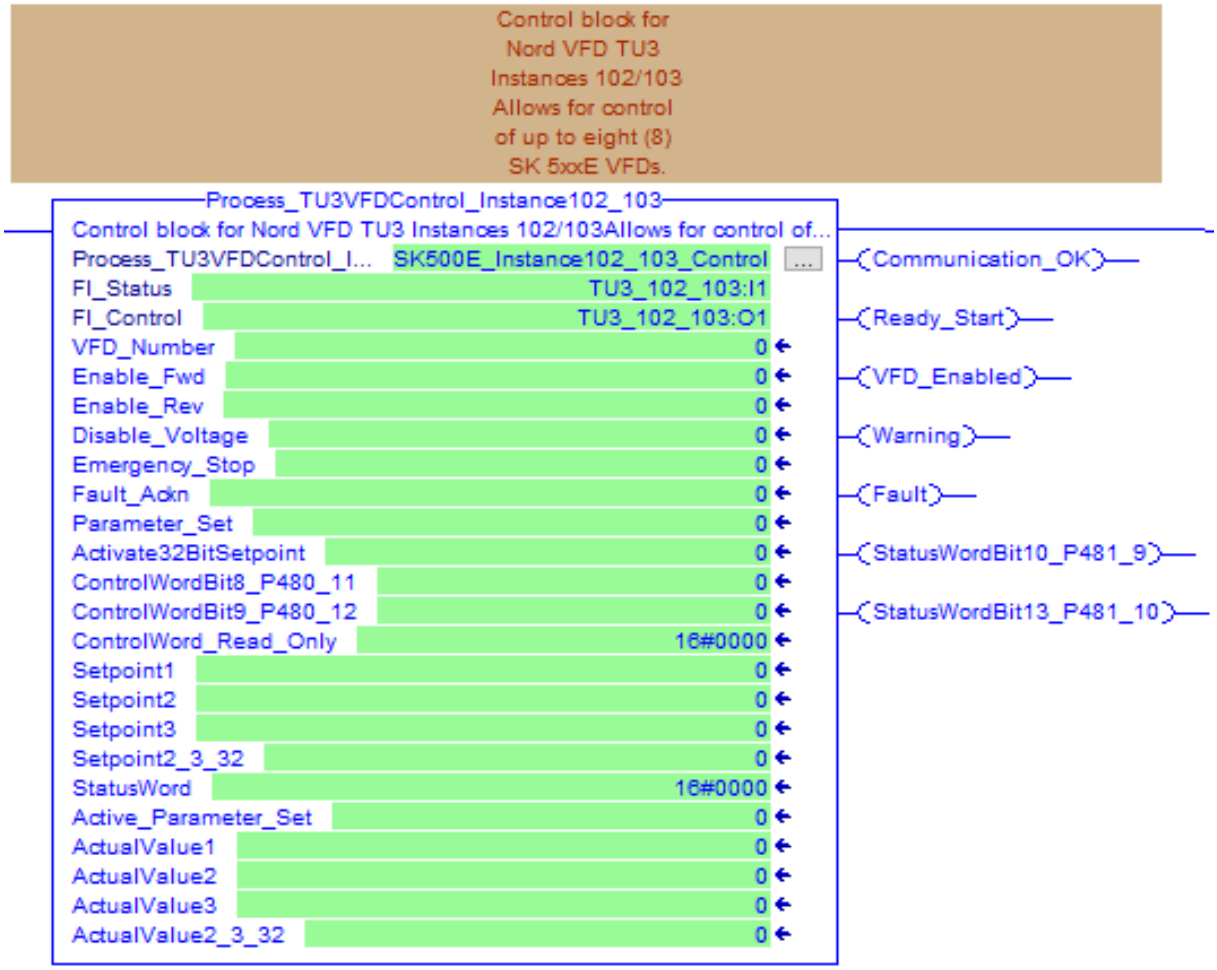

Figure 11: Process Module Process_TU3VFDControl_Instance102_103

3.2.4.1 Input Parameters

Parameter name	Type	Description
FI_Status	-	Input map of the VFD's process data (Status from VFD via ethernet module)
FI_Control	-	Output map of the VFD's process data (Control of VFD via ethernet module)
VFD_Number	SINT	Particular VFD selected with which the AOI instance will control. This value depends on where the VFD is located on the Systembus network. The first VFD on a NORD-Systembus network would have a VFD_number of 1. If value is less than 1 or greater than what the FI_Status and FI_Control data types allow, this value will revert to a default of 1.
Enable_FWD	BOOL	When **TRUE**, direction of rotation set to CW by default.
Enable_REV	BOOL	When **TRUE**, direction of rotation set to CCW.

Parameter name	Type	Description
Disable_Voltage	BOOL	When **FALSE**, output voltage is disabled; motor coasts to stop and inhibits subsequent enable.
		When **TRUE**, voltage is not disabled.
Quick_Stop	BOOL	When **FALSE**, motor ramps to stop (P426 = quick stop time) quickly. **Information** Care must be taken to ensure appropriate braking resistors are used to stop the motor in this time, or else the VFD will fault with an E005 Overvoltage UD fault during the braking sequence and coast to stop.
		When **TRUE**, quick stop not active.
Fault_Ackn	BOOL	**RISING EDGE** resets faults that are no longer active on the VFD. **Information** If a digital input has been programmed for the “ackn.fault” function, this bit must not be permanently set to 1 via the bus (otherwise, flank evaluation would be prevented).
Parameter_Set	SINT	Several parameters within the VFD have four parameter sets. By changing this variable, these settings can be accessed.
Activate32BitSetpoint	BOOL	When **FALSE**, Setpoint2 and Setpoint3 are valid, while Setpoint2_3_32 is invalid (applications not requiring 32-bit positioning control).
		When **TRUE**, Setpoint2 and Setpoint3 are invalid, while Setpoint2_3_32 becomes valid. Setpoint2 and 3 are combined into a 32-bit position setpoint for positioning applications.
ControlWordBit8_P480_11	BOOL	For additional process data control, function of bit 8 in the Control Word can be programmed via P480[11].
ControlWordBit9_P480_12	BOOL	For additional process data control, function of bit 9 in the Control Word can be programmed via P480[12].
Setpoint1	INT	Function of Setpoint1 can be programmed in VFD parameters via P546. **Information** For setpoint value standardization, please refer to “Section 8.7 Standardization of setpoint/target values” in the SK 5xxE manual (BU 0500).
Setpoint2	INT	Function of Setpoint2 can be programmed in VFD parameters via P547.
Setpoint3	INT	Function of Setpoint3 can be programmed in VFD parameters via P548.
Setpoint2_3_32	DINT	32bit version of Setpoint2 and 3. Used to set 32bits of position setpoint data.

Table F: Input Parameters for Process_TU3VFDControl_Instance102_103 AOI

3.2.4.2 Output Parameters

Parameter name	Type	Description
ControlWord_Read_Only	INT	Shows the control word for the drive. Changing this value in PLC does nothing to control the drive.
StatusWord	INT	Shows the status word from the drive. The “Communication_OK” bit must be high for this data to be valid.
Active_Parameter_Set	SINT	Displays the active parameter set.
ActualValue1	INT	Function for each actual value can be programmed in VFD parameters P543. **Information** For actual value standardization, please refer to “Section 8.7 Standardization of setpoint/target values” in the SK 5xxE manual (BU 0500).
ActualValue2	INT	Function for each actual value can be programmed in VFD parameters P544.
ActualValue3	INT	Function for each actual value can be programmed in VFD parameters P545.
ActualValue2_3_32	DINT	32bit version of Actual Value 2 and 3. Used to read 32bits of actual position data.
Communication_OK	BOOL	When TRUE, communication over network is OK.
Ready_Start	BOOL	When TRUE, VFD is in READY state.
VFDEnabled	BOOL	When TRUE, VFD is in RUNNING state and there is output voltage present.
Warning	BOOL	When TRUE, a warning is present. P700[2] contains warning code.
Fault	BOOL	When TRUE, an error/fault is present. P700[1] contains error code.
StatusWord_Bit10_P481_9	BOOL	Function of bit 10 in the Status Word can be programmed in P481[9] for additional status information.
StatusWord_Bit13_P481_10	BOOL	Function of bit 13 in the Status Word can be programmed in P481[10] for additional status information.

Table G: Output Parameters for Process_TU3VFDControl_Instance102_103 AOI

3.3 NORD_VFDcontrol_XU4_Inst100_101

3.3.1 Task

This Add On Instruction (AOI) is specific to the SK CU4-ETH internal customer unit and SK TU4-ETH external technology unit, which is exclusively for the NORDAC BASE (SK 1x0E), NORDAC FLEX (SK 2xxE), and NORDAC LINK frequency inverter product lines. It is called up in the cyclic section of the program and requires the ethernet module instances to be set to Input = 101 and Output = 100 (Section 3.3.3 "Hardware Configuration"). This AOI is used to control only one (1) frequency inverter with

- A 16-bit setpoint (integer format)
- Control signals (e.g. enabling, error acknowledgement) (Section 3.3.4 "Parameters")
- No access of embedded fieldbus DI or DO on SK CU4-ETH (2x DI) or SK TU4-ETH (8x DI & 2x DO)

3.3.2 Use

Frequency inverter	SK 1x0E/SK 2xxE/LINK (SK xU4-ETH)
Communication Path	EtherNet/IP®
Control	ControlLogix®
	CompactLogix™

3.3.3 Hardware Configuration

This section defines the type of connection and size of process data.

- Connection = Exclusive Owner
- Input Remote Data = 101
- Output Remote Data = 100
- Size = 6 INT for both Input and Output Data.

Picking up where we left off in the process of adding the NORD EtherNet/IP® interface module in Section 3 "Process modules":

6. Complete setting up the module definition.

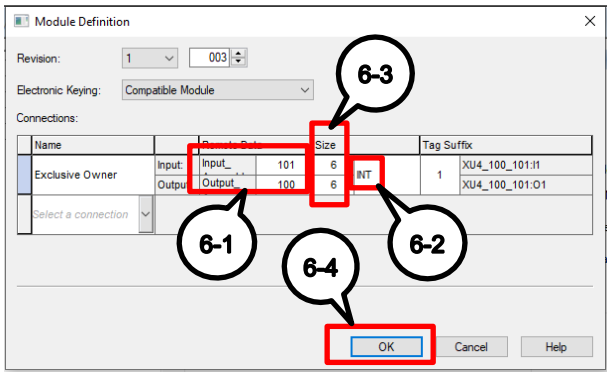

Figure 12: NORD_VFDcontrol_XU4_Inst100_101 Hardware Configuration Step 6

3.3.4 Parameters

This AOI provides detailed information about the signal statuses between the PLC and the frequency inverter.

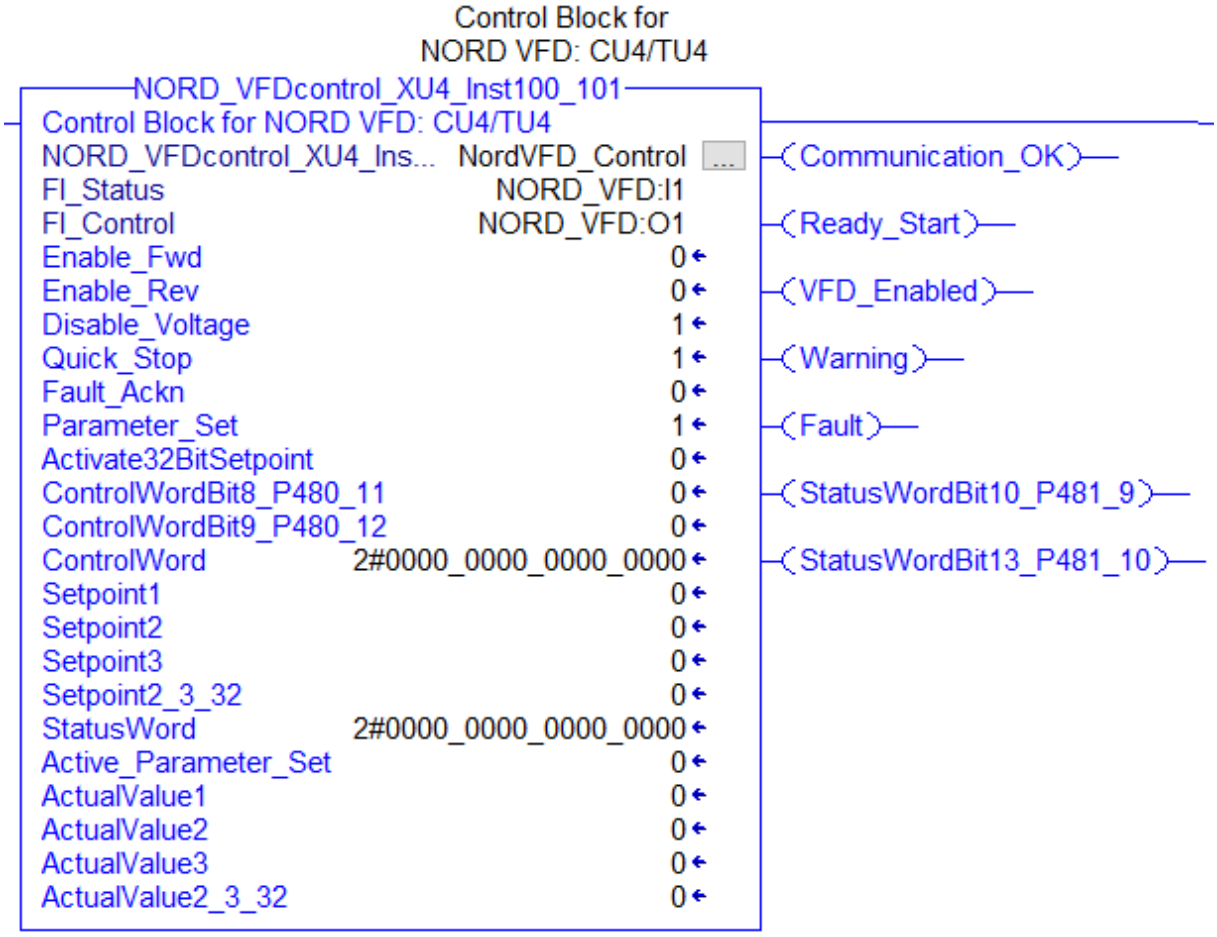

Figure 13: Process Module NORD_VFDcontrol_XU4_Inst100_101

3.3.4.1 Input Parameters

Parameter name	Type	Description
FI_Status	-	Input map of the VFD's process data (Status from VFD via ethernet module)
FI_Control	-	Output map of the VFD's process data (Control of VFD via ethernet module)
Enable_FWD	BOOL	When TRUE, direction of rotation set to CW by default.
Enable_REV	BOOL	When TRUE, direction of rotation set to CCW.
Disable_Voltage	BOOL	When FALSE, output voltage is disabled; motor coasts to stop and inhibits subsequent enable.
		When TRUE, voltage is not disabled.

Parameter name	Type	Description
Quick_Stop	BOOL	When FALSE, motor ramps to stop (P426 = quick stop time) quickly. **Information** Care must be taken to ensure appropriate braking resistors are used to stop the motor in this time, or else the VFD will fault with an E005 Overvoltage UD fault during the braking sequence and coast to stop.
		When TRUE, quick stop not active.
Fault_Ackn	BOOL	RISING EDGE resets faults that are no longer active on the VFD. **Information** If a digital input has been programmed for the “ackn.fault” function, this bit must not be permanently set to 1 via the bus (otherwise, flank evaluation would be prevented).
Parameter_Set	SINT	Several parameters within the VFD have four parameter sets. By changing this variable, these settings can be accessed.
Activate32BitSetpoint	BOOL	When FALSE, Setpoint2 and Setpoint3 are valid, while Setpoint2_3_32 is invalid (applications not requiring 32-bit positioning control).
		When TRUE, Setpoint2 and Setpoint3 are invalid, while Setpoint2_3_32 becomes valid. Setpoint2 and 3 are combined into a 32-bit position setpoint for positioning applications.
ControlWordBit8_P480_11	BOOL	For additional process data control, function of bit 8 in the Control Word can be programmed via P480[11].
ControlWordBit9_P480_12	BOOL	For additional process data control, function of bit 9 in the Control Word can be programmed via P480[12].
Setpoint1	INT	Function of Setpoint1 can be programmed in VFD parameters via P546[1]. **Information** For setpoint value standardization, please refer to “Section 8.9 Standardization of setpoint/target values” in the SK 1x0E manual (BU 0180) and SK 2xxE manual (BU 0200), and “Section 8.8 Standardization of setpoint/target values” in the SK 2X0E-FDS manual (BU 0250).
Setpoint2	INT	Function of Setpoint2 can be programmed in VFD parameters via P546[2].
Setpoint3	INT	Function of Setpoint3 can be programmed in VFD parameters via P546[3].
Setpoint2_3_32	DINT	32bit version of Setpoint2 and 3. Used to set 32bits of position setpoint data.

Table H: Input Parameters for NORD_VFDcontrol_XU4_Inst100_101 AOI

3.3.4.2 Output Parameters

Parameter name	Type	Description
ControlWord_Read_Only	INT	Shows the control word for the drive. Changing this value in PLC does nothing to control the drive.
StatusWord	INT	Shows the status word from the drive. The “Communication_OK” bit must be high for this data to be valid.
Active_Parameter_Set	SINT	Displays the active parameter set.
ActualValue1	INT	Function for each actual value can be programmed in VFD parameters P543[1]. **Information** For setpoint value standardization, please refer to “Section 8.9 Standardization of setpoint/target values” in the SK 1x0E manual (BU 0180) and SK 2xxE manual (BU 0200), and “Section 8.8 Standardization of setpoint/target values” in the SK 2X0E-FDS manual (BU 0250).
ActualValue2	INT	Function for each actual value can be programmed in VFD parameters P543[2].
ActualValue3	INT	Function for each actual value can be programmed in VFD parameters P543[3].
ActualValue2_3_32	DINT	32bit version of Actual Value 2 and 3. Used to read 32bits of actual position data.
Communication_OK	BOOL	When TRUE, communication over network is OK.
Ready_Start	BOOL	When TRUE, VFD is in READY state.
VFDEnabled	BOOL	When TRUE, VFD is in RUNNING state and there is output voltage present.
Warning	BOOL	When TRUE, a warning is present. P700[2] contains warning code.
Fault	BOOL	When TRUE, an error/fault is present. P700[1] contains error code.
StatusWord_Bit10_P481_9	BOOL	Function of bit 10 in the Status Word can be programmed in P481[9] for additional status information.
StatusWord_Bit13_P481_10	BOOL	Function of bit 13 in the Status Word can be programmed in P481[10] for additional status information.

Table I: Output Parameters for NORD_VFDcontrol_XU4_Inst100_101 AOI

3.4 NORD_VFDcontrol_XU4_Inst110_111

3.4.1 Task

This Add On Instruction (AOI) is specific to the SK CU4-ETH internal customer unit and SK TU4-ETH external technology unit, which is exclusively for the NORDAC BASE (SK 1x0E), NORDAC FLEX (SK 2xxE), and NORDAC LINK frequency inverter product lines. It is called up in the cyclic section of the program and requires the ethernet module instances to be set to Input = 111 and Output = 110 (Section 3.4.3 "Hardware configuration"). This AOI is used to control up to four (4) frequency inverters with

- A 16-bit setpoint (integer format)
- Control signals (e.g. enabling, error acknowledgement) (Section 3.4.4 "Parameters")
- Access to embedded fieldbus DI or DO on SK CU4-ETH (2x DI) or SK TU4-ETH (8x DI & 2x DO)

Information **Device Address/Systembus Address**

For details of the device address (also known as P515 CAN bus address or Systembus address) settings, please refer to the manual for the frequency inverter as well as the EtherNet/IP® fieldbus manual (BU2100).

3.4.2 Use

Frequency inverter	SK 1x0E/SK 2xxE/LINK (SK xU4-ETH)
Communication Path	EtherNet/IP®
Control	ControlLogix®
	CompactLogix™

3.4.3 Hardware configuration

This section defines the type of connection and size of process data.

- Connection = Exclusive Owner
- Input Remote Data = 111
- Output Remote Data = 110
- Size = 1 + 6 INT * Number of VFD’s being controlled per SK xU4-ETH. This number will be the same for both Input and Output Data.

Use the table below to select the correct data package size, FI_Status data type, and FI_Control data type. Use each value in the corresponding steps found above each column.

No. of Controlled VFDs	In Step 6-3 below Change Data Package Size to:	In Step 7-2 below Change FI_Status Data Type to:	In Step 7-3 below Change FI_Control Data Type to:
1	7	_0342:CU4_ETH_15072931:I:0	_0342:CU4_ETH_23BA2C07:O:0
2	13	_0342:CU4_ETH_18286BED:I:0	_0342:CU4_ETH_D7A44371:O:0
3	19	_0342:CU4_ETH_B9B3488B:I:0	_0342:CU4_ETH_763F6017:O:0
4	25	_0342:CU4_ETH_FF99926D:I:0	_0342:CU4_ETH_3015BAF1:O:0

Table J: Hardware Configuration Guide for NORD_VFDcontrol_XU4_Inst110_111

The example module definition below shows the setup for control of four (4) frequency inverters. Adapt steps 6-3, 7-2, and 7-3 for the desired application needs based on Table J above.

Picking up where we left off in the process of adding the NORD EtherNet/IP® interface module in Section 3 "Process modules":

6. Complete setting up the module definition. Utilize the “Data Package Size” value most appropriate for the application from Table J above in Step 6-3 below.

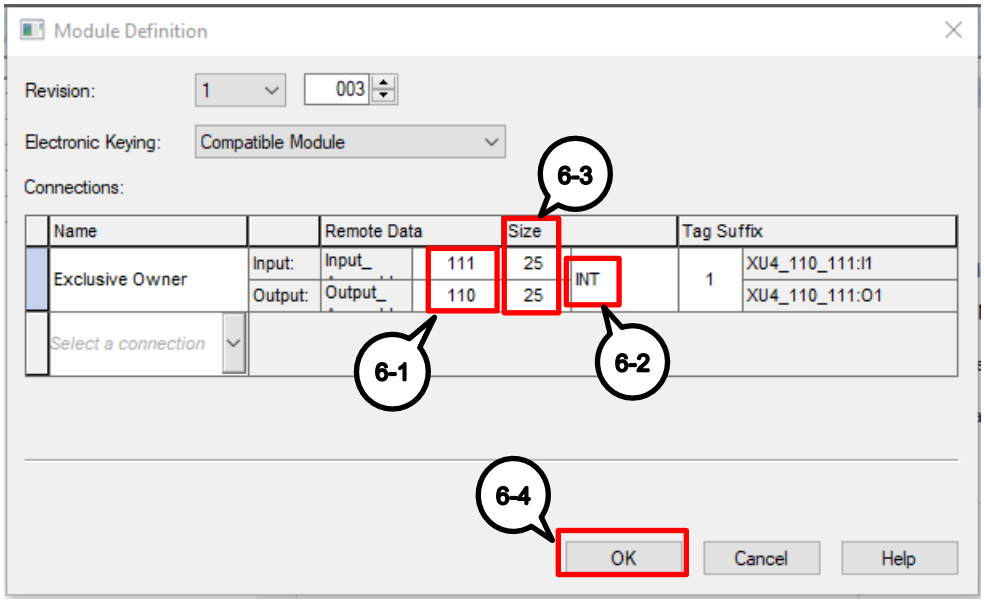

Figure 14: NORD_VFDcontrol_XU4_Inst110_111 Hardware Configuration Step 6A

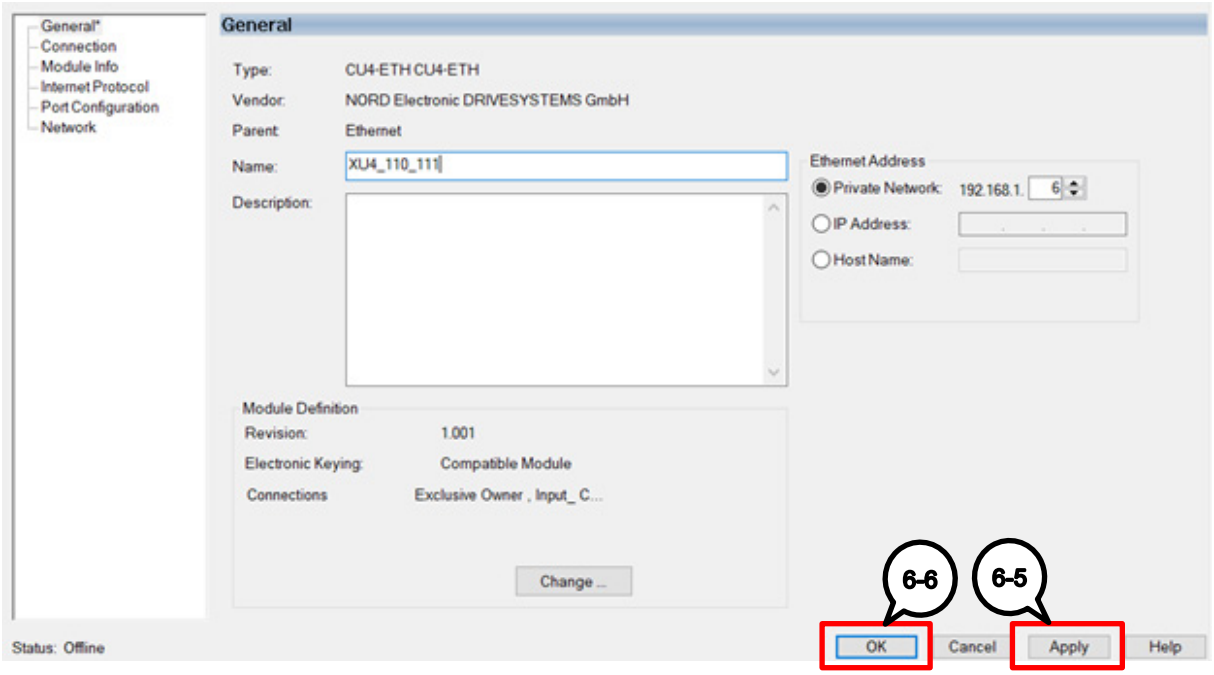

Figure 15: NORD_VFDcontrol_XU4_Inst110_111 Hardware Configuration Step 6B

7. Update the Add-On-Instruction's process data "Data Type" to match Table J above corresponding to the number of VFDs being controlled per ethernet network node. Utilize the FI_Status Data Type name in Step 7-2 and likewise utilize the FI_Control Data Type name in Step 7-3. When done click elsewhere in the „Parameters and Local Tags" list and then exit out.

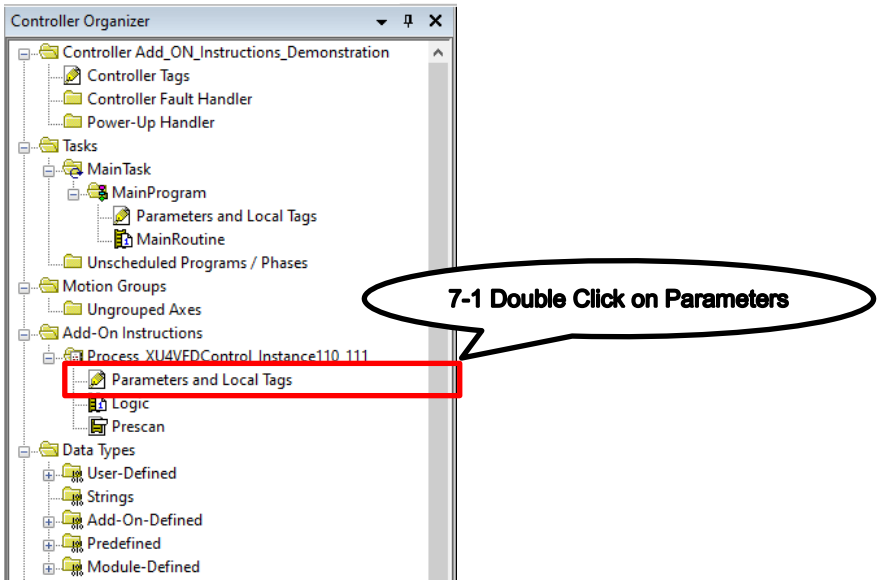

Figure 16: NORD_VFDcontrol_XU4_Inst110_111 Hardware Configuration Step 7A

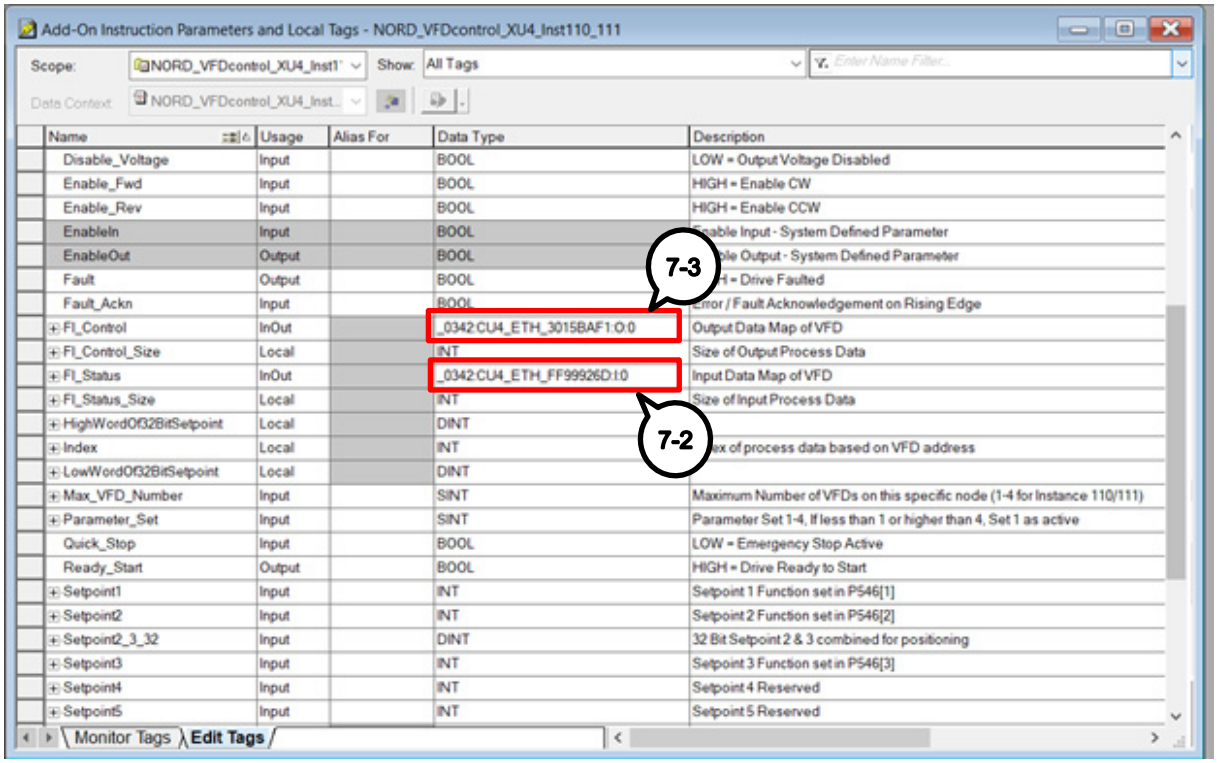

Figure 17: NORD_VFDcontrol_XU4_Inst110_111 Hardware Configuration Step 7B

3.4.4 Parameters

This AOI provides detailed information about the signal statuses between the PLC and the frequency inverter.

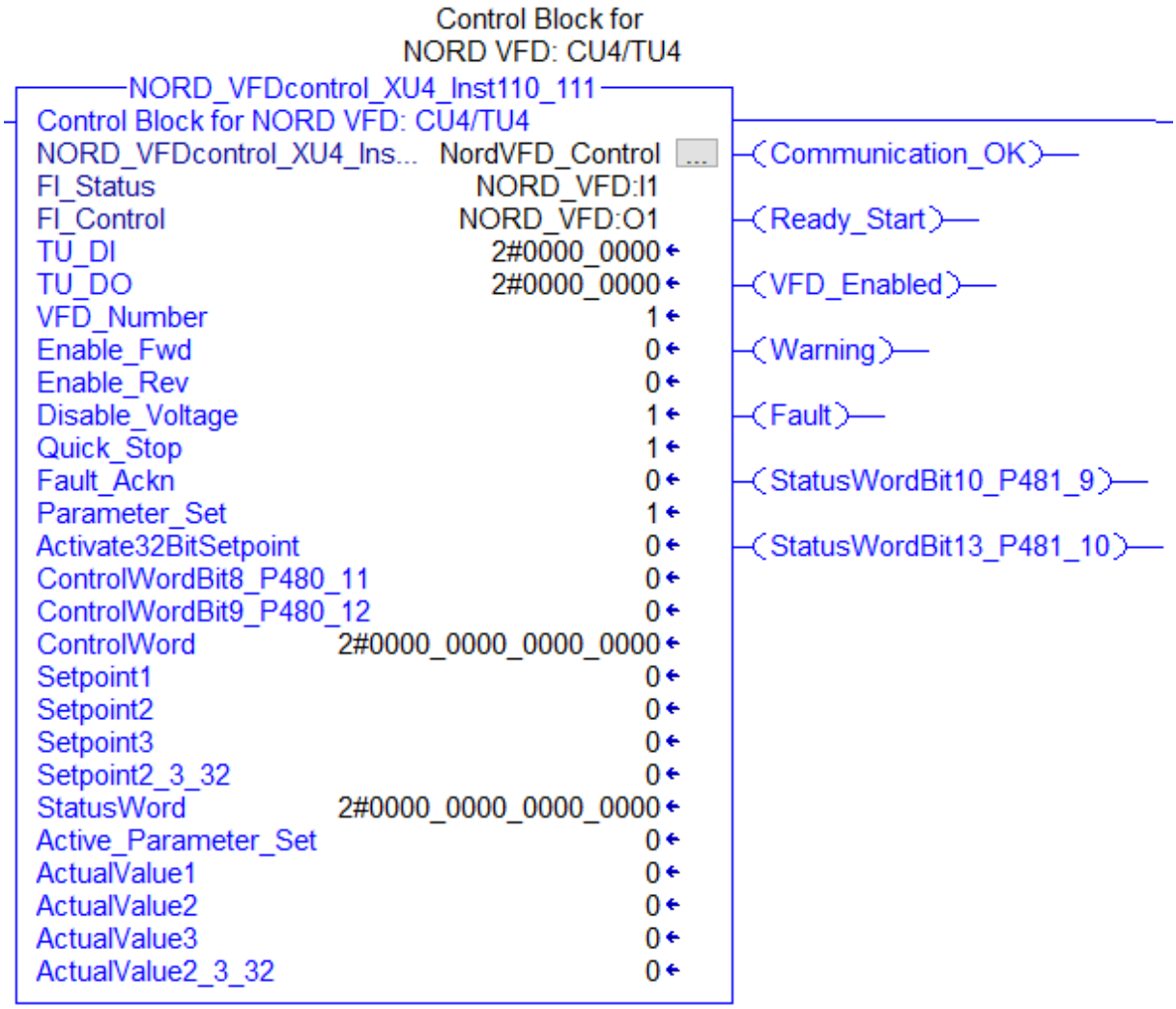

Figure 18: Process Module NORD_VFDcontrol_XU4_Inst110_111

3.4.4.1 Input Parameters

Parameter name	Type	Description
FI_Status	-	Input map of the VFD's process data (Status from VFD via ethernet module)
FI_Control	-	Output map of the VFD's process data (Control of VFD via ethernet module)
Digital_OUT	SINT	Digital outputs on the SK TU4-ETH module can be modified by controlling these bits. Bit 0: DOUT 1 — TU4-ETH only Bit 1: DOUT 2 — TU4-ETH only
VFD_Number	SINT	Particular VFD selected with which the AOI instance will control. This value depends on where the VFD is located on the Systembus network. The first VFD on a NORD-Systembus network would have a VFD_number of 1. If value is less than 1 or greater than what the FI_Status and FI_Control data types allow, this value will revert to a default of 1.

Parameter name	Type	Description
Enable_FWD	BOOL	When TRUE, direction of rotation set to CW by default.
Enable_REV	BOOL	When TRUE, direction of rotation set to CCW.
Disable_Voltage	BOOL	When FALSE, output voltage is disabled; motor coasts to stop and inhibits subsequent enable. When TRUE, voltage is not disabled.
Quick_Stop	BOOL	When FALSE, motor ramps to stop (P426 = quick stop time) quickly. **Information** Care must be taken to ensure appropriate braking resistors are used to stop the motor in this time, or else the VFD will fault with an E005 Overvoltage UD fault during the braking sequence and coast to stop. When TRUE, quick stop not active.
Parameter_Set	SINT	Several parameters within the VFD have four parameter sets. By changing this variable, these settings can be accessed.
Activate32BitSetpoint	BOOL	When FALSE, Setpoint2 and Setpoint3 are valid, while Setpoint2_3_32 is invalid (applications not requiring 32-bit positioning control). When TRUE, Setpoint2 and Setpoint3 are invalid, while Setpoint2_3_32 becomes valid. Setpoint2 and 3 are combined into a 32-bit position setpoint for positioning applications.
ControlWordBit8_P480_11	BOOL	For additional process data control, function of bit 8 in the Control Word can be programmed via P480[11].
ControlWordBit9_P480_12	BOOL	For additional process data control, function of bit 9 in the Control Word can be programmed via P480[12].
Setpoint1	INT	Function of Setpoint1 can be programmed in VFD parameters via P546[1]. **Information** For setpoint value standardization, please refer to “Section 8.9 Standardization of setpoint/target values” in the SK 1x0E manual (BU 0180) and SK 2xxE manual (BU 0200), and “Section 8.8 Standardization of setpoint/target values” in the SK 2X0E-FDS manual (BU 0250).
Setpoint2	INT	Function of Setpoint2 can be programmed in VFD parameters via P546[2].
Setpoint3	INT	Function of Setpoint3 can be programmed in VFD parameters via P546[3].
Setpoint2_3_32	DINT	32bit version of Setpoint2 and 3. Used to set 32bits of position setpoint data.

Table K: Input Parameters for NORD_VFDcontrol_XU4_Inst110_111 AOI

3.4.4.2 Output Parameters

Parameter name	Type	Description
Digital_IN	SINT	Status of digital inputs on the SK CU4/ TU4-ETH module. Bit 0: DIN 1 — CU4-ETH, TU4-ETH Bit 1: DIN 2 — CU4-ETH, TU4-ETH Bit 2: DIN 3 — TU4-ETH only Bit 3: DIN 4 — TU4-ETH only Bit 4: DIN 5 — TU4-ETH only Bit 5: DIN 6 — TU4-ETH only Bit 6: DIN 7 — TU4-ETH only Bit 7: DIN 8 — TU4-ETH only
ControlWord_Read_Only	INT	Shows the control word for the drive. Changing this value in PLC does nothing to control the drive.
StatusWord	INT	Shows the status word from the drive. The “Communication_OK” bit must be high for this data to be valid.
Active_Parameter_Set	SINT	Displays the active parameter set.
ActualValue1	INT	Function for each actual value can be programmed in VFD parameters P543[1]. **Information** For setpoint value standardization, please refer to “Section 8.9 Standardization of setpoint/target values” in the SK 1x0E manual (BU 0180) and SK 2xxE manual (BU 0200), and “Section 8.8 Standardization of setpoint/target values” in the SK 2X0E-FDS manual (BU 0250).
ActualValue2	INT	Function for each actual value can be programmed in VFD parameters P543[2].
ActualValue3	INT	Function for each actual value can be programmed in VFD parameters P543[3].
ActualValue2_3_32	DINT	32bit version of Actual Value 2 and 3. Used to read 32bits of actual position data.
Communication_OK	BOOL	When TRUE, communication over network is OK.
Ready_Start	BOOL	When TRUE, VFD is in READY state.
VFD_Enabled	BOOL	When TRUE, VFD is in RUNNING state and there is output voltage present.
Warning	BOOL	When TRUE, a warning is present. P700[2] contains warning code.
Fault	BOOL	When TRUE, an error/fault is present. P700[1] contains error code.
StatusWord_Bit10_P481_9	BOOL	Function of bit 10 in the Status Word can be programmed in P481[9] for additional status information.
StatusWord_Bit13_P481_10	BOOL	Function of bit 13 in the Status Word can be programmed in P481[10] for additional status information.

Table L: Output Parameters for NORD_VFDcontrol_XU4_Inst110_111 AOI

3.5 NORD_VFDcontrol_PRO_Inst100_101

3.5.1 Task

This Add On Instruction (AOI) is specific to the NORDAC PRO (SK 550P) frequency inverter product line. It is called up in the cyclic section of the program and requires the ethernet module instances to be set to Input = 101 and Output = 100 (Section 3.5.3 "Hardware configuration"). This AOI is used to control up to eight (8) frequency inverters with

- A 16-bit setpoint (integer format)
- Control signals (e.g. enabling, error acknowledgement) (Section 3.5.4 "Parameters")

The first frequency inverter on the NORD-Systembus must always be an SK 550P type inverter with embedded Ethernet capabilities. (i.e. VFD_number = 1 must always be of SK 550P type). However, the remaining frequency inverters on the Systembus can be of any family in the 5xxP inverter product lines.

Information **Device Address/Systembus Address**

For details of the device address (also known as P515 CAN bus address or Systembus address) settings, please refer to the manual for the frequency inverter as well as the EtherNet/IP® fieldbus manual (BU 2100).

3.5.2 Use

Frequency inverter	SK 550P (SK XU5-EIP embedded)
Communication Path	EtherNet/IP®
Control	ControlLogix®
	CompactLogix™

3.5.3 Hardware configuration

This section defines the type of connection and size of process data.

- Connection = Exclusive Owner
- Input Remote Data = 101
- Output Remote Data = 100
- Size = 6 INT * Number of VFD’s being controlled per EtherNet/IP® fieldbus network node. This number will be the same for both Input and Output Data.

Use the table below to select the correct data package size, FI_Status data type, and FI_Control data type. Use each value in the corresponding steps found above each column.

No. of Controlled VFDs	In Step 6-3 below Change Data Package Size to:	In Step 7-2 below Change FI_Status Data Type to:	In Step 7-3 below Change FI_Control Data Type to:
1	6	_0342:XU5_EIP_DE5BFA94:I:0	_0342:XU5_EIP_E8E6FFA2:O:0
2	12	_0342:XU5_EIP_D374B848:I:0	_0342:XU5_EIP_1CF890D4:O:0
3	18	_0342:XU5_EIP_72EF9B2E:I:0	_0342:XU5_EIP_BD63B3B2:O:0
4	24	_0342:XU5_EIP_34C541C8:I:0	_0342:XU5_EIP_FB496954:O:0
5	30	_0342:XU5_EIP_0923086A:I:0	_0342:XU5_EIP_C6AF20F6:O:0
6	36	_0342:XU5_EIP_DF7AEB77:I:0	_0342:XU5_EIP_10F6C3EB:O:0
7	42	_0342:XU5_EIP_814C97EF:I:0	_0342:XU5_EIP_4EC0BF73:O:0
8	48	_0342:XU5_EIP_20D7B489:I:0	_0342:XU5_EIP_EF5B9C15:O:0

Table M: Hardware Configuration Guide for NORD_VFDcontrol_PRO_Inst100_101

The example module definition below shows the setup for control of one (1) frequency inverter. Adapt steps 6-3, 7-2, and 7-3 for the desired application needs based on the table above.

Picking up where we left off in the process of adding the NORD EtherNet/IP® interface module in Section 3 "Process modules":

6. Complete setting up the module definition. Utilize the “Data Package Size” value most appropriate for the application from Table P above in Step 6-3 below.

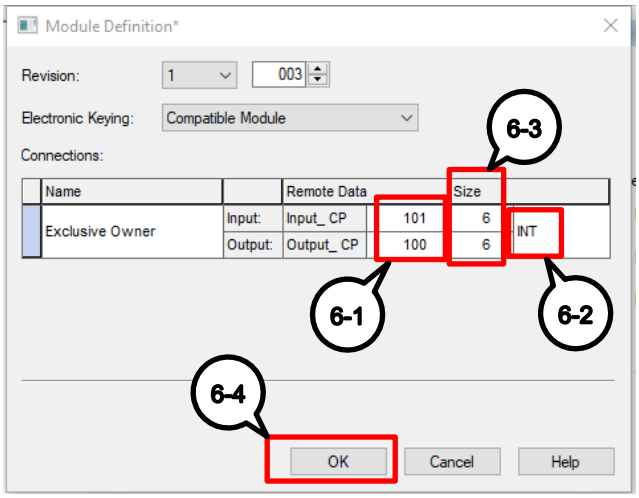

Figure 19: NORD_VFDcontrol_PRO_Inst100_101 Hardware Configuration Step 6A

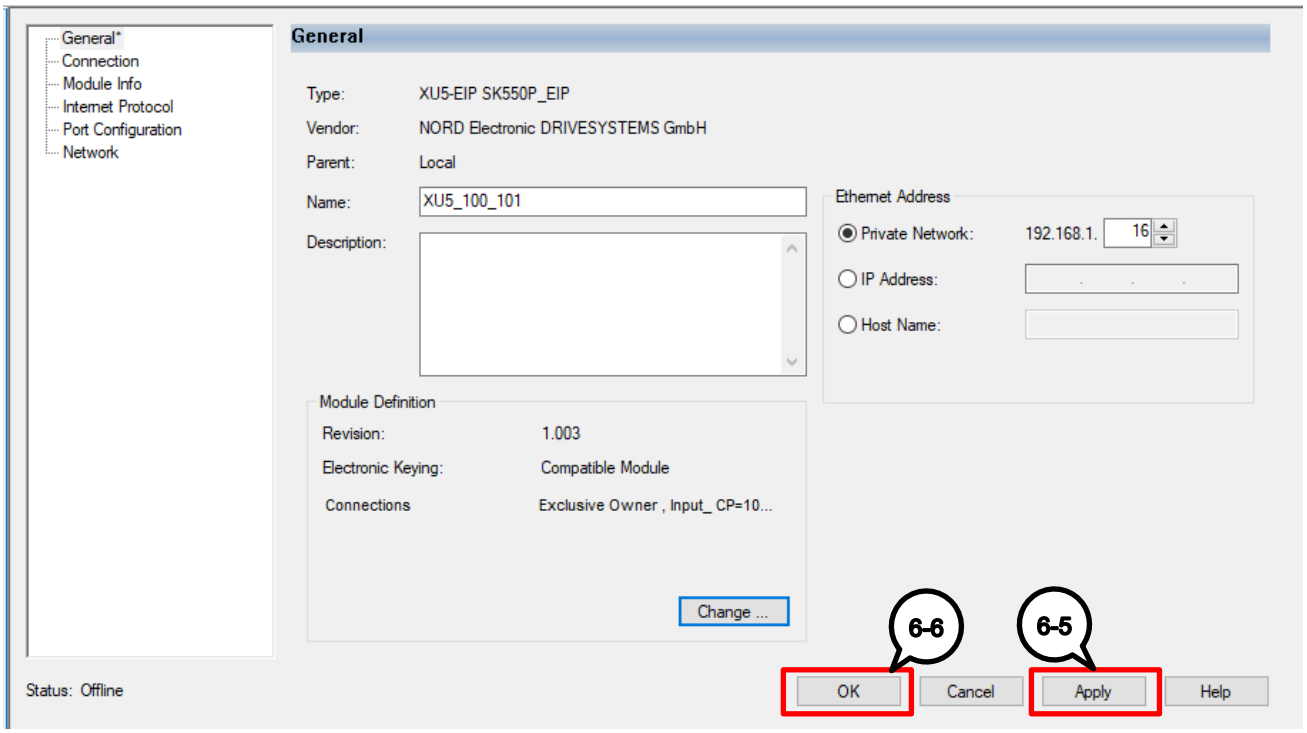

Figure 20: NORD_VFDcontrol_PRO_Inst100_101 Hardware Configuration Step 6B

7. Update the Add-On-Instruction's process data "Data Type" to match Table P above corresponding to the number of VFDs being controlled per ethernet network node. Utilize the "FI_Status Data Type" name in Step 7-2 and likewise utilize the "FI_Control Data Type" name in Step 7-3. When done click elsewhere in the "Parameters and Local Tags" list and then exit out.

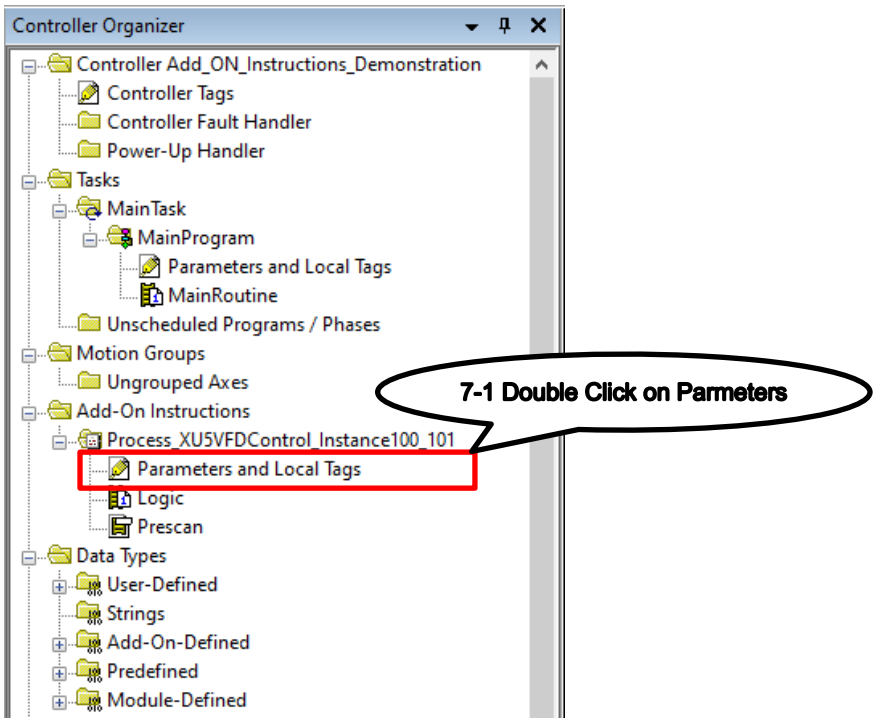

Figure 21: NORD_VFDcontrol_PRO_Inst100_101 Hardware Configuration Step 7A

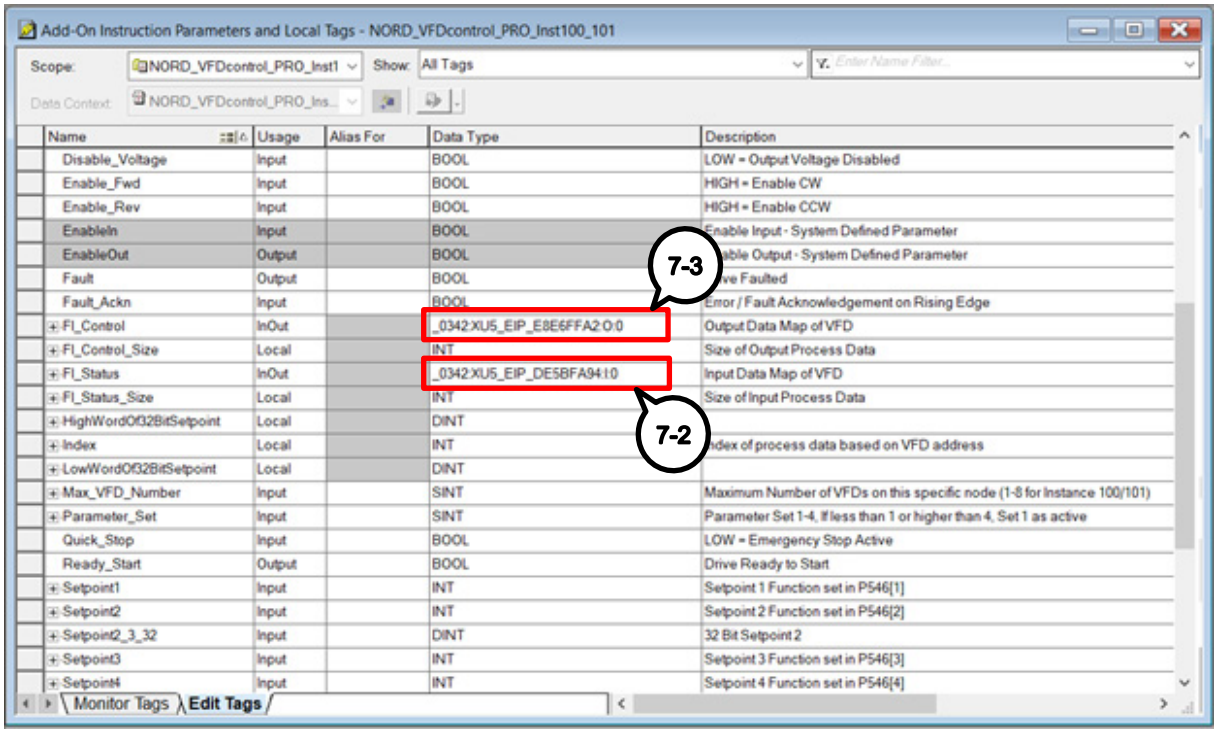

Figure 22: NORD_VFDcontrol_PRO_Inst100_101 Hardware Configuration Step 7B

3.5.4 Parameters

This AOI provides detailed information about the signal statuses between the PLC and the frequency inverter.

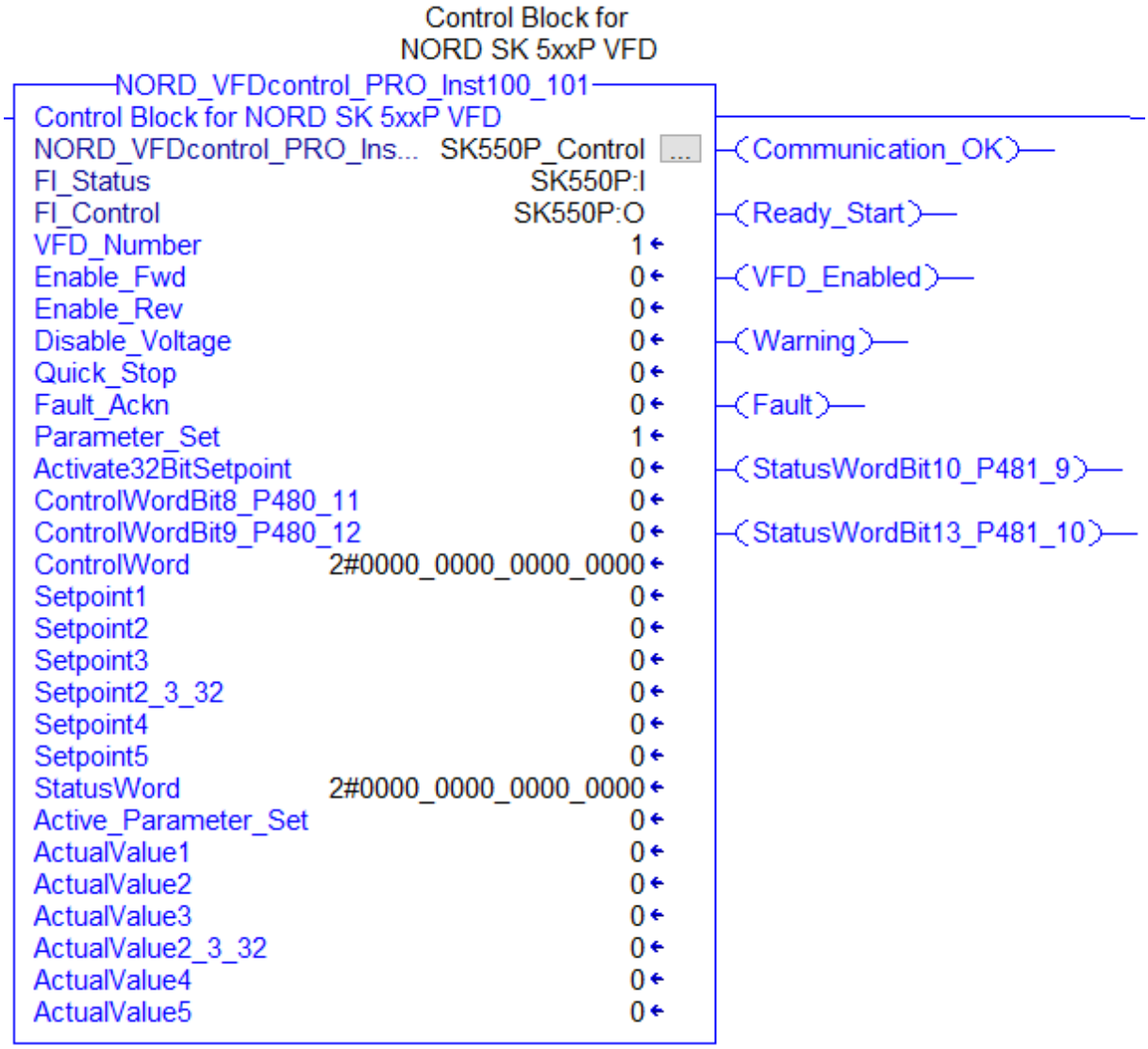

Figure 23: Process Module NORD_VFDcontrol_PRO_Inst100_101

3.5.4.1 Input Parameters

Parameter name	Type	Description
FI_Status	-	Input map of the VFD's process data (Status from VFD via ethernet module)
FI_Control	-	Output map of the VFD's process data (Control of VFD via ethernet module)
VFD_Number	SINT	Particular VFD selected with which the AOI instance will control. This value depends on where the VFD is located on the Systembus network. The first VFD on a NORD-Systembus network would have a VFD_number of 1. If value is less than 1 or greater than what the FI_Status and FI_Control data types allow, this value will revert to a default of 1.
Enable_FWD	BOOL	When TRUE, direction of rotation set to CW by default.
Enable_REV	BOOL	When TRUE, direction of rotation set to CCW.

Parameter name	Type	Description
Disable_Voltage	BOOL	When FALSE, output voltage is disabled; motor coasts to stop and inhibits subsequent enable.
		When TRUE, voltage is not disabled.
Quick_Stop	BOOL	When FALSE, motor ramps to stop (P426 = quick stop time) quickly. **Information** Care must be taken to ensure appropriate braking resistors are used to stop the motor in this time, or else the VFD will fault with an E005 Overvoltage UD fault during the braking sequence and coast to stop.
		When TRUE, quick stop not active.
Fault_Ackn	BOOL	RISING EDGE resets faults that are no longer active on the VFD. **Information** If a digital input has been programmed for the “ackn.fault” function, this bit must not be permanently set to 1 via the bus (otherwise, flank evaluation would be prevented).
Parameter_Set	SINT	Several parameters within the VFD have four parameter sets. By changing this variable, these settings can be accessed.
Activate32BitSetpoint	BOOL	When FALSE, Setpoint2 and Setpoint3 are valid, while Setpoint2_3_32 is invalid (applications not requiring 32-bit positioning control).
		When TRUE, Setpoint2 and Setpoint3 are invalid, while Setpoint2_3_32 becomes valid. Setpoint2 and 3 are combined into a 32-bit position setpoint for positioning applications.
ControlWordBit8_P480_11	BOOL	For additional process data control, function of bit 8 in the Control Word can be programmed via P480[11].
ControlWordBit9_P480_12	BOOL	For additional process data control, function of bit 9 in the Control Word can be programmed via P480[12].
Setpoint1	INT	Function of Setpoint1 can be programmed in VFD parameters via P546[1]. **Information** For setpoint value standardization, please refer to “Section 8.7 Standardization of setpoint/target values” in the SK 5xxP manual (BU 0600).
Setpoint2	INT	Function of Setpoint2 can be programmed in VFD parameters via P546[2].
Setpoint3	INT	Function of Setpoint3 can be programmed in VFD parameters via P546[3].
Setpoint2_3_32	DINT	32bit version of Setpoint2 and 3. Used to set 32bits of position setpoint data.
Setpoint4	INT	Function of Setpoint4 can be programmed in VFD parameters via P546[4].
Setpoint5	INT	Function of Setpoint5 can be programmed in VFD parameters via P546[5].

Table N: Input Parameters for NORD_VFDcontrol_PRO_Inst100_101 AOI

3.5.4.2 Output Parameters

Parameter name	Type	Description
ControlWord_Read_Only	INT	Shows the control word for the drive. Changing this value in PLC does nothing to control the drive.
StatusWord	INT	Shows the status word from the drive. The “Communication_OK” bit must be high for this data to be valid.
Active_Parameter_Set	SINT	Displays the active parameter set.
ActualValue1	INT	Function for actual value 1 can be programmed in VFD parameters P543[1]. **Information** For actual value standardization, please refer to “Section 8.7 Standardization of setpoint/target values” in the SK 5xxP manual (BU 0600).
ActualValue2	INT	Function for Actual Value 2 can be programmed in VFD parameters P543[2].
ActualValue3	INT	Function for Actual Value 3 can be programmed in VFD parameters P543[3].
ActualValue2_3_32	DINT	32bit version of Actual Value 2 and 3. Used to read 32bits of actual position data.
ActualValue4	INT	Function for Actual Value 4 can be programmed in VFD parameters P543[4].
ActualValue5	INT	Function for Actual Value 5 can be programmed in VFD parameters P543[5].
Communication_OK	BOOL	When TRUE, communication over network is OK.
Ready_Start	BOOL	When TRUE, VFD is in READY state.
VFDEnabled	BOOL	When TRUE, VFD is in RUNNING state and there is output voltage present.
Warning	BOOL	When TRUE, a warning is present. P700[2] contains warning code.
Fault	BOOL	When TRUE, an error/fault is present. P700[1] contains error code.
StatusWord_Bit10_P481_9	BOOL	Function of bit 10 in the Status Word can be programmed in P481[9] for additional status information.
StatusWord_Bit13_P481_10	BOOL	Function of bit 13 in the Status Word can be programmed in P481[10] for additional status information.

Table O: Output Parameters for NORD_VFDcontrol_PRO_Inst100_101 AOI

3.6 NORD_VFDcontrol_ON_Inst100_101

3.6.1 Task

This Add On Instruction (AOI) is specific to the NORDAC ON (SK 300P) frequency inverter product line. It is called up in the cyclic section of the program and requires the ethernet module instances to be set to Input = 101 and Output = 100 (Section 3.6.3 "Hardware configuration"). This AOI is used to control one (1) frequency inverter with

- A 16-bit setpoint (integer format)
- Control signals (e.g. enabling, error acknowledgement) (Section 3.6.4 "Parameters")

Information **Device Address/Systembus Address**

For details of the device address (also known as P515 CAN bus address or Systembus address) settings, please refer to the manual for the frequency inverter as well as the Industrial Ethernet Bus module manual (BU 2900).

3.6.2 Use

Frequency inverter	SK 300P (SK CU6-ETH embedded)
Communication Path	EtherNet/IP®
Control	ControlLogix®
	CompactLogix™

3.6.3 Hardware configuration

This section defines the type of connection and size of process data.

- Connection = Exclusive Owner
- Input Remote Data = 101
- Output Remote Data = 100
- Size = 6 INT. This number will be the same for both Input and Output Data.

Use the table below to select the correct data package size, FI_Status data type, and FI_Control data type. Use each value in the corresponding steps found above each column.

No. of Controlled VFDs	In Step 6-3 below Change Data Package Size to:	In Step 7-2 below Change FI_Status Data Type to:	In Step 7-3 below Change FI_Control Data Type to:
1	6	_0342:SK300P_DE5BFA94:I:0	_0342:SK300P_E8E6FFA2:O:0

Table P: Hardware Configuration Guide for NORD_VFDcontrol_ON_Inst100_101

The example module definition below shows the setup for control of one (1) frequency inverter. Adapt steps 6-3, 7-2, and 7-3 for the desired application needs based on the table above.

Picking up where we left off in the process of adding the NORD EtherNet/IP® interface module in Section 3 "Process modules":

6. Complete setting up the module definition. Utilize the “Data Package Size” value most appropriate for the application from Table P above in Step 6-3 below.

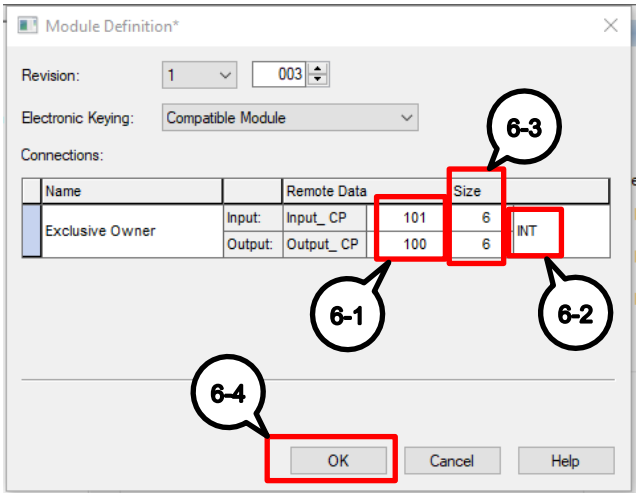

Figure 24: NORD_VFDcontrol_ON_Inst100_101 Hardware Configuration Step 6A

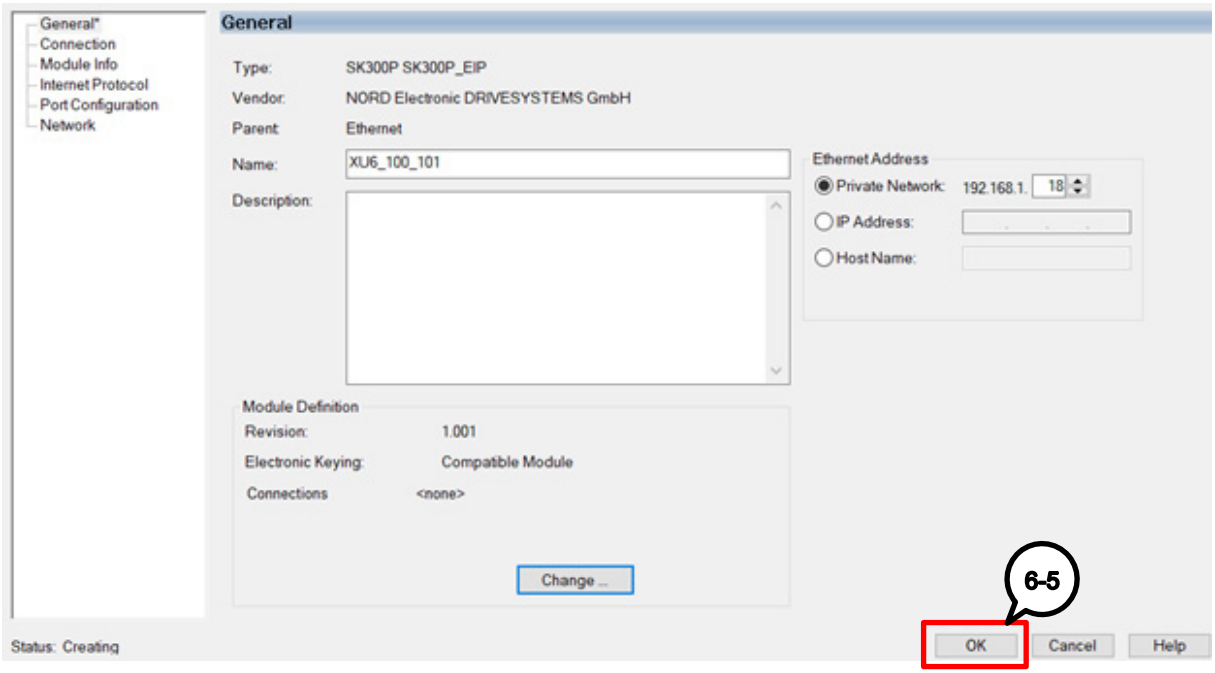

Figure 25: NORD_VFDcontrol_ON_Inst100_101 Hardware Configuration Step 6B

3.6.4 Parameters

This AOI provides detailed information about the signal statuses between the PLC and the frequency inverter.

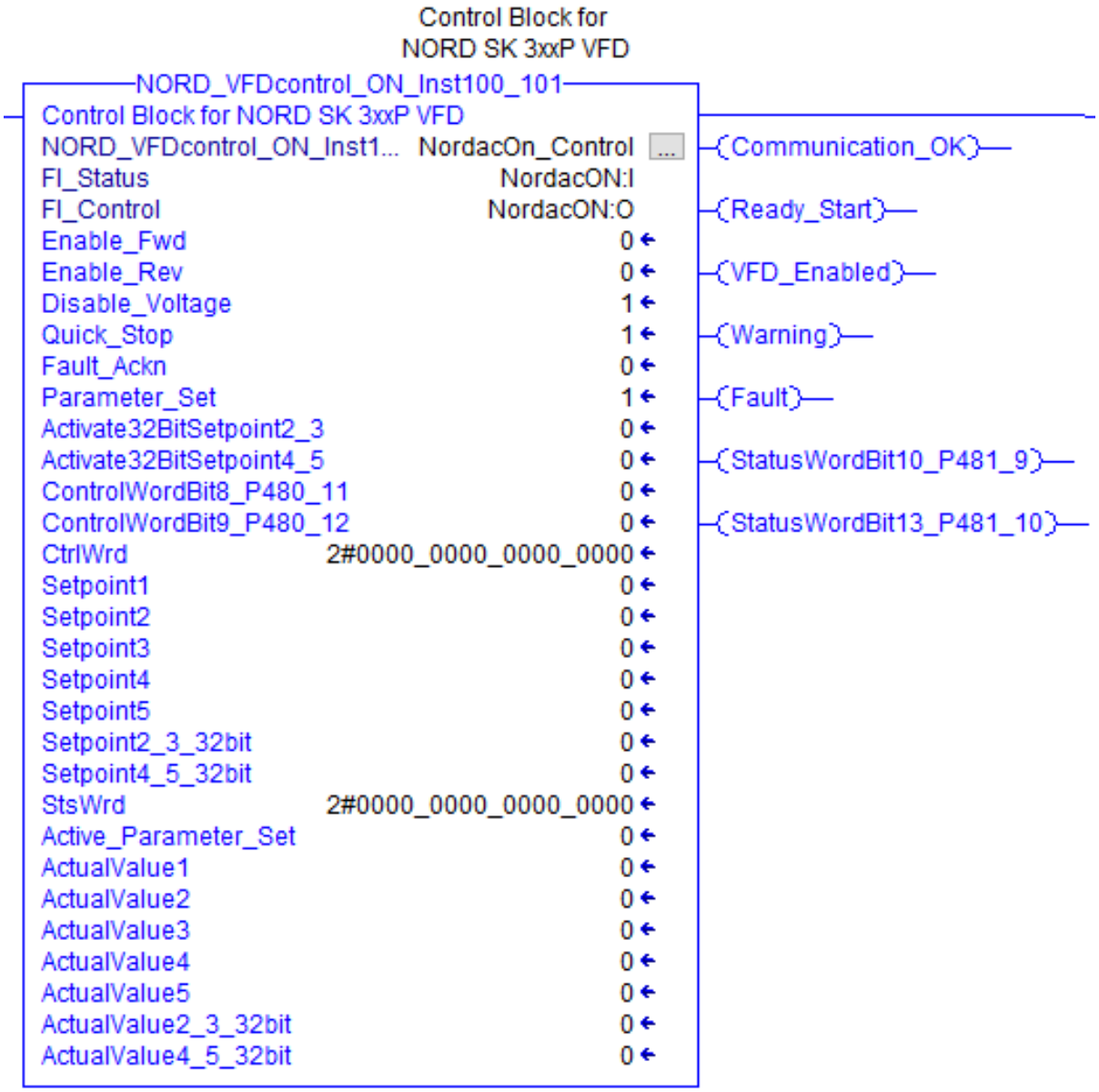

Figure 26: Process Module NORD_VFDcontrol_ON_Inst100_101

3.6.4.1 Input Parameters

Parameter name	Type	Description
FI_Status	-	Input map of the VFD's process data (Status from VFD via ethernet module)
FI_Control	-	Output map of the VFD's process data (Control of VFD via ethernet module)
Enable_FWD	BOOL	When TRUE, direction of rotation set to CW by default.
Enable_REV	BOOL	When TRUE, direction of rotation set to CCW.
Disable_Voltage	BOOL	When FALSE, output voltage is disabled; motor coasts to stop and inhibits subsequent enable.
		When TRUE, voltage is not disabled.

Parameter name	Type	Description
Quick_Stop	BOOL	When FALSE, motor ramps to stop (P426 = quick stop time) quickly. **Information** Care must be taken to ensure appropriate braking resistors are used to stop the motor in this time, or else the VFD will fault with an E005 Overvoltage UD fault during the braking sequence and coast to stop.
		When TRUE, quick stop not active.
Fault_Ackn	BOOL	RISING EDGE resets faults that are no longer active on the VFD. **Information** If a digital input has been programmed for the “ackn.fault” function, this bit must not be permanently set to 1 via the bus (otherwise, flank evaluation would be prevented).
Parameter_Set	SINT	Several parameters within the VFD have four parameter sets. By changing this variable, these settings can be accessed.
Activate32BitSetpoint2_3	BOOL	When FALSE, Setpoint2 and Setpoint3 are valid, while Setpoint2_3_32 is invalid (applications not requiring 32-bit positioning control).
		When TRUE, Setpoint2 and Setpoint3 are invalid, while Setpoint2_3_32 becomes valid. Setpoint2 and 3 are combined into a 32-bit position setpoint for positioning applications.
Activate32BitSetpoint4_5	BOOL	When FALSE, Setpoint4 and Setpoint5 are valid, while Setpoint4_5_32 is invalid (applications not requiring 32-bit positioning control).
		When TRUE, Setpoint4 and Setpoint5 are invalid, while Setpoint4_5_32 becomes valid. Setpoint4 and 5 are combined into a 32-bit position setpoint for positioning applications.
ControlWordBit8_P480_11	BOOL	For additional process data control, function of bit 8 in the Control Word can be programmed via P480[11].
ControlWordBit9_P480_12	BOOL	For additional process data control, function of bit 9 in the Control Word can be programmed via P480[12].
Setpoint1	INT	Function of Setpoint1 can be programmed in VFD parameters via P546[1]. **Information** For setpoint value standardization, please refer to “Section 8.7 Standardization of setpoint/target values” in the SK 5xxP manual (BU 0600).
Setpoint2	INT	Function of Setpoint2 can be programmed in VFD parameters via P546[2].
Setpoint3	INT	Function of Setpoint3 can be programmed in VFD parameters via P546[3].
Setpoint2_3_32	DINT	32bit version of Setpoint2 and 3. Used to set 32bits of position setpoint data.
Setpoint4_5_32	DINT	32bit version of Setpoint4 and 5. Used to set 32bits of position setpoint data.
Setpoint4	INT	Function of Setpoint4 can be programmed in VFD parameters via P546[4].
Setpoint5	INT	Function of Setpoint5 can be programmed in VFD parameters via P546[5].

Table Q: Input Parameters for NORD_VFDcontrol_ON_Inst100_101 AOI

3.6.4.2 Output Parameters

Parameter name	Type	Description
ControlWord_Read_Only	INT	Shows the control word for the drive. Changing this value in PLC does nothing to control the drive.
StatusWord	INT	Shows the status word from the drive. The “Communication_OK” bit must be high for this data to be valid.
Active_Parameter_Set	SINT	Displays the active parameter set.
ActualValue1	INT	Function for actual value 1 can be programmed in VFD parameters P543[1]. **Information** For actual value standardization, please refer to “Section 8.7 Standardization of setpoint/target values” in the SK 5xxP manual (BU 0600).
ActualValue2	INT	Function for Actual Value 2 can be programmed in VFD parameters P543[2].
ActualValue3	INT	Function for Actual Value 3 can be programmed in VFD parameters P543[3].
ActualValue2_3_32bit	DINT	32bit version of Actual Value 2 and 3. Used to read 32bits of actual position data.
ActualValue4_5_32bit	DINT	32bit version of Actual Value 4 and 5. Used to read 32bits of actual position data.
ActualValue4	INT	Function for Actual Value 4 can be programmed in VFD parameters P543[4].
ActualValue5	INT	Function for Actual Value 5 can be programmed in VFD parameters P543[5].
Communication_OK	BOOL	When TRUE, communication over network is OK.
Ready_Start	BOOL	When TRUE, VFD is in READY state.
VFDEnabled	BOOL	When TRUE, VFD is in RUNNING state and there is output voltage present.
Warning	BOOL	When TRUE, a warning is present. P700[2] contains warning code.
Fault	BOOL	When TRUE, an error/fault is present. P700[1] contains error code.
StatusWord_Bit10_P481_9	BOOL	Function of bit 10 in the Status Word can be programmed in P481[9] for additional status information.
StatusWord_Bit13_P481_10	BOOL	Function of bit 13 in the Status Word can be programmed in P481[10] for additional status information.

Table R: Output Parameters for NORD_VFDcontrol_ON_Inst100_101 AOI

4 Parameter modules

The parameter modules are used to read out parameter values from the frequency inverters or to write values into them. Access to all parameters of the bus interface and the connected frequency inverters is via Explicit Messaging.

The parameters for the bus module and the frequency inverters connected to it are accessed by varying the .DeviceType and .DeviceAddress variable as shown below in "Table S" and "Table T".

NORD Device	Value of .DeviceType
NORDAC BASE SK 180E … SK 190E	1
NORDAC FLEX SK 200E … SK 235E	2
NORDAC LINK SK 250E … SK 280E	3
NORDAC PRO SK 500E … SK 535E	4
NORDAC PRO SK 540E … SK 545E	5
NORDAC PRO SK 500P … SK 550P	6

Table S: Device Type Selection for Parameter_Read_CIP and Parameter_Write_CIP

.DeviceAddress Variable	Use			
	SK 1x0E	SK2xxE	SK 5xxE	SK 5xxP
0	SK CU4-ETH/ SK TU4-ETH	SK CU4-ETH/ SK TU4-ETH	SK TU3-EIP	--
1	SK 1x0E	SK 2xxE	SK 5xxE	SK 550P & SK XU5-EIP
2	SK 1x0E	SK 2xxE	SK 5xxE	5xxP
3	SK 1x0E	SK 2xxE	SK 5xxE	5xxP
4	SK 1x0E	SK 2xxE	SK 5xxE	5xxP
5	--	--	SK 5xxE	5xxP
6	--	--	SK 5xxE	5xxP
7	--	--	SK 5xxE	5xxP
8	--	--	SK 5xxE	5xxP

Table T: Device Address Selection for Parameter_Read_CIP and Parameter_Write_CIP

If a CU4-ETH/TU4-ETH module is being used as the communication interface, up to four (4) inverter addresses are available in addition to the EtherNet/IP® interface.

If a TU3-EIP module is being used as the communication interface, up to eight (8) inverter addresses are available. Having multiple 5xxE inverters on a Systembus network requires all inverters on NORD-Systembus to have embedded CAN/CANopen on board (SK 511E and higher).

Lastly, when using the embedded ethernet interface on the SK 550P, there is no device address zero (0) available for the EtherNet/IP® parameters. Those parameters are included in the parameter structure of the SK 550P which the user is connected to. The first inverter in a 5xxP Systembus network receiving commands over ethernet must be the 550P.

4.1 Parameter_Read_CIP

4.1.1 Task

This Add On Instruction (AOI) instance can be called up in continuous, periodic, or event tasks of the program.

The AOI requires the instance block “Parameter_Read_CIP”. Access to the specific frequency inverter is via the EtherNet/IP® module’s IP Address and frequency inverter’s Device Address. The IP address is explicitly specified during the hardware configuration. Specification is performed separately for each EtherNet/IP® network node.

The function module is used to read out a parameter from a frequency inverter, taking into account the

- Device Address
- Parameter Number
- Parameter Set Number (if the parameter also depends on the parameter set)
- Index (if the parameter has a format of an index or array parameter)

Information **Parameter Formats**

For details of the parameter structure, please refer to the manual for the frequency inverter.

4.1.2 Use

Frequency inverter	SK 550P, SK 5xxE, SK 2xxE, SK 1x0E, LINK
Fieldbus Protocol	EtherNet/IP®
Control	ControlLogix®
	CompactLogix™

4.1.3 Hardware Configuration

This section defines the message configuration and communication.

- Message Type = CIP® Generic
- Service Type = Get Attribute Single
- Service Code = e
- Instance = 0 (Will be defined by Parameter_Read_CIP instance in function block)
- Class = 0 (Will be defined by Parameter_Read_CIP instance in function block)
- Attribute = 0 (Will be defined by Parameter_Read_CIP instance in function block)
- Destination Element = “Parameter_Read_CIP”.Value

The following hardware and message configuration example follows the setup for a previously created and defined TU3-EIP module.

1. Define instances for “Parameter_Read_CIP” and “MSGConfig” in the Parameter_Read_CIP add-on-instruction. Note that the “MSGConfig” instance needs to be defined as the data type MESSAGE. Then click on the configuration icon next to the MSGConfig instance.

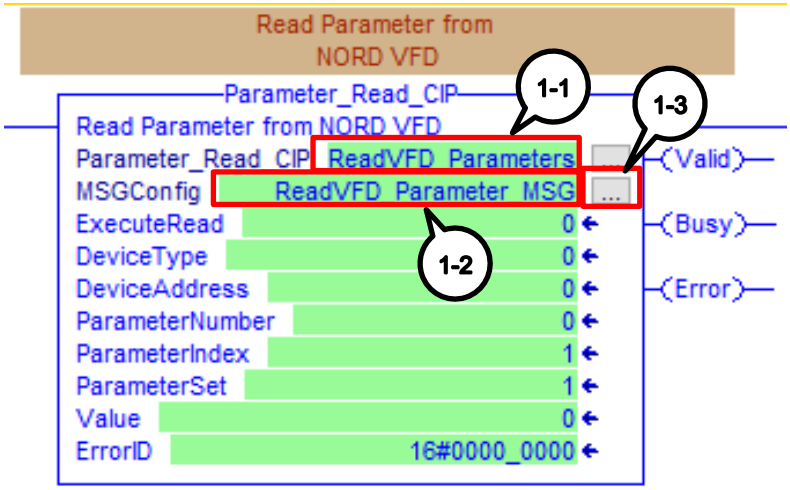

Figure 27: Parameter_Read_CIP Hardware Configuration Step 1

2. Define the Configuration tab with the following characteristics. In Step 2-5 set the “Destination Element” to the .Value tag of the Parameter_Read_CIP instance created in Step 1-1. Then go to the Communication tab.

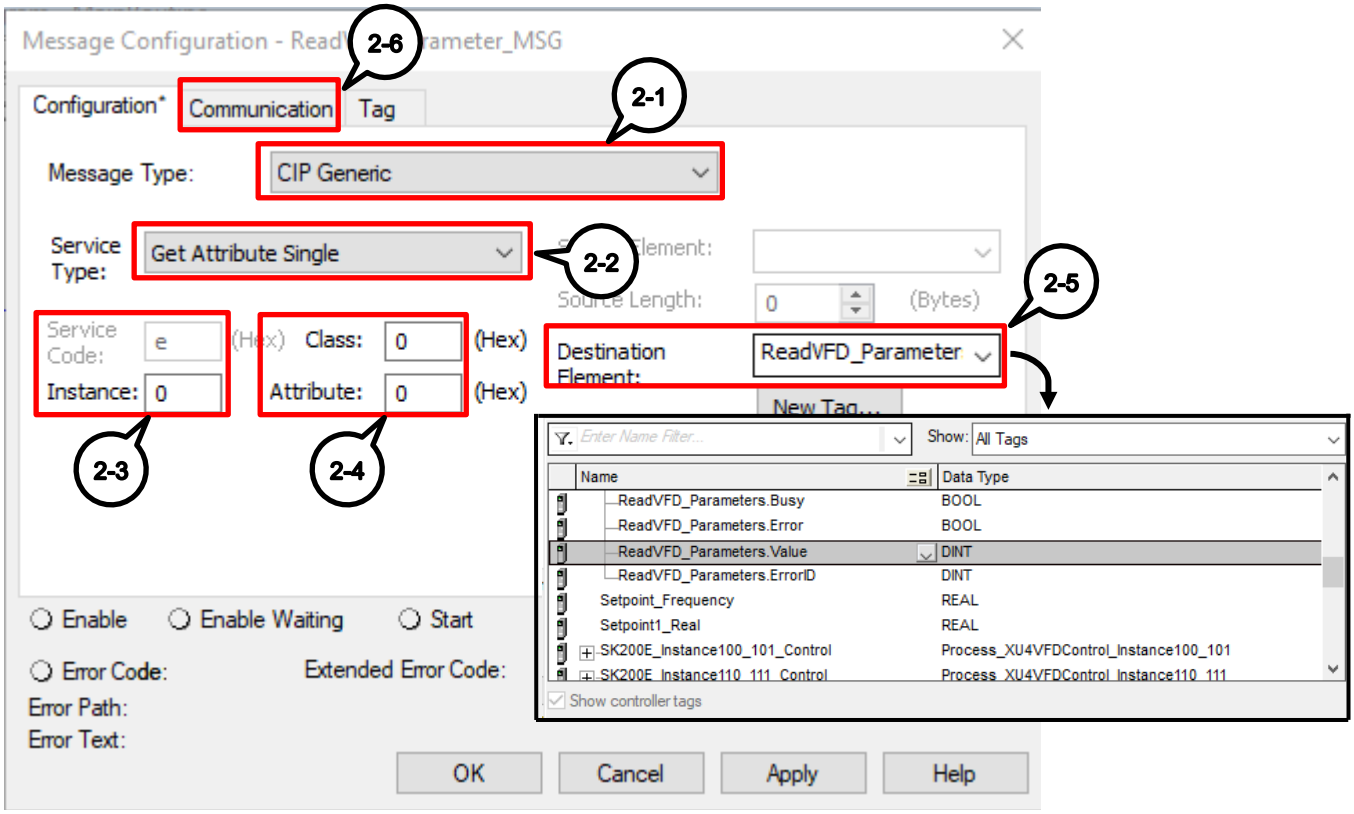

Figure 28: Parameter_Read_CIP Hardware Configuration Step 2

3. In the Communication tab, click on “Browse” to find the ethernet node with which the explicit read instance will be accessing. The Ethernet module needs to be created and configured (Section 3 "Process modules") before it can be selected in the “Message Path Browser”. Once the correct module is selected, press “Apply” and then “OK”. Alternatively, the IP address can be manually entered in “Path:”.

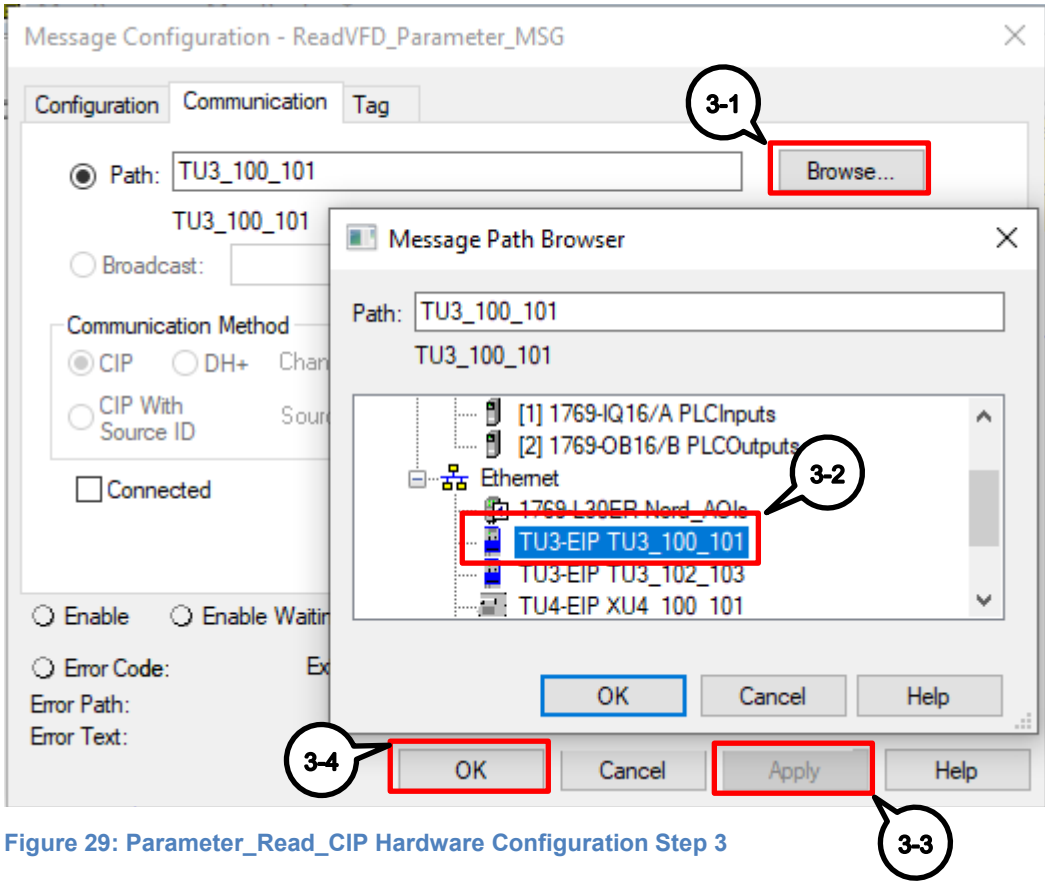

Figure 29: Parameter_Read_CIP Hardware Configuration Step 3

4.1.4 Parameters

This AOI is intended to read out values from the frequency inverter. A trigger is necessary to execute the Add On Instruction on its rising edge. An example trigger is shown below with the Parameter_Read_CIP Add On Instruction.

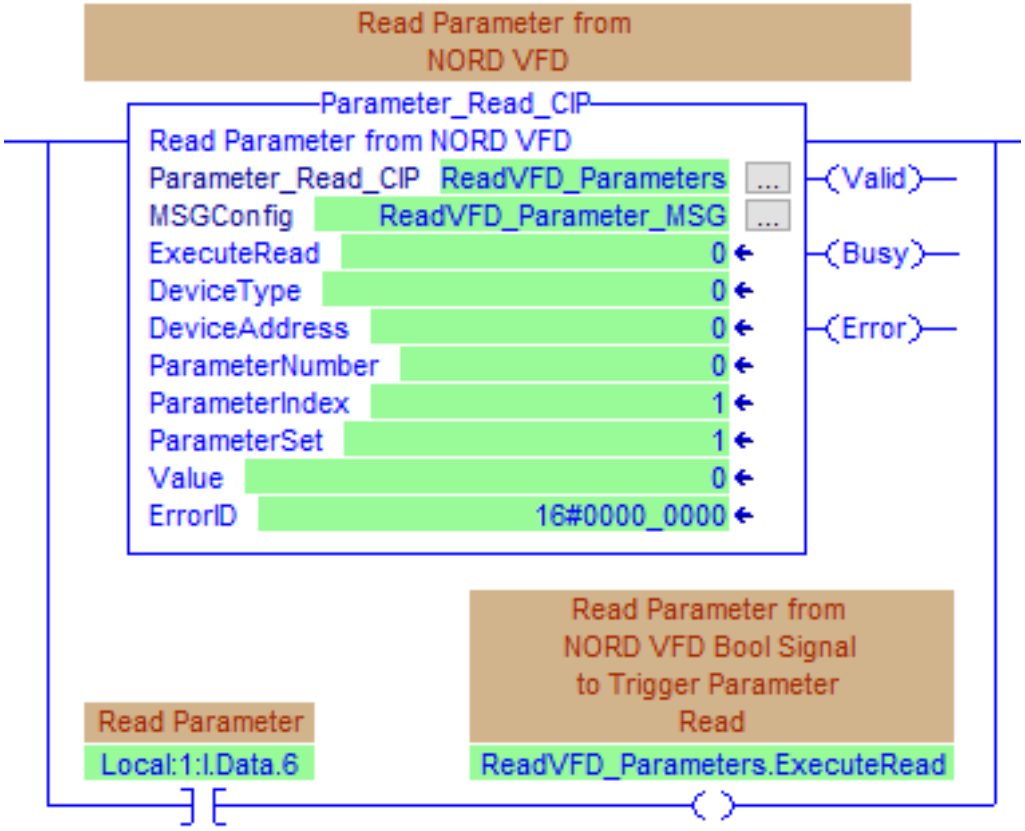

Figure 30: Parameter Module Parameter_Read_CIP

4.1.4.1 Input Parameters

Variable	Type	Description
Parameter_Read_CIP	Parameter_Read_CIP	An instance of this AOI must be defined for use within the program.
MSGConfig	MESSAGE	Message instruction instance mapping is initially configured in 4.1.3 "Hardware Configuration".
ExecuteRead	BOOL	Messaging begins at the **RISING EDGE** transition of this variable.
DeviceType	SINT	Follow instructions in "Table S"(Section 4 "Parameter modules") to determine device type.
DeviceAddress	DINT	Follow instructions in "Table T" (Section 4 "Parameter modules") to determine device address.
ParameterNumber	DINT	Enter the parameter number to be read.

Variable	Type	Description
ParameterIndex	DINT	If ParameterNumber is an array parameter with multiple indexes, this value can be changed to read the value of a specific index. All NORD VFD parameter indexes begin at 1. Default value is 1. If ParameterNumber is a parameter that does not contain an array, this value may revert to its default. (Section 4.1.5 "Examples") **Information** For details of the parameter structure, please refer to the manual for the frequency inverter.
ParameterSet	DINT	If ParameterNumber is a parameter with multiple parameter sets, this value can be changed to read the value of a specific parameter set. All NORD VFD parameter sets begin at 1. Default value is 1. If ParameterNumber is a parameter that does not have multiple parameter sets, this value may revert to its default. (Section 4.1.5 "Examples") **Information** For details of the parameter structure, please refer to the manual for the frequency inverter.

Table U: Input Parameters for Parameter_Read_CIP AOI

4.1.4.2 Output Parameters

Variable	Type	Description
Value	DINT	This is the value read from the NORD VFD parameter. Range and format depend on the allowable resolution for each parameter. (Section 4.1.5 "Examples") **Information** For details of the parameter structure, please refer to the manual for the frequency inverter.
ErrorID	DINT	This variable shows the error code when the message instruction is not executed and the Error status bit is TRUE.
Valid	BOOL	When **TRUE**, Message is successful.
Busy	BOOL	When **TRUE**, Messaging process has started and still not complete.
Error	BOOL	When **TRUE**, Message was not sent and there was an error.

Table V: Output Parameters for Parameter_Read_CIP AOI

4.1.5 Examples

Read a value of 3.53 seconds from parameter set 3 of P102 on the first VFD.

Parameter 102 has 4 parameter sets and no array indexing. Refer to the specific VFD's manual for more information.

- DeviceAddress: 1
- ParameterNumber: 102
- ParameterIndex: 1
- ParameterSet: 3

Value will read "353". This parameter has a resolution of 2 decimal places. The .Valid bit will be TRUE once the parameter has been successfully read.

Read the current fault code of 4.1 from P700 on the first VFD.

Parameter 700 has 3 indexes. The current fault is in the first index. When the error 4.1 is active, the "Overcurrent Measurement" error is apparent which is described in the specific VFD's manual.

- DeviceAddress: 1
- ParameterNumber: 700
- ParameterIndex: 1
- ParameterSet: 1

Value will read "41". This parameter has a resolution of 1 decimal place. The .Valid bit will be TRUE once the parameter has been successfully read.

Read a value of 48.3 Hz from 12th index of the Fixed Frequency Array (465[12]) on the third VFD.

Parameter 465 has 31 indexes and does not have multiple parameter sets. Refer to the specific VFD's manual for more information.

- DeviceAddress: 3
- ParameterNumber: 465
- ParameterIndex: 12
- ParameterSet: 1

Value will read "483". This parameter array index has a resolution of 1 decimal place. The .Valid bit will be TRUE once the parameter has been successfully read.

Read the default function of P400[2] for parameter set 3 on the second VFD.

Note: This case specifically refers to an SK 2x5E VFD. Parameter 400 on an SK 2x5E has 9 indexes and each index has 4 parameter sets. Refer to the specific VFD's manual for more information.

- DeviceAddress: 2
- ParameterNumber: 400
- ParameterIndex: 2
- ParameterSet: 3

Value will read "15". This parameter has a resolution of 0 decimal places. Function 15 is the default value for this parameter number, index, and set. The .Valid bit will be TRUE once this parameter has been successfully read.

4.2 Parameter_Write_CIP

4.2.1 Task

This Add On Instruction (AOI) instance can be called up in continuous, periodic, or event tasks of the program.

The AOI requires the instance block “Parameter_Write_CIP”. Access to the specific frequency inverter is via the EtherNet/IP® module’s IP Address and frequency inverter’s Device Address. The IP address is explicitly specified during the hardware configuration. Specification is performed separately for each EtherNet/IP® network node.

The function module is used to write to a parameter of a frequency inverter, taking into account the

- Device Address
- Parameter Number
- Parameter Set Number (if the parameter also depends on the parameter set)
- Index (if the parameter has a format of an index or array parameter)

The function module can only write to parameters which allow write access.

Information

For details of the parameter structure, please refer to the manual for the frequency inverter.

4.2.2 Use

Frequency inverter	SK 550P, SK 5xxE, SK 2xxE, SK 1x0E, LINK
Fieldbus Protocol	EtherNet/IP®
Control	ControlLogix®
	CompactLogix™

4.2.3 Hardware configuration

This section defines the message configuration and communication.

- Message Type = CIP® Generic
- Service Type = Custom
- Service Code = 10
- Instance = 0 (Will be defined by Parameter_Write_CIP instance in function block)
- Class = 0 (Will be defined by Parameter_Write_CIP instance in function block)
- Attribute = 0 (Will be defined by Parameter_Write_CIP instance in function block)
- Source Element = “Parameter_Write_CIP”.Value
- Destination Element = “Parameter_Write_CIP”.ReturnValue

The following hardware and message configuration example follows the setup for a previously created and defined TU3-EIP module.

1. Define instances for “Parameter_Write_CIP” and “MSGConfig” in the Parameter_Write_CIP AOI. Note that the “MSGConfig” instance needs to be defined as the data type MESSAGE. Then click on the configuration icon next to the MSGConfig instance.

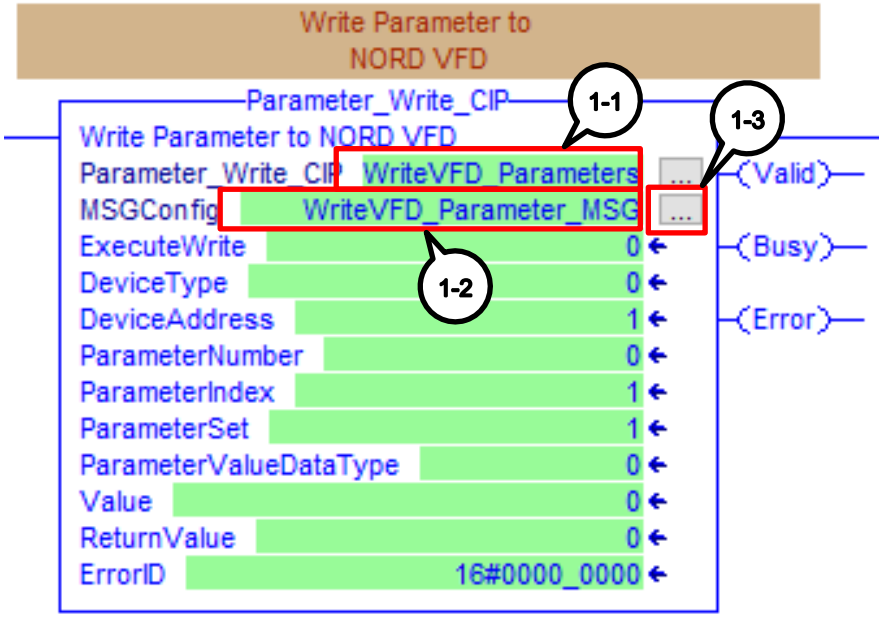

Figure 31: Parameter_Write_CIP Hardware Configuration Step 1

2. Define the Configuration tab with the following characteristics. Set the “Source Element” to the .Value tag of the Parameter_Write_CIP instance that was created in Step 1-1. Set the “Destination Element” to the .ReturnValue tag of the same Parameter_Write_CIP instance. Then go to the Communication tab.

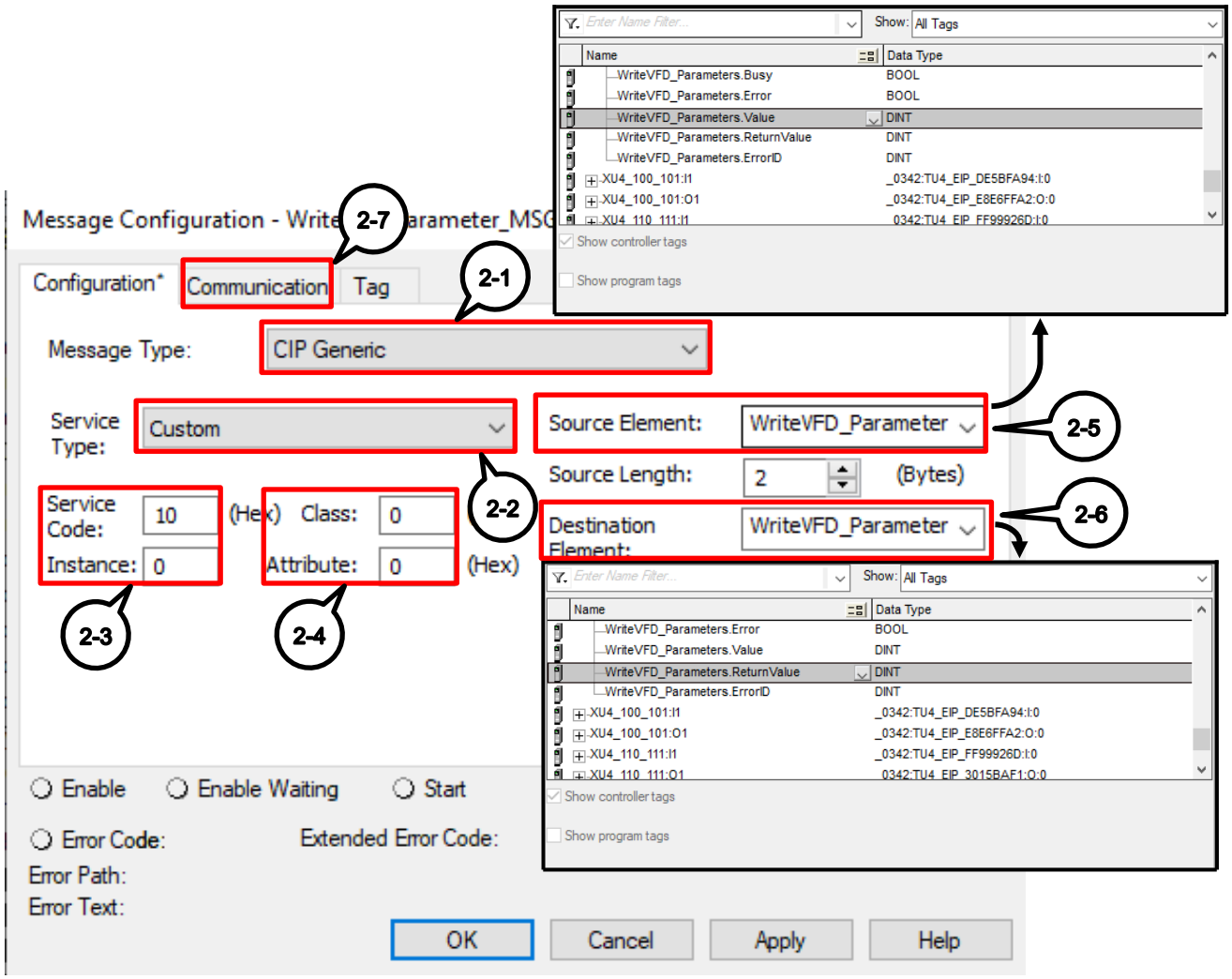

Figure 32: Parameter_Write_CIP Hardware Configuration Step 2

3. In the Communication tab, click on “Browse” to find the ethernet node with which the explicit read instance will be accessing. The Ethernet module needs to be created and configured (Section 3 "Process modules") before it can be selected in the “Message Path Browser”. Once the correct module is selected, press “Apply” and then “OK”. Alternatively, the IP address can be manually entered in “Path:”.

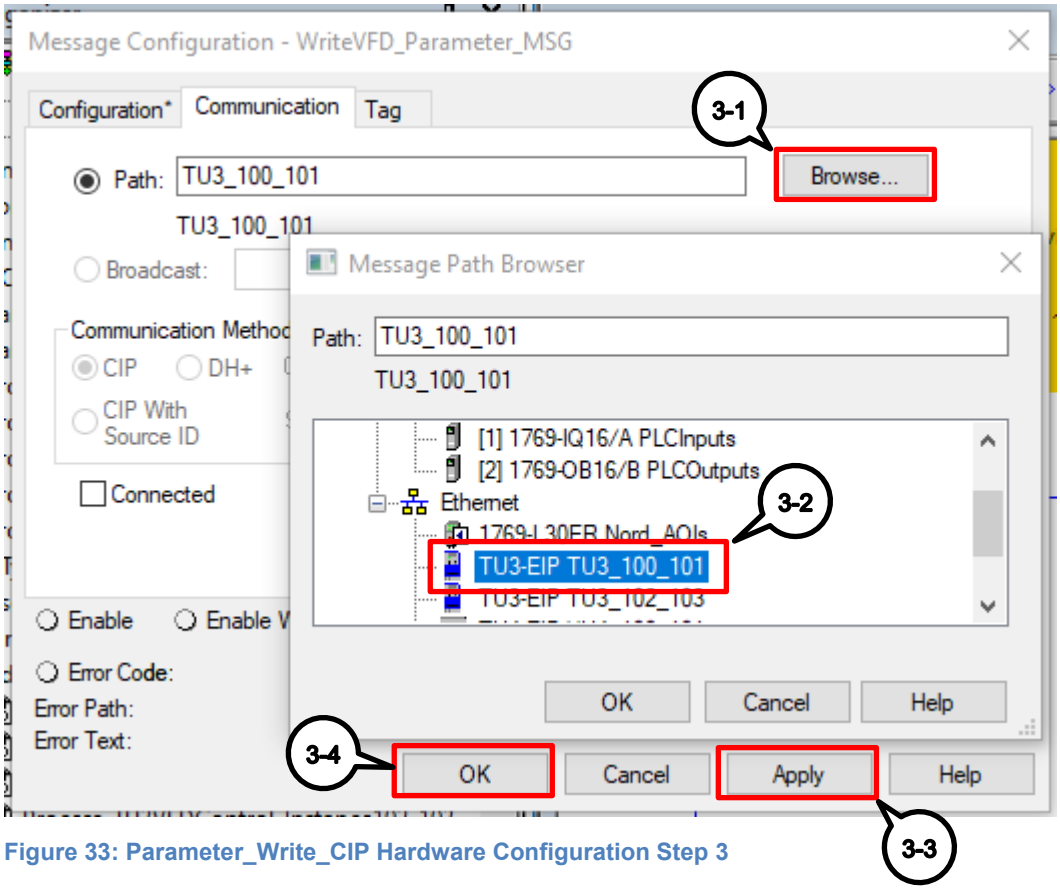

Figure 33: Parameter_Write_CIP Hardware Configuration Step 3

4.2.4 Parameters

This AOI is intended to write to values in the frequency inverter. A trigger is necessary to execute the AOI on its rising edge. An example trigger is shown below with the Parameter_Write_CIP AOI.

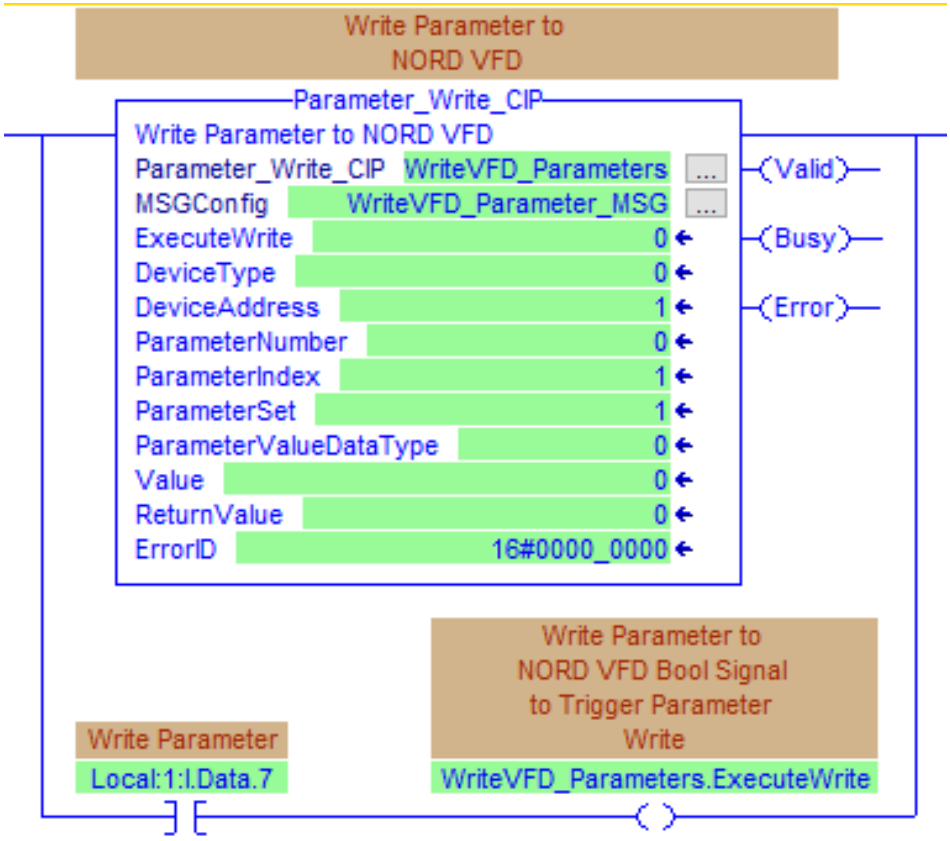

Figure 34: Parameter_Write_CIP Hardware Configuration Step 3

4.2.4.1 Input Parameters

Variable	Type	Description
Parameter_Write_CIP	Parameter_Write_CIP	An instance of this AOI must be defined for use within the program.
MSGConfig	MESSAGE	Message instruction instance mapping is initially configured in Section 4.2.3 "Hardware configuration")
ExecuteWrite	BOOL	Messaging begins at the **RISING EDGE** transition of this variable.
DeviceType	SINT	Follow instructions in "Table S"(Section 4 "Parameter modules") to determine device address.
DeviceAddress	DINT	Follow instructions in "Table T"(Section 4 "Parameter modules") to determine device address.
ParameterNumber	DINT	Enter the parameter number to be read.

Variable	Type	Description
ParameterIndex	DINT	If ParameterNumber is an array parameter with multiple indexes, this value can be changed to read the value of a specific index. All NORD VFD parameter indexes begin at 1. Default value is 1. If ParameterNumber is a parameter that does not contain an array, this value may revert to its default. (Section 4.2.5 "Examples") **Information** For details of the parameter structure, please refer to the manual for the frequency inverter.
ParameterSet	DINT	If ParameterNumber is a parameter with multiple parameter sets, this value can be changed to read the value of a specific parameter set. All NORD VFD parameter sets begin at 1. Default value is 1. If ParameterNumber is a parameter that does not have multiple parameter sets, this value may revert to its default. (Section 4.2.5 "Examples") **Information** For details of the parameter structure, please refer to the manual for the frequency inverter.
Value	DINT	This is the value written to the NORD VFD parameter. Range and format depend on the allowable resolution for each parameter. (Section 4.2.5 "Examples") **Information** For details of the parameter structure, please refer to the manual for the frequency inverter.

Table W: Input Parameters for Parameter_Write_CIP AOI

4.2.4.2 Output Parameters

Variable	Type	Description
ReturnValue	DINT	This will be the same as .Value if the explicit write message is successful. It will be the data read back after the explicit write has completed.
ErrorID	DINT	This variable shows the error code when the message instruction is not executed and the Error status bit is TRUE.
Valid	BOOL	When **TRUE**, Message is successful.
Busy	BOOL	When **TRUE**, Messaging process has started and still not complete.
Error	BOOL	When **TRUE**, Message was not sent and there was an error.

Table X: Output Parameters for Parameter_Write_CIP AOI

4.2.5 Examples

Write a value of 3.5 seconds to parameter set 3 of P102 on the first VFD.

Parameter 102 has 4 parameter sets but is not an array parameter. Refer to the specific VFD's manual for more information.

- DeviceAddress: 1
- ParameterNumber: 102
- ParameterIndex: 1
- ParameterSet: 3

Value: 350 – Resolution of P102 is 2 decimal places.

ReturnValue will read "350" once the parameter has been successfully written to and the .Valid bit is TRUE for 1 program cycle.

Change function of Digital Input 2 (P420[2]) to Fixed Frequency 1 for the third VFD.

Note: This case specifically refers to an SK 2xxE VFD. The Fixed Frequency 1 function is denoted as a value of four (4). Write the value 4 to P420[2] on the third VFD. P420 has four (4) array indexes but does not have multiple parameter sets. Refer to the specific VFD's manual for more information.

- DeviceAddress: 3
- ParameterNumber: 420
- ParameterIndex: 2
- ParameterSet: 1

Value = 4

ReturnValue will read "4" once the parameter has been successfully written to and the .Valid bit is TRUE for 1 program cycle.

Change function of Analog Input 2 P400[2] within parameter set three to Maximum Frequency on the second VFD.

Note: This case specifically refers to an SK 2x0E VFD. The Maximum Frequency function is denoted as a value of five (5). Write a value of 5 to P400[2] for parameter set three on the second VFD. This parameter has 9 indexes and 4 parameter sets for each array index. Refer to the specific VFD's manual for more information.

- DeviceAddress: 2
- ParameterNumber: 400
- ParameterIndex: 2
- ParameterSet: 3

Value = 5

ReturnValue will read "5" once the parameter has been successfully written to and the .Valid bit is TRUE for 1 program cycle.

4.3 NORD_ADC

4.3.1 Task

The NORD_ADC Add-On Instruction (AOI) is designed to manage explicit messages to a Nord device. The messages can be used to read or write to specific parameters. Additionally, the AOI has a built in 'Automatic Device Configurator' scheme to back up the current parameters of a drive and the option to restore a backup file to the drive.

4.3.2 Use

Frequency inverter	SK 550P, SK 5xxE, SK 3xxP, SK 2xxE, SK 1x0E, LINK
Fieldbus Protocol	EtherNet/IP®
Control	ControlLogix®
	CompactLogix™

4.3.3 Hardware configuration with Excel tool

The NORD_ADC_AOI_Setup.xlsm excel tool provides a quick and simple way to integrate the NORD_ADC AOI into a studio 5000 program with all tags created and linked properly.

1. Open the "NORD_ADC_AOI_Setup.xlsm" Excel Tool.
2. Create tag names for the:
   - AOI Tag,
   - Parameter Backup Tag,
   - Read Message Tag,
   - Write Message Tag.

   Enter in the Module Name. The name should be the exact name in the Studio 5000 'I/O Configuration' Tree. Select the device type. Click on the 'Create Tags/Logic' button. ASCII text PLC Rungs will be created in column 'E'. Repeat the step as many times as necessary.

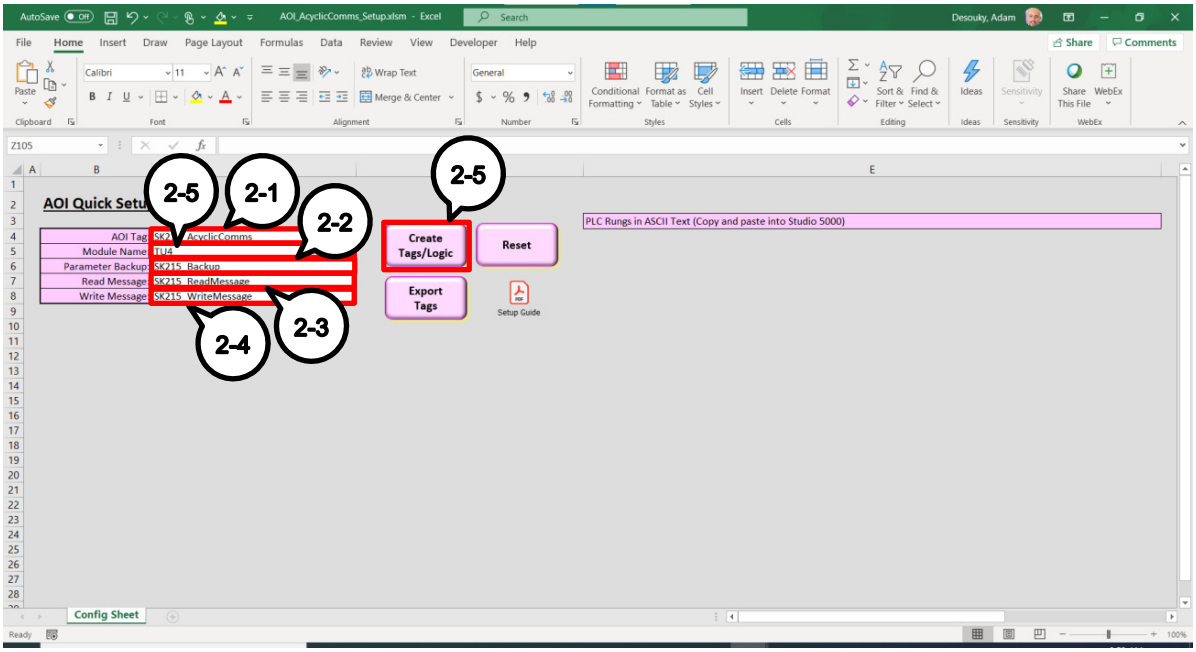

Figure 35: Create tags

3. Click on the “Export Tags” button. Save the file as a ‘.CSV’. Copy the ASCII text PLC Rungs (Column ‘E’) created in step 2 for use in step 4.

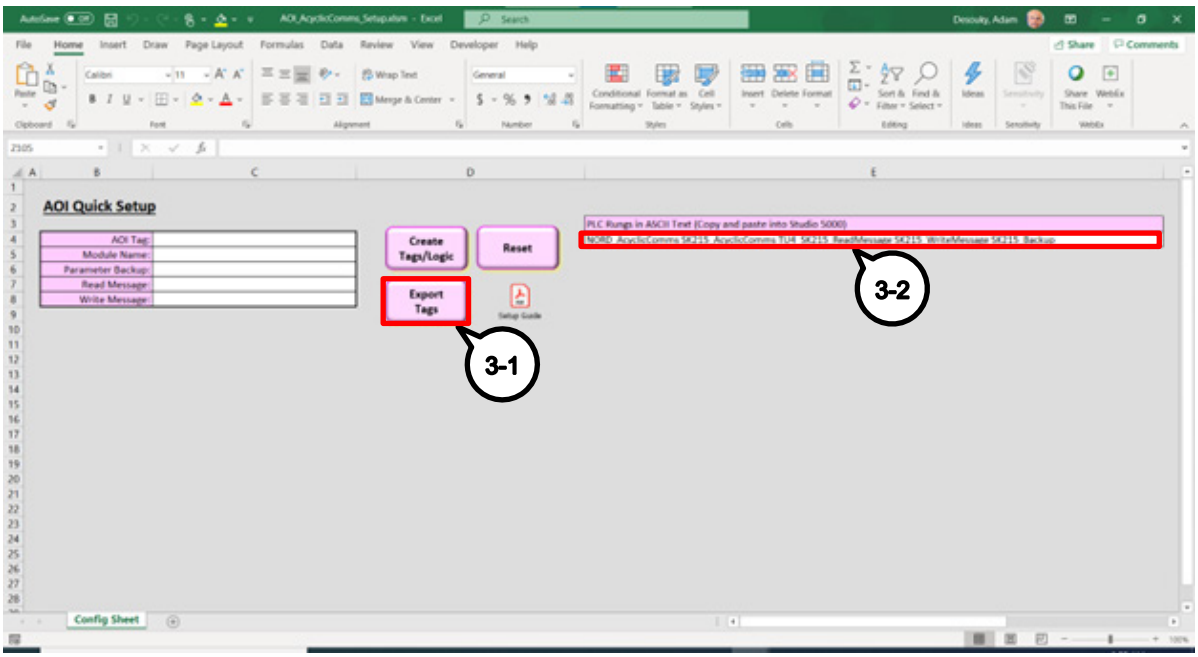

Figure 36: Export tags and PLC Rungs

Information

Pressing the “Reset” button will remove the created PLC Rungs and delete all currently stored PLC Tags. Double-clicking the “Setup Guide” will bring up this document.

4. Create the PLC Rung of code: Double-click on an empty rung. Verify that it is set for “In ASCII Text”. Paste the PLC Rungs in ASCII Text copied Step 3 above. Click the ✓ or press enter.

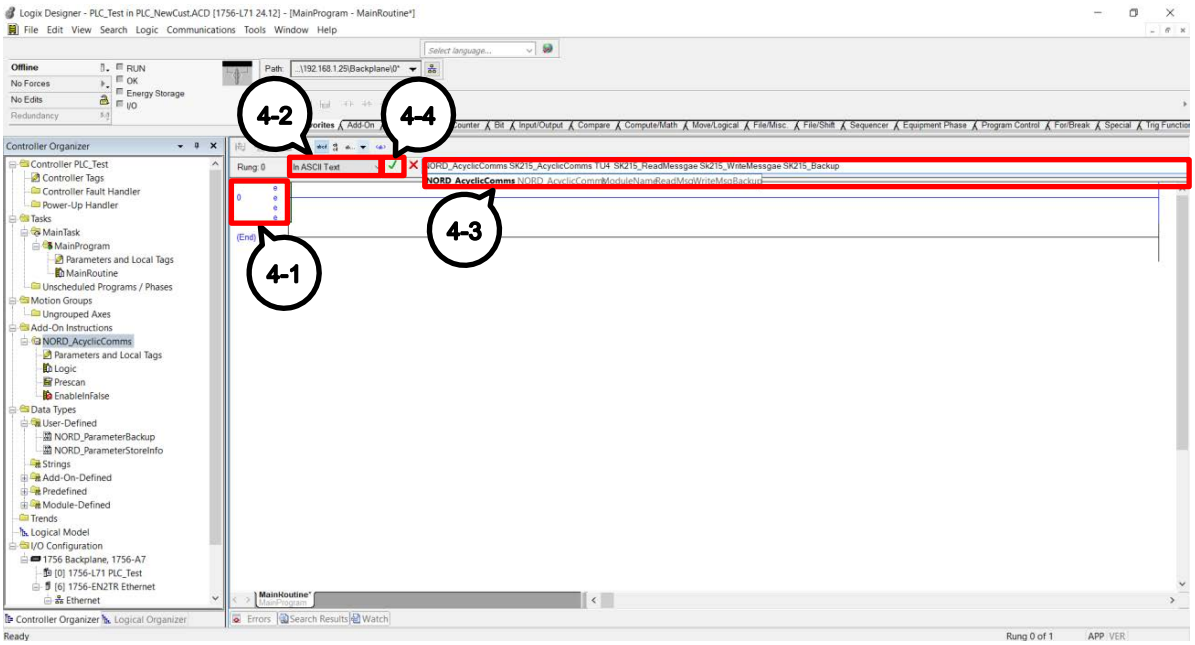

Figure 37: Create PLC Rungs

Information

The rung will have errors if the tags have not been imported yet. See step 5.

5. Import tags: Click ‘Tools>Import>Tags and Logic Components’. Select the file exported in Step 3 above. Click “Import”

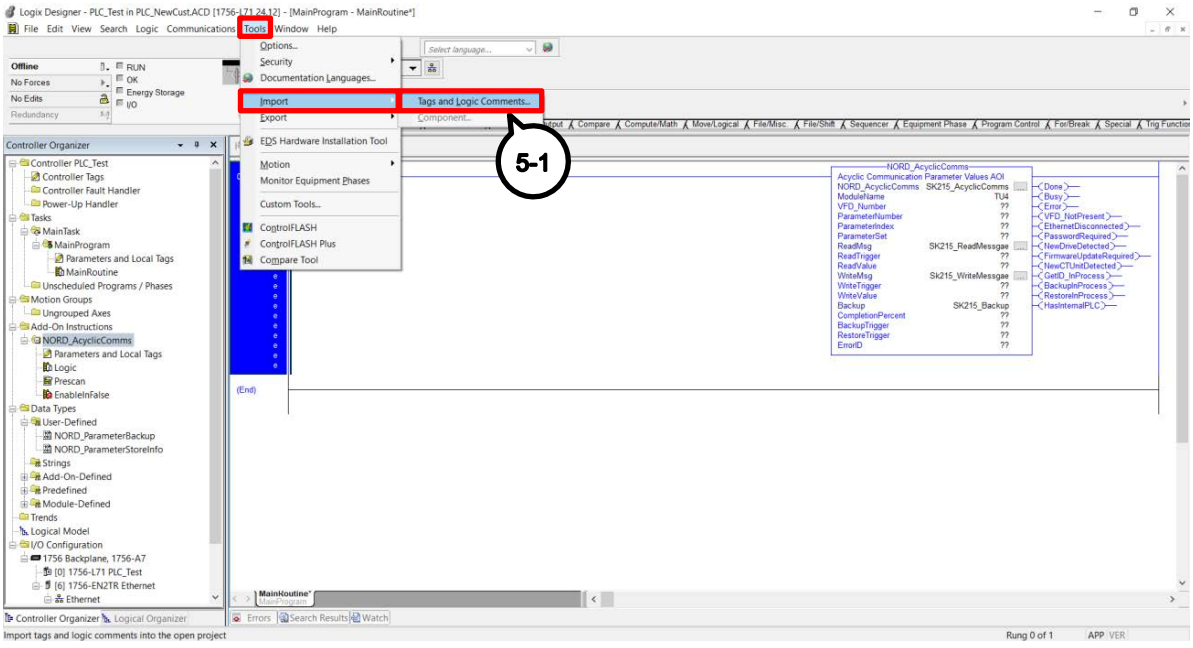

Figure 38: Import tags

4.3.4 Manual Hardware Configuration

This section defines the message configuration and communication.

- Message Type = CIP® Generic
- Service Type = Custom
- Service Code = e
- Source Length = 0
- Class = 0 (Get set within the AOI)
- Attribute = 0 (Get set within the AOI)
- Instance = 0 (Get set within the AOI)
- Destination Element = “AOI_TagName.ReadValue” (AOI_TagName is the tag created for ‘NORD_ADC’)

The following hardware and message configuration example follows the setup for a previously created and defined TU4 module.

1. Create a unique tag for ‘NORD_ADC’. Select the Module that this AOI is to communicate with. Create a unique tag for ‘ReadMsg’. Create a unique tag for ‘WriteMsg’. Create a unique tag for ‘ParameterBackup’.

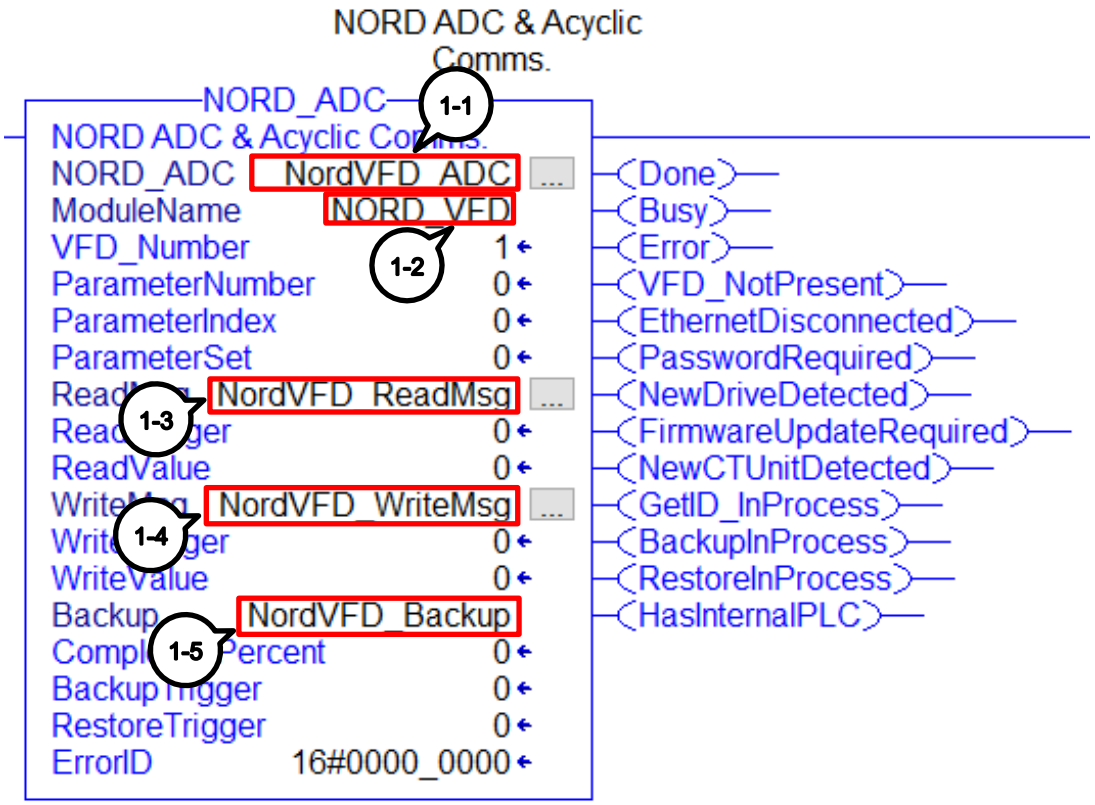

Figure 39: NORD_ADC Hardware Configuration Step 1

2. Click on the ‘…’ next to the ReadMSG instance to bring up the ‘Message Configuration’ window. Define the Configuration tab with the following characteristics. In Step 2-5 set the “Destination Element” to the .ReadValue tag of the NORD_ADC instance created in Step 1-1. Then go to the Communication tab.

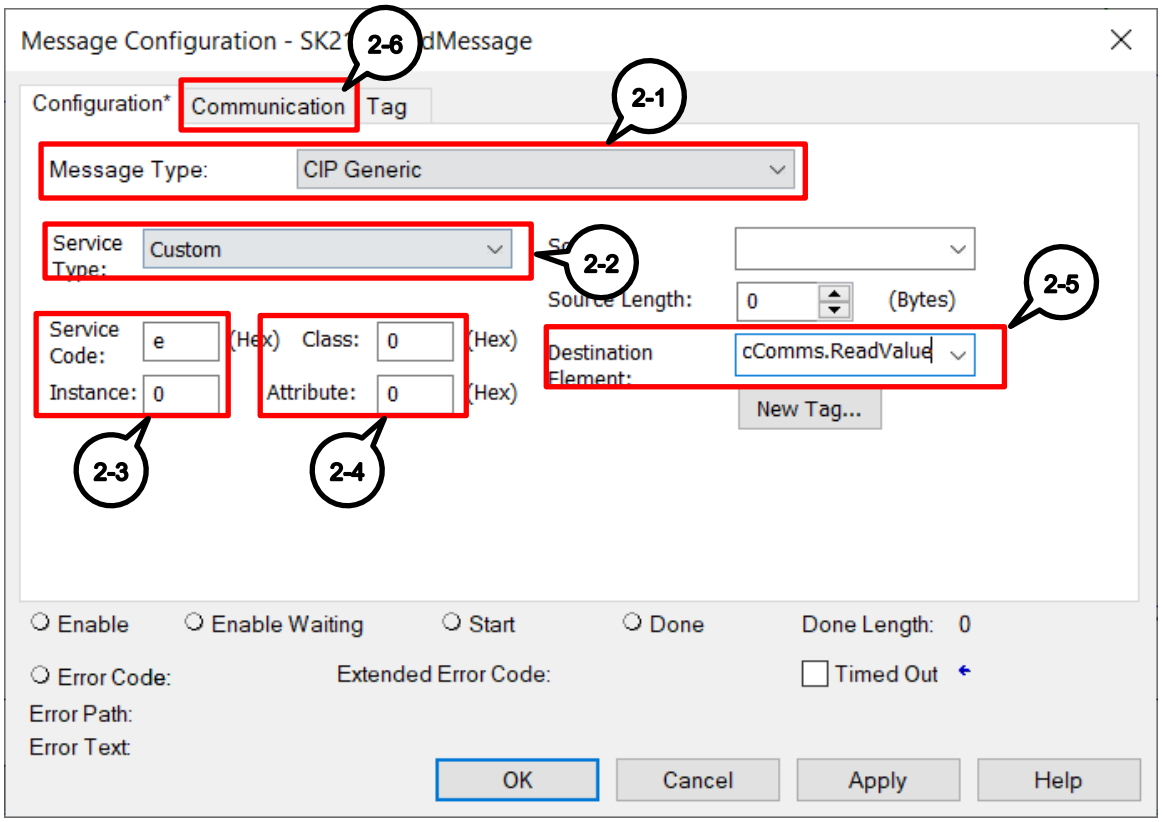

Figure 40: NORD_ADC Hardware Configuration Step 2

3. In the Communication tab, select the Module that this AOI is to communicate with. The Ethernet module needs to be created and configured (Section 3 "Process modules") before it can be selected in the “Message Path Browser”. Alternatively, the IP address can be manually entered in “Path:”. Once the correct module is selected, press “Apply” and then “OK”.

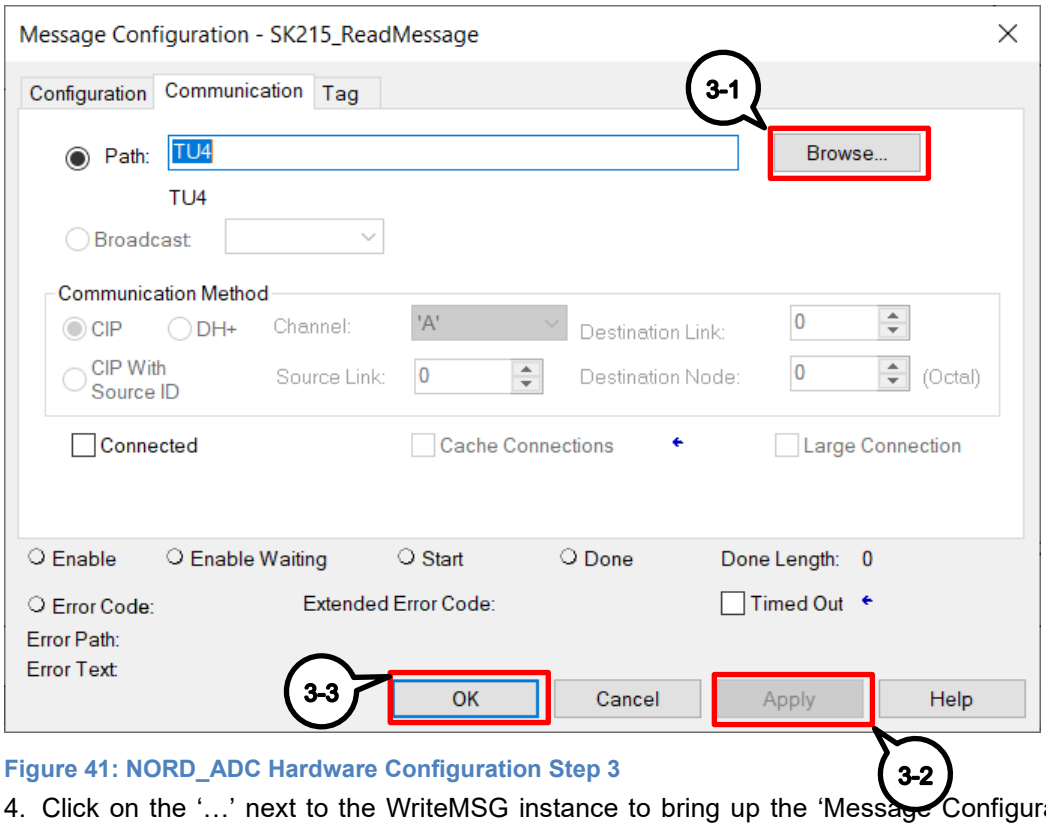

Figure 41: NORD_ADC Hardware Configuration Step 3

4. Click on the ‘…’ next to the WriteMSG instance to bring up the ‘Message Configuration’ window. Define the Configuration tab with the following characteristics. In Step 4-5 set the “Source” to the

.WriteValueMSG tag of the NORD_ADC instance created in Step 1-1. In Step 4-6 set the “Destination Element” to the .ReadValue tag of the NORD_ADC instance created in Step 1-1. Then go to the Communication tab.

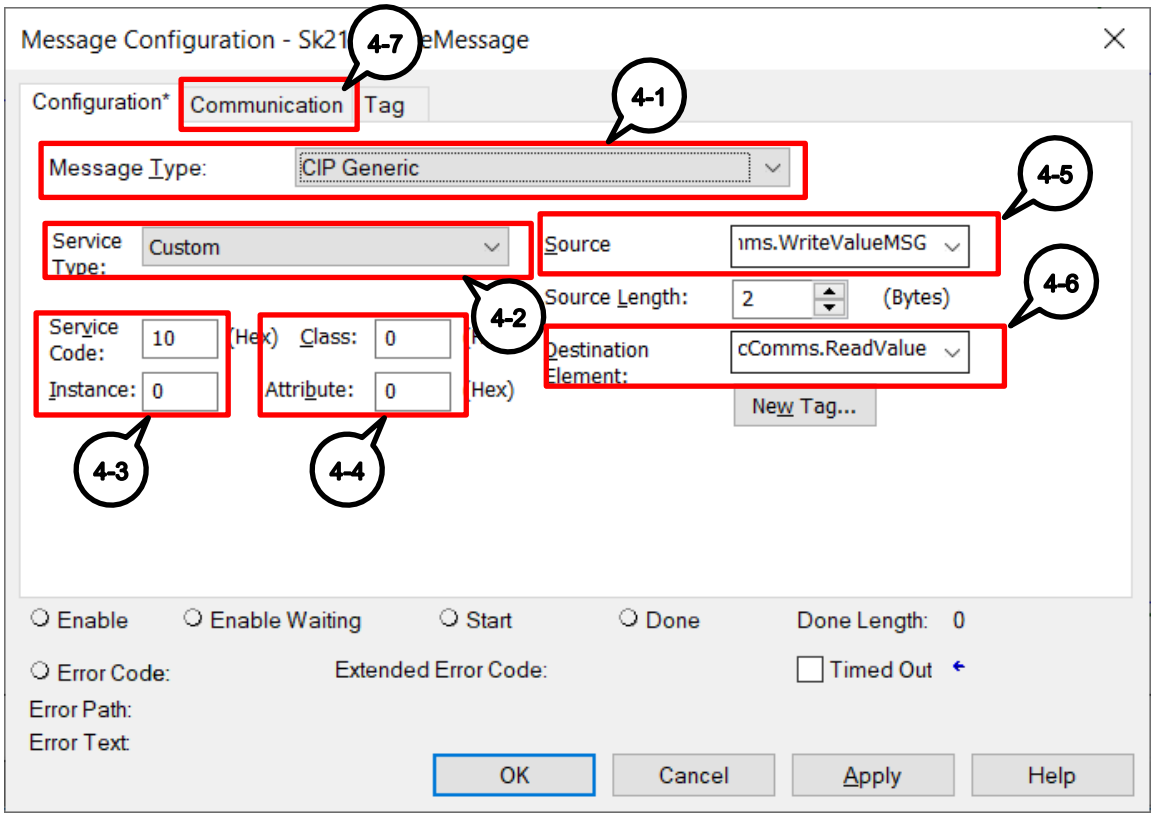

Figure 42: NORD_ADC Hardware Configuration Step 4

5. In the Communication tab, select the Module that this AOI is to communicate with. The Ethernet module needs to be created and configured (Section 3 "Process modules") before it can be selected in the “Message Path Browser”. Alternatively, the IP address can be manually entered in “Path:”. Once the correct module is selected, press “Apply” and then “OK”.

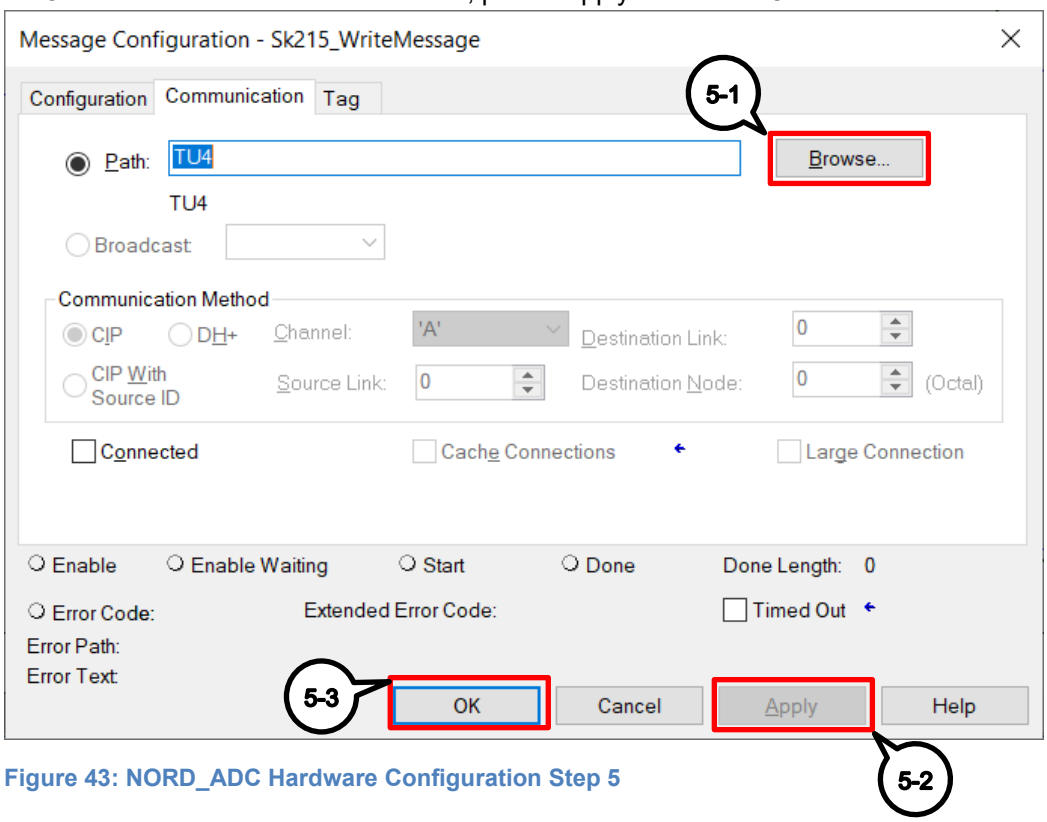

Figure 43: NORD_ADC Hardware Configuration Step 5

4.3.5 Parameters

This AOI is intended to read or write to specific parameters. Additionally, the AOI has a built in 'Automatic Device Configurator' scheme to back up the current parameters of a drive and the option to restore a backup file to the drive.

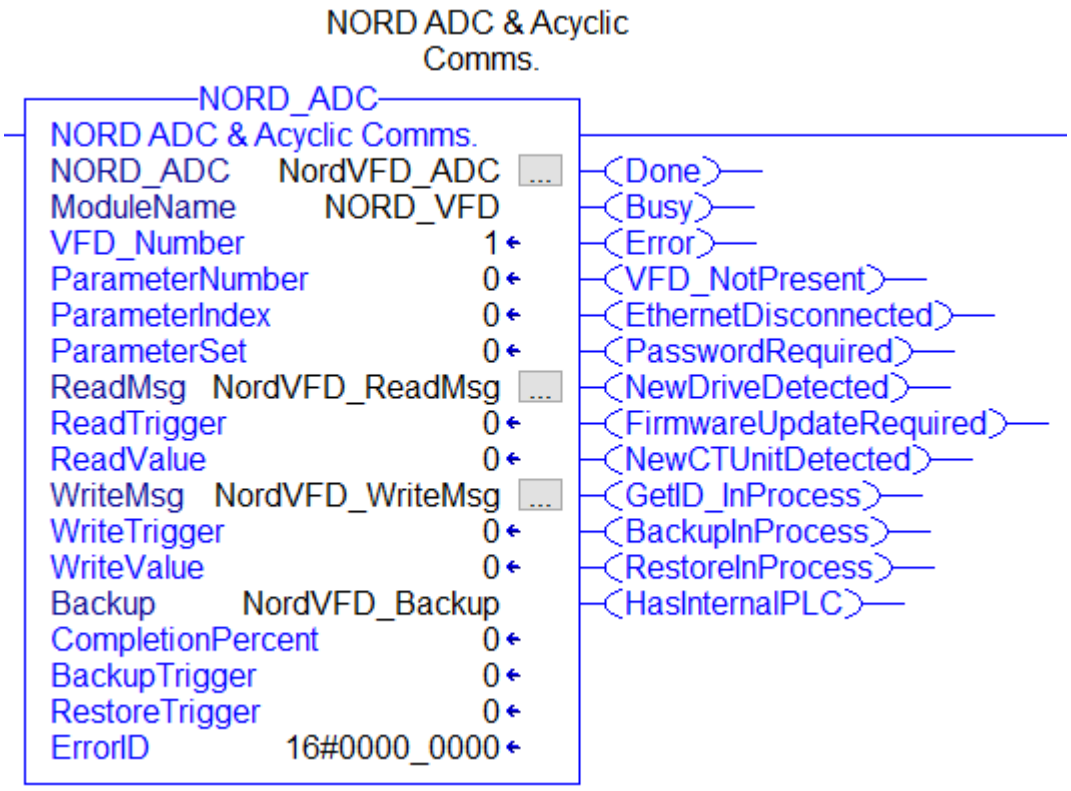

Figure 44: Parameter Module NORD_ADC

4.3.5.1 Input Parameters

Variable	Type	Description
NORD_ADC	NORD_ADC	An instance of this AOI must be defined for use within the program.
VFD_Number	SINT	Range 0 … 8. The "VFD_Number" tag represents the position of the Nord device within its local Systembus connection. **Information** A value of '0' will communicate with the Ethernet/IP Customer/Technology Unit. A value of '1' … '8' will communicate with the first or each sequential VFDs in the Systembus connection. Please reference the corresponding Industrial Ethernet manual (BU2900 or BU0820) when selecting a VFD number.
ParameterNumber	INT	Enter the parameter number to be read.
ParameterIndex	SINT	If the parameter does not have an index, enter '0' for the "ParameterIndex" tag.
ParameterSet	SINT	If the parameter does not have a separate value for each parameter set, enter '0' for the "ParameterSet" tag.

Variable	Type	Description
ReadTrigger	BOOL	A momentary signal via the “ReadTrigger” tag will initiate a read message to the parameter set up with ‘ParameterNumber’, ‘ParameterIndex’ and ‘ParameterSet’.
WriteTrigger	BOOL	A momentary signal via the “WriteTrigger” tag will initiate the process to write to the parameter set up with ‘ParameterNumber’, ‘ParameterIndex’ and ‘ParameterSet’.
WriteValue	DINT	The value contained in the “WriteValue” tag is written to the parameter set up with ‘ParameterNumber’, ‘ParameterIndex’ and ‘ParameterSet’.
BackupTrigger	BOOL	To create a backup, a momentary signal via the “BackupTrigger” tag is required to initiate the Backup Process.
RestoreTrigger	BOOL	A momentary signal via the “RestoreTrigger” tag will initiate the Restore Process. This will set the parameters within the Nord Device to equal those contained in the backup file.
Backup	NORD_ParameterBackup	The process will create a backup for every writable parameter within the VFD and the Customer/Technology Unit if applicable. The parameters are saved in the “Backup” tag within the PLC. **Information** For external storage of the “Backup” tag, see 4.3.6.4 "External storage of the backup".

Table Y: Input Parameters for NORD_ADC AOI

4.3.5.2 Output Parameters

Variable	Type	Description
VFD_NotPresent	BOOL	The “VFD_NotPresent” bit will become active if trying to communicate with a VFD that does not exist in the Systembus Connection.
EthernetDisconnect	BOOL	The “EthernetDisconnected” bit will become active if the ethernet cord between the Module and the PLC is disconnected or is not communicating properly.
Done	BOOL	When **TRUE**, the AOI completed a task successfully.
Busy	BOOL	When **TRUE**, the AOI is in the process of performing one of its tasks.
Error	BOOL	When **TRUE**, Message was not read/written and there was an error.
PasswordRequired	BOOL	In the case that the VFD is password protected, the “PasswordRequired” bit will latch to denote that the password needs to be entered before writing parameters.
ReadValue	DINT	The value returned will be contained in the “ReadValue” tag.
ErrorID	DINT (Hex)	After an unsuccessful read/write message the “ErrorID” tag will get populated with the respective message error code.
NewDeviceDetected	BOOL	The “NewDeviceDetected” bit will activate if the Device ID differs from the one contained in the backup file.
FirmwareUpdateRequired	BOOL	If the Device ID cannot be established, the “FirmwareUpdateRequired” bit will activate to denote that the device has an older firmware that does not contain a Device ID. P501 Inverter Name will be recoded instead.
GetID_InProcess	BOOL	Upon every time a device gets connected to the PLC, the NORD_ADC AOI will go through a process to retrieve the Device ID or MAC Address. The “GetID_InProcess” will become active while performing this task.

Variable	Type	Description
BackupInProcess	BOOL	The PLC is performing a Backup.
RestoreInProcess	BOOL	The PLC is restoring a device
HasInternalPLC	BOOL	If the backup parameter file suggests that the VFD contains an internal PLC, the “HasInternalPLC” bit will latch. The restore process can restore the parameters but the internal PLC program will need to be downloaded to the drive manually via NordCON.
CompletionPercent	DINT	The “CompletionPercent” tag will give a status as to how far along into the process it is.

Table Z: Output Parameters for NORD_ADC AOI

4.3.6 Automatic Device Configurator Processes

4.3.6.1 Get ID Process

The Get ID Process of the Automatic Device Configurator retrieves the Device ID from a VFD and the MAC Address from an Ethernet/IP Customer or Technology Unit (if present) whenever ethernet connection is first established. If the VFD Device ID cannot be found due to an older firmware, parameter P501 'Inverter Name' will be recorded instead. The Device ID and MAC address are used to determine if it is connected to the same device as the backup file or if the unit has been replaced with a new device.

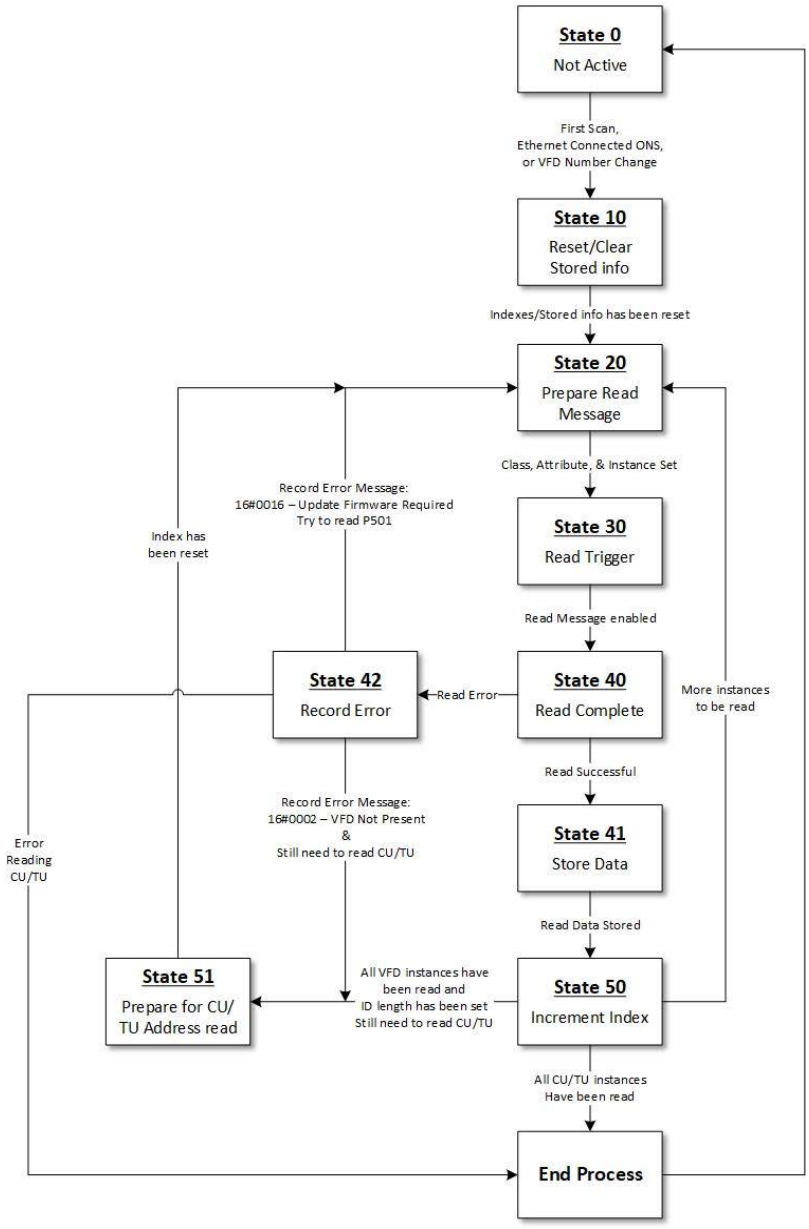

Figure 45: Get ID Process

4.3.6.2 Backup Process

The Backup Process is manually enabled and reads every parameter from within the Nord Device. Every parameter and parameter value are stored within the Backup Tag in the PLC.

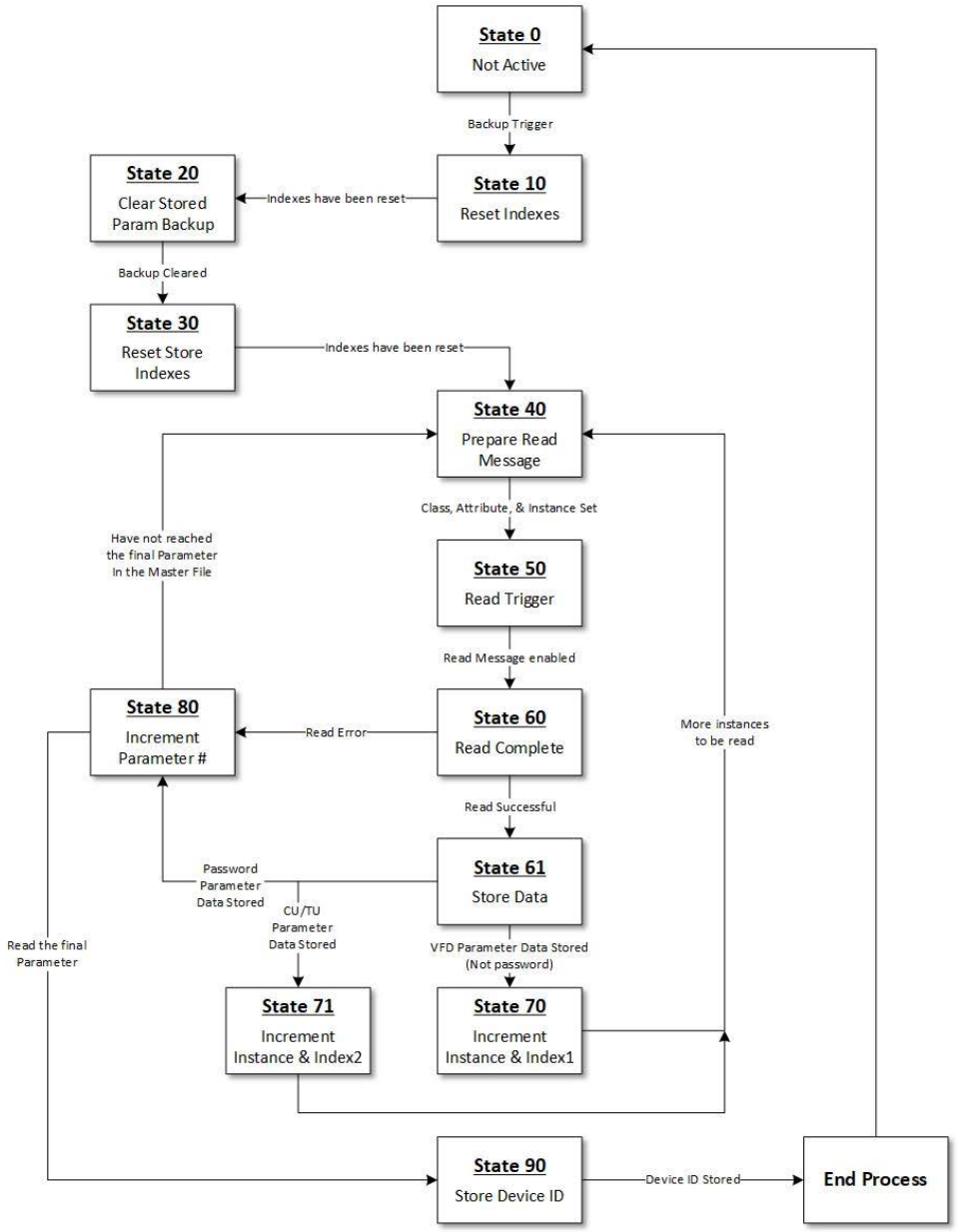

Figure 46: Backup Process

4.3.6.3 Restore Process

The Restore Process is manually enabled and will update any writable parameter within the Nord Device that differs from the value within the saved backup tag.

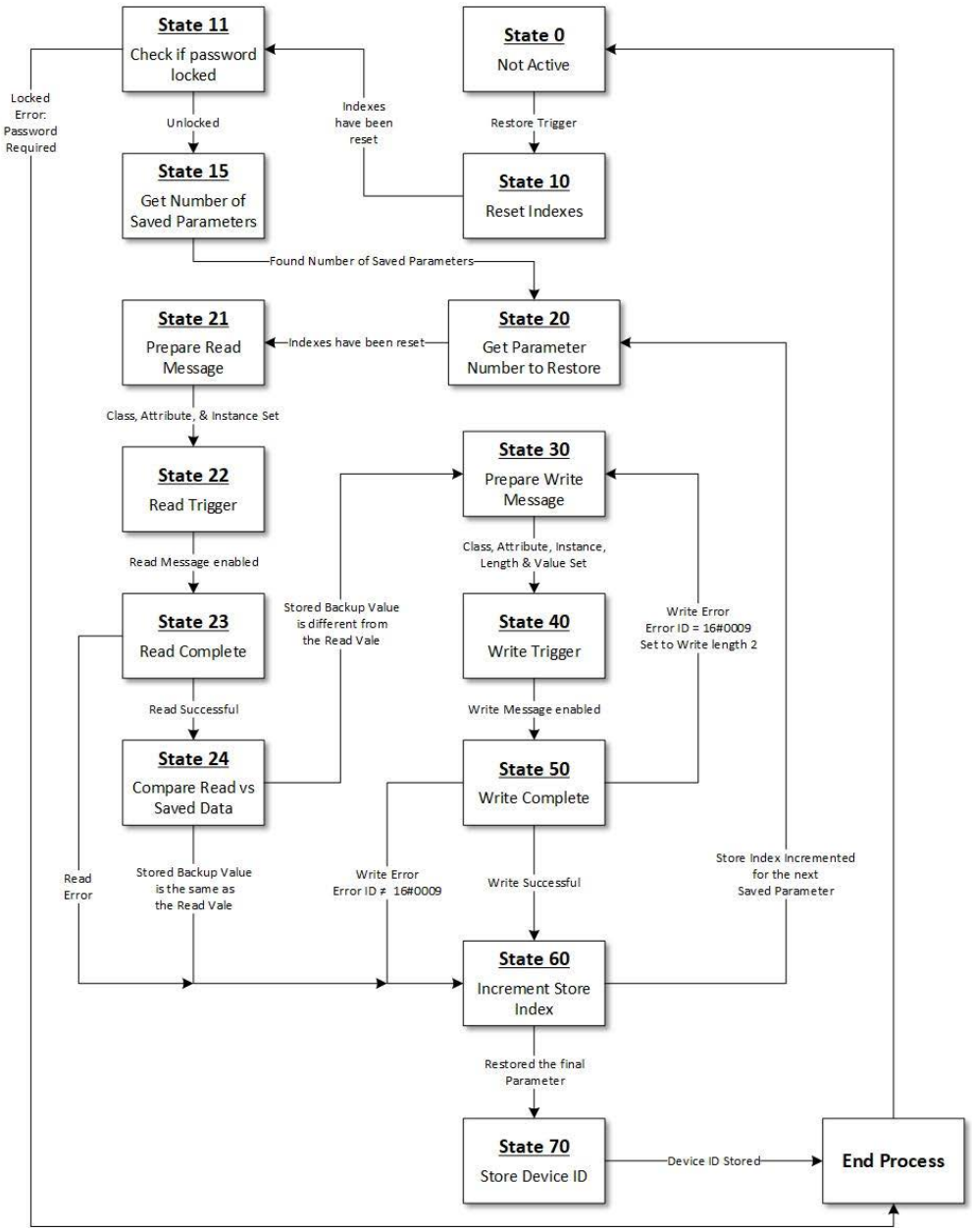

Figure 47: Restore Process

4.3.6.4 External storage of the backup

If the Backups are to be stored external to the PLC, a rung containing the backup parameter can be exported from the program and the resulting '.L5X' can be stored. Note that before the backup file can be imported into the program, the backup tag must be removed from the program so the import can recreate the backup tag as a new tag. Failure to remove the backup tag from the program prior to importing will result in not updating the backup tags stored values from what currently resides in the PLC.

The other option to have the Backups external to the PLC would be to set up Dynamic Data Exchange (DDE) to monitor tag values. Please reference the RSLinx manuals for information as to how to set this up. Using DDE, the live tag values can be read and edited via excel and the files can be saved in excel format.

4.3.7 Examples

Read the value stored in Parameter Set 3 of P102 of the first VFD (Value is 3.5 seconds)

Parameter 102 has 4 parameter sets but is not an array parameter. Refer to the specific VFD's manual for more information.

- VFD_Number: 1
- ParameterNumber: 102
- ParameterIndex: 0
- ParameterSet: 3

Toggle the 'ReadTrigger' bit to read the value stored in P102 Parameter Set 3. ('Done' bit unlatches and 'Busy' bit is set)

'ReadValue' will read "350" (resolution is 2 decimal places) and the 'Done' bit will latch/'Busy' bit unlatch once the read is complete.

Change function of Digital Input 2 (P420[2]) to Fixed Frequency 1 for the third VFD

Note: This case specifically refers to an SK 2xxE VFD. The Fixed Frequency 1 function is denoted as a value of four (4). Write the value 4 to P420[2] on the third VFD. P420 has four (4) array indexes but does not have multiple parameter sets. Refer to the specific VFD's manual for more information.

- VFD_Number: 3
- ParameterNumber: 420
- ParameterIndex: 2
- ParameterSet: 0
- WriteValue = 4

Toggle the 'WriteTrigger' bit to write the value of 4 to P420[2]. 'Done' bit unlatches and 'Busy' bit is set.

'ReadValue' will read "4". The 'Done' bit will latch and the 'Busy' bit will unlatch once the write is complete.

Backup all Parameters stored in the first VFD

- VFD_Number: 1

Toggle the 'BackupTrigger' bit to start the Backup Process.

- Done bit unlatch
- Busy bit is set
- BackupInProcess bit is set
- CompletionPercentage will display the status of the backup from 0-100%

When the Backup Process has completed, the 'CompletionPercentage' will read 100%, the 'Done' Bit will latch, 'Busy' bit will unlatch, and the 'BackupInProcess' bit will unlatch. All parameter values from the first VFD will be stored in the current 'Backup' tag.

Restore all Parameters in the first VFD from the Backup Tag

A Drive goes down and is replaced with a new Drive from the backup stock shelf.

- VFD_Number: 1
- Backup = Backup Tag File

Once the new drive is connected, the Get ID Process will auto-commence. The 'Done' bit unlatches, the 'Busy' bit is set and the 'GetID_InProcess' bit is set. When the process completes, the 'Done' bit will latch, the 'Busy' bit will unlatch and the 'GetID_InProcess' bit will unlatch. The process will determine that the original drive has been replaced with a new device and the 'NewDriveDetected' bit is set.

Toggle the ‘RestoreTrigger’ bit to start the Restore Process.

- Done bit unlatch
- Busy bit is set
- RestoreInProcess bit is set
- CompletionPercentage will display the status of the backup from 0-100%

When the Restore Process has completed, the ‘CompletionPercentage’ will read 100%, the ‘Done’ Bit will latch, ‘Busy’ bit will unlatch, and the ‘RestoreInProcess’ bit will unlatch. The new Drive will have all of its parameters set according to the ‘Backup’ Tag of the original VFD that is being replaced.

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