

CANopen



AC20 Series

CANopen option comms

Configuration and Programming with IQAN Design

10.05.2024



ENGINEERING **YOUR** SUCCESS.

1.1.1 Non-warranty clause

We checked the contents of this publication for compliance with the associated hardware and software. We can, however, not exclude discrepancies and do therefore not accept any liability for the exact compliance. The information in this publication is regularly checked, necessary corrections will be part of the subsequent publications.

English Master created.

1.1.2 Production site:

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1 Introduction

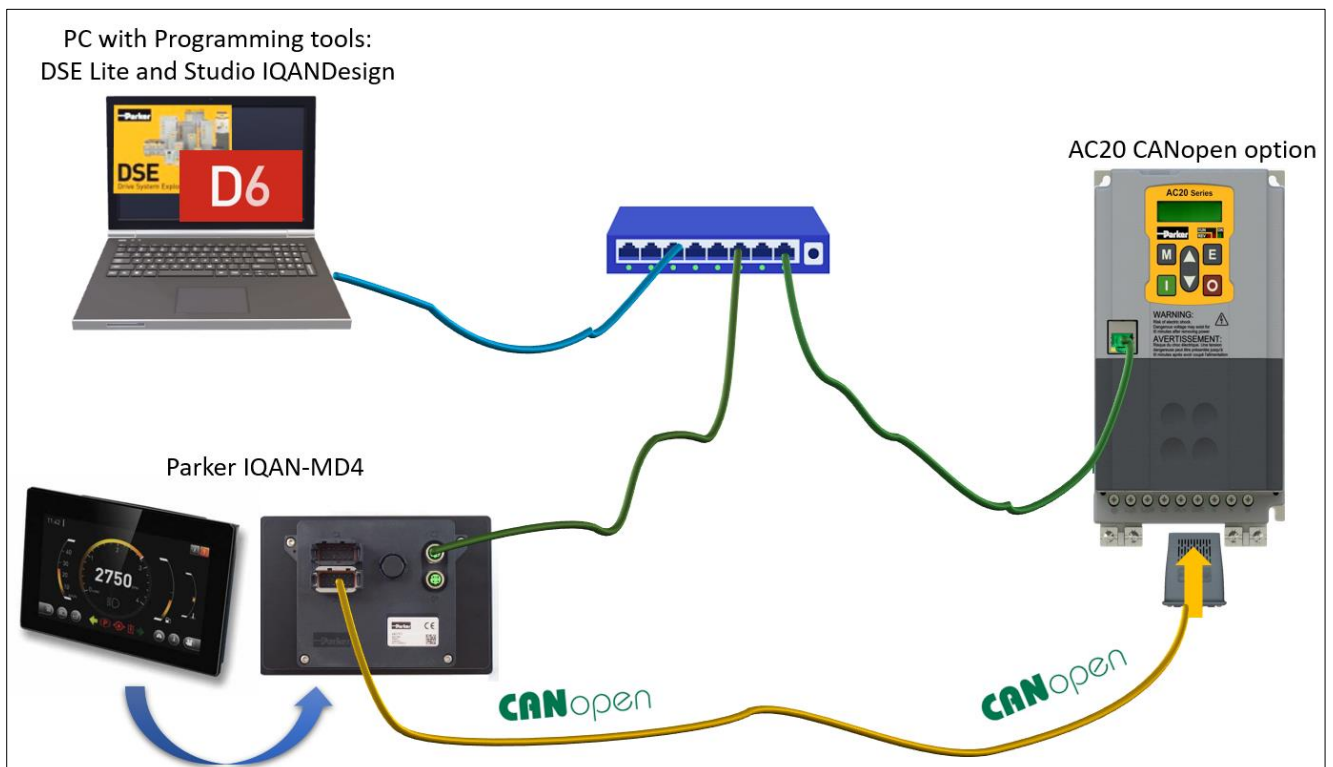
1.1 About this document

This application note describes how to set up communication between AC20 driver and Parker IQAN Controllers through the CANopen option communication board.

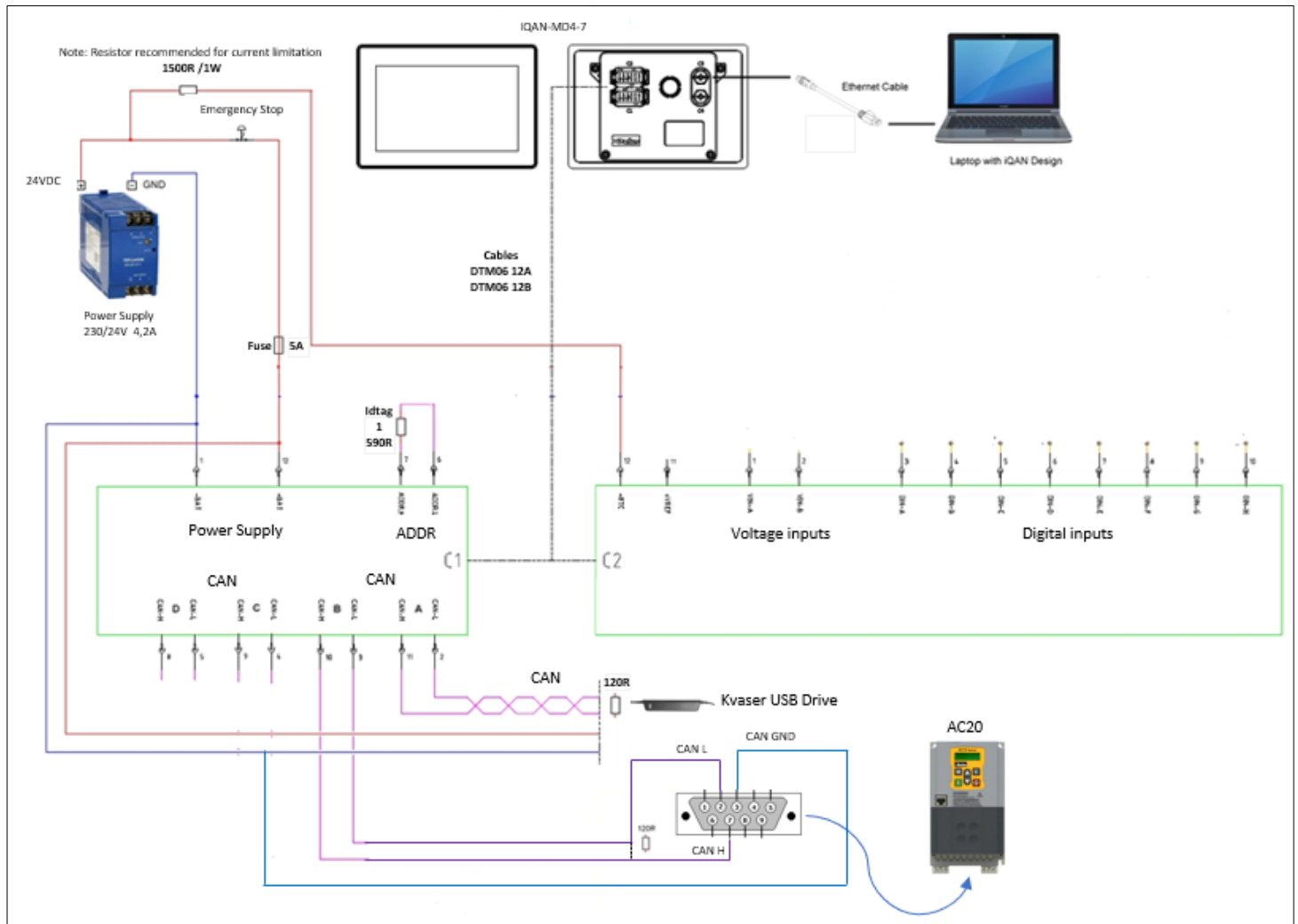
1.2 Tools

To connect the AC20 CANopen to an IQAN controllers, the following items are needed:

	Name	Firmware Version
Hardware	AC20 Drive	1.2.1
	IQAN-MD4-7-T1E2	
	[2003-CB-00] CANopen communication board	
Software	Parker DSE Lite	3.13
	IQANDesign	6.08.32



1.3 Wiring Diagram



2 Setting up the AC20 Communication parameters

The parker AC20 CANopen slave can be easily integrated into a Parker IQAN control architecture by setting the **network parameters** and mapping the **PDO (Process Data Object)**.

AC20 keypad or Parker DSE Lite application or AC20 Webserver is used to access communications function block and set the parameters.

- Access the “Ethernet” function block and set the connection parameters.

Keypad Menu Path	DSE-Lite Function Block	Webserver

No.	Name	Default Value	Description
0640	ADDRESS METHOD (Method for assigning the IP address)	AUTOMATIC	Address assigned by DHCP server
		LINK LOCAL	Address assigned link-local by the inverter
		FIXED	Ip address must be set manually via parameters “0641”, “0642”, “0643”.
0641	SET IP ADDRESS	0.0.0.0	IP address of the inverter
0642	SET SUBNET MASK	0.0.0.0	Subnet Mask of the inverter
0643	SET GATEWAY ADDR	0.0.0.0	Gateway address of the inverter

- Access the “Option Comms” block and set the CANopen communication parameters.

Keypad Menu Path	DSE-Lite Function Block	Webserver

No.	Name	Default Value	Description
0691	COMMS REQUIRED	NONE	Communication option required
0763	NODE ADDRESS	0	Node Address of the CANopen device
0764	CANOPEN BAUD	AUTO	Required communication speed

2.1 Config the drive using Parker DSE Lite Application

Display your configuration page in DSE Lite, click the plus sign [+] at the left of function block “Ethernet” and “Option Comms Config” to set the appropriate communication parameters or double click the function Blocks to open parameters tab in the configuration interface.

➤ Ethernet Config

Parameters - A20v_CANopenCommsMD4

Energy Meter	
Ethernet	
ADDRESS METHOD	FIXED
SET IP ADDRESS	192.168.10.120
SET SUBNET MASK	255.255.255.0
SET GATEWAY ADDR	0.0.0.0
LAST AUTO IP	169.254.54.98
Fan Control	
Feedbacks	
Fieldbus Config	
Fieldbus Input Mapping	
Fieldbus Output mapping	
Fire Mode	

A20v_CANopenCommsMD4

Ethernet

MAC ADDRESS	00-0D-46-00-11-E6
IP ADDRESS	192.168.10.120
SUBNET MASK	255.255.255.0
GATEWAY ADDRESS	0.0.0.0
ETHERNET LINK	100M FULL DUPLEX
ETHERNET STATE	RESOLVED FIXED
ADDRESS IS TEMP	FALSE
ADDRESS METHOD	FIXED
SET IP ADDRESS	192.168.10.120
SET SUBNET MASK	255.255.255.0
SET GATEWAY ADDR	0.0.0.0
LAST AUTO IP	169.254.54.98

➤ CANopen option comms config

Parameters - A20v_CANopenCommsMD4*

Logic Func 9	
Minimum Speed	
Modbus TCP Config	
Motor Load	
Motor Nameplate	
MRAS	
Multi-Stage Speed	
Multiplexer 1	
Multiplexer 2	
Option Comms Config	
COMMS REQUIRED	CANOPEN
ADDR ASSIGNMENT	EXTERNAL
SET IP ADDRESS	0.0.0.0
SET SUBNET MASK	0.0.0.0
SET GATEWAY ADDR	0.0.0.0
ACCESS	0x001F
NODE ADDRESS	30
CANOPEN BAUD	250 KBPS
MODBUS BAUD RATE	19200 BPS
PARITY	EVEN 1 STOP
ACTIVE TIMEOUT	0 s
MASTERMAPPING	TRUE
Option Comms Input M	
Option Comms Output	

A20v_CANopenCommsMD4*

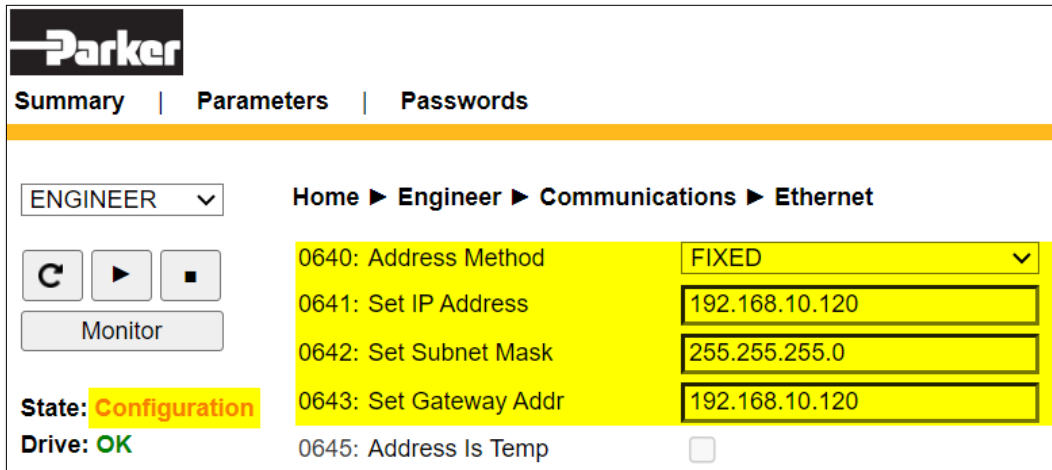
Option Comms Config

COMMS FITTED	CANOPEN
COMMS VERSION[0]	1
COMMS VERSION[1]	2
COMMS SERIAL NUM	0xA04FB61A
COMMS STATE	PROCESS ACTIVE
DIAGNOSTIC	OK
EXCEPTION CODE	0x0000
COMMS SUPERVISED	FALSE
MAPPING CHANGED	TRUE
STATION NAME	
IP ADDRESS	0.0.0.0
SUBNET MASK	0.0.0.0
GATEWAY ADDRESS	0.0.0.0
ACTUAL BAUD RATE	250 KBPS
COMMS REQUIRED	CANOPEN
ADDR ASSIGNMENT	EXTERNAL
SET IP ADDRESS	0.0.0.0
SET SUBNET MASK	0.0.0.0
SET GATEWAY ADDR	0.0.0.0
ACCESS	0x001F
NODE ADDRESS	30
CANOPEN BAUD	250 KBPS
MODBUS BAUD RATE	19200 BPS
PARITY	EVEN 1 STOP
ACTIVE TIMEOUT	0 s
MASTERMAPPING	TRUE

2.2 Config the drive using AC20 Webserver

Access the AC20 webserver by typing the IP-Address of the drive into a web browser. Switch the driver state from “Operational” to “Configuration” by clicking on stop button, then set the parameters.

➤ Ethernet Config



Parker

Summary | Parameters | Passwords

ENGINEER ▾

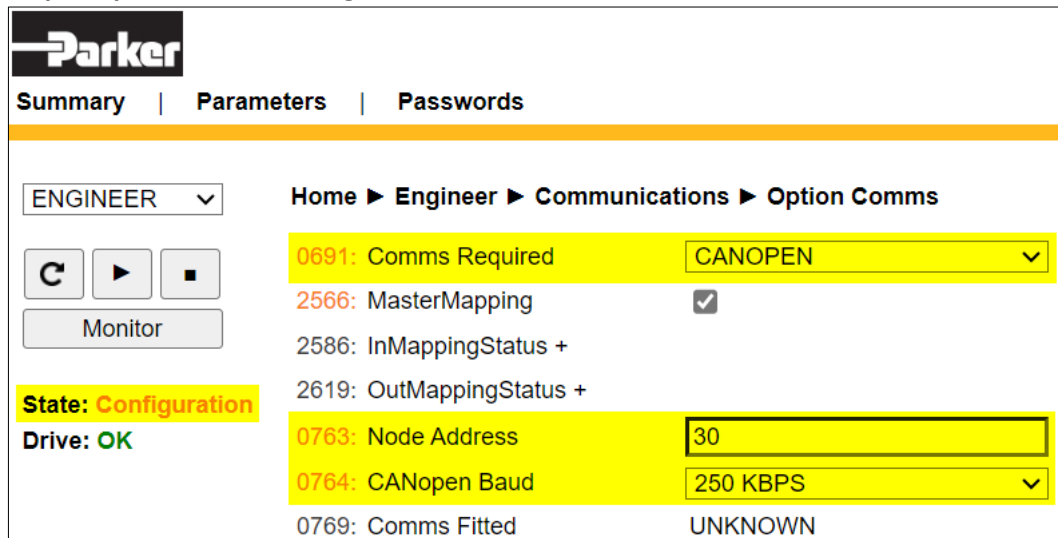
Home ► Engineer ► Communications ► Ethernet

Monitor

State: **Configuration**
Drive: **OK**

0640: Address Method	FIXED ▾
0641: Set IP Address	192.168.10.120
0642: Set Subnet Mask	255.255.255.0
0643: Set Gateway Addr	192.168.10.120
0645: Address Is Temp	☐

➤ CANopen option comms Config



Parker

Summary | Parameters | Passwords

ENGINEER ▾

Home ► Engineer ► Communications ► Option Comms

Monitor

State: **Configuration**
Drive: **OK**

0691: Comms Required	CANOPEN ▾
2566: MasterMapping	☒
2586: InMappingStatus +	
2619: OutMappingStatus +	
0763: Node Address	30
0764: CANopen Baud	250 KBPS ▾
0769: Comms Fitted	UNKNOWN

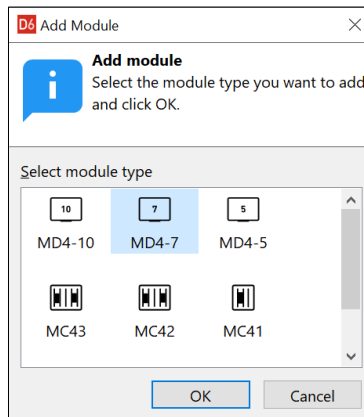
3 Configuration and programming with IQANDESIGN

The IQANDesign software is used for configuration and programming and can be downloaded from IQAN website.

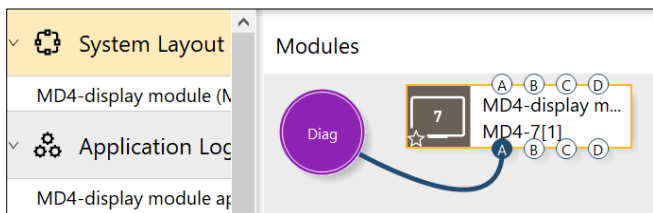
3.1 Configuration

- **Add the IQAN controller and set the properties.**

Create a new project, select your IQAN controller and click “OK”.



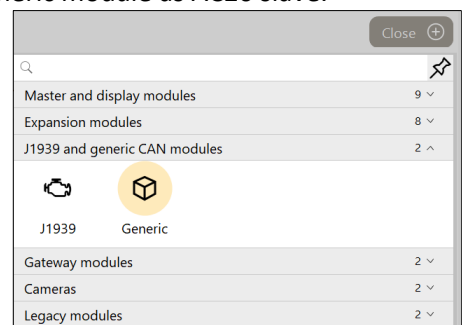
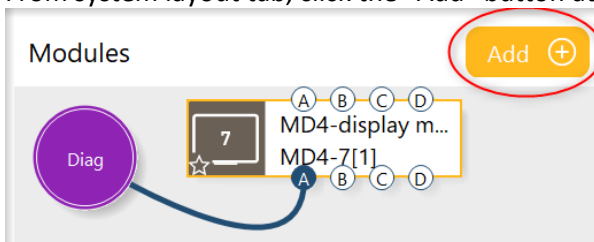
From system layout tab, select the module controller and set the properties at the left pane to match your physical configuration.



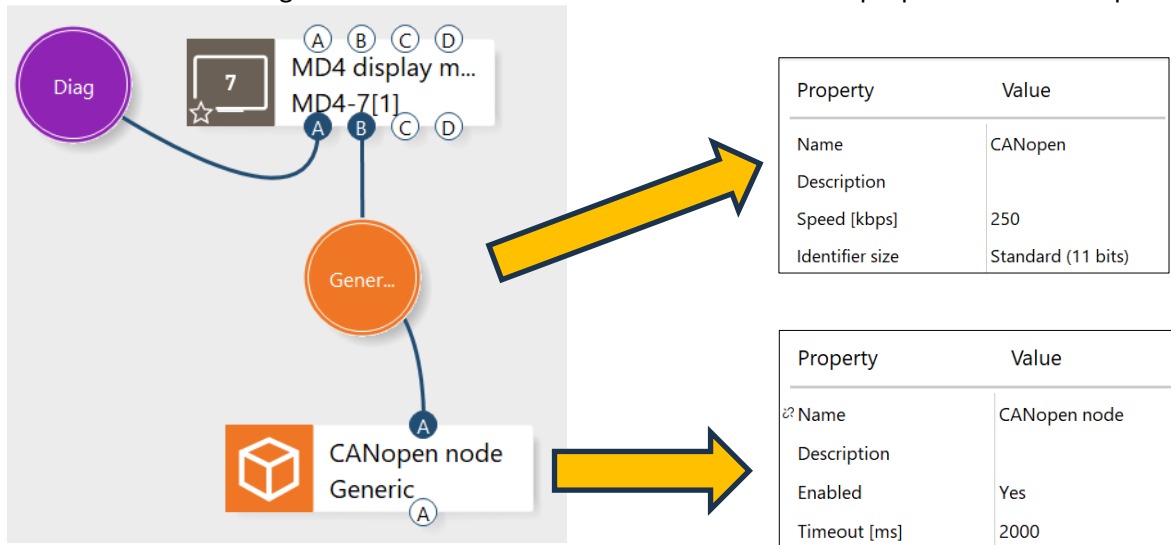
Property	Value
Name	MD4-display modu
Description	
Address	1
Optional	No
RTC enabled	Yes
J1939	{39; No; Yes; Yes}
Terminate CAN-A	Yes
Terminate CAN-B	Yes
Terminate CAN-C	Yes
Terminate CAN-D	Yes
Ethernet	{192.168.10.55; 255
IP address	192.168.10.55
Subnet mask	255.255.255.0
Default gateway	192.168.10.1
Primary DNS	
Secondary DNS	
Connect to IQANconn	Never

- **Add AC20 slave.**

From system layout tab, click the “Add” button at the top and select generic module as AC20 slave.



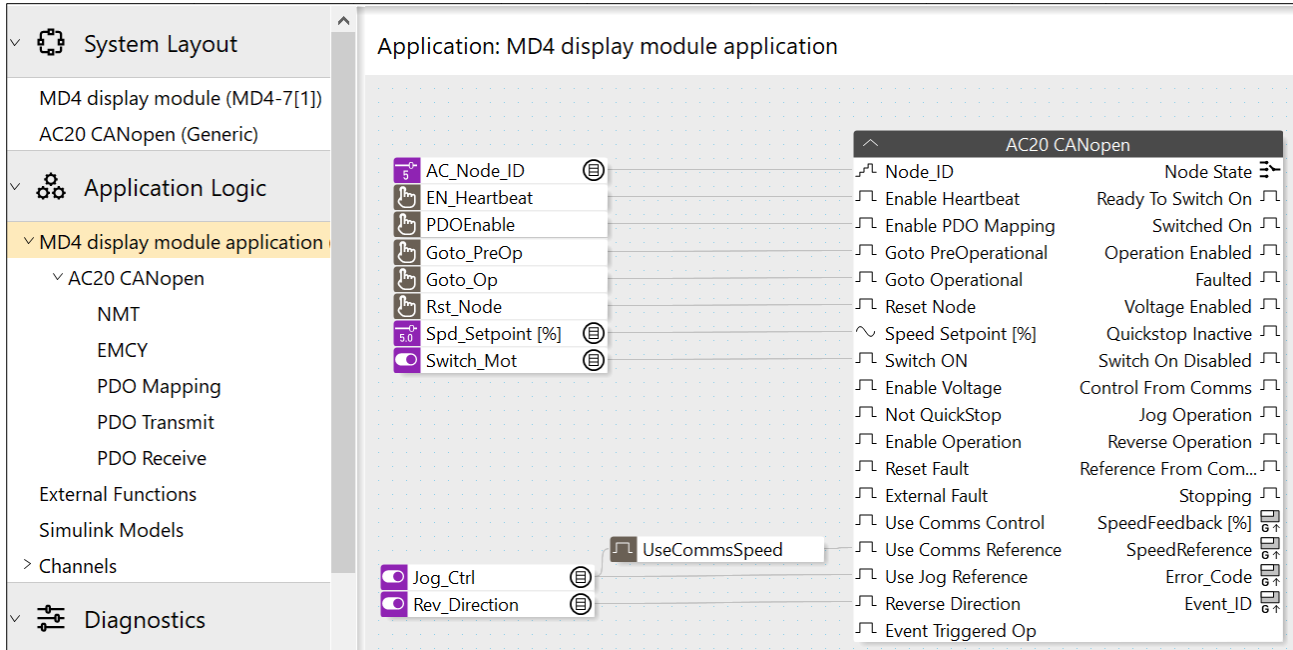
Drag and drop the just added generic module node “A” to the master node according to your physical connection. Select the generic module then the connection and set the properties at the left pane.



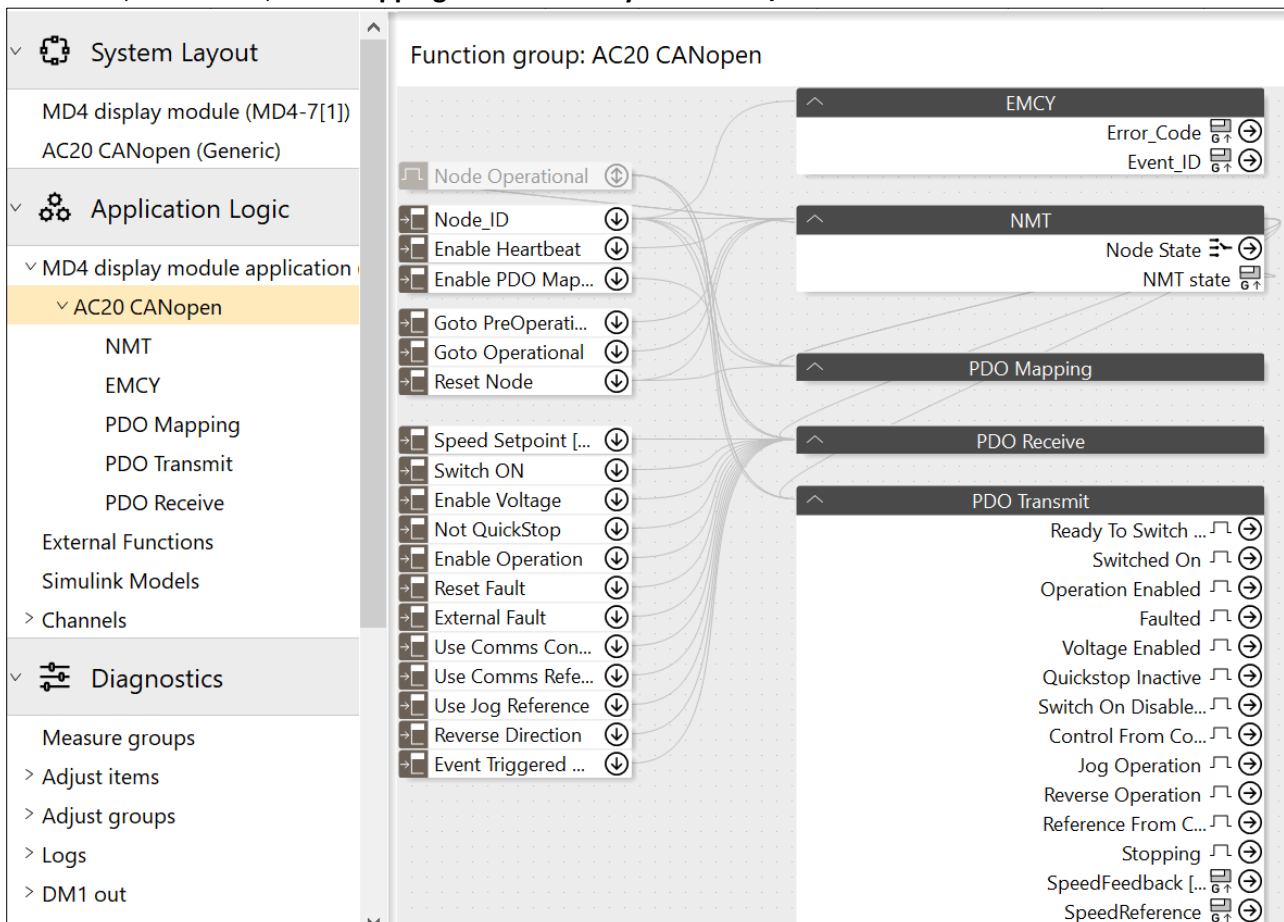
3.2 Programming

3.2.1 Application logic

In this document we will create a function group from Application logic called “AC20 CANopen” to implement the logical control of the AC20, this function group contains many functions block.

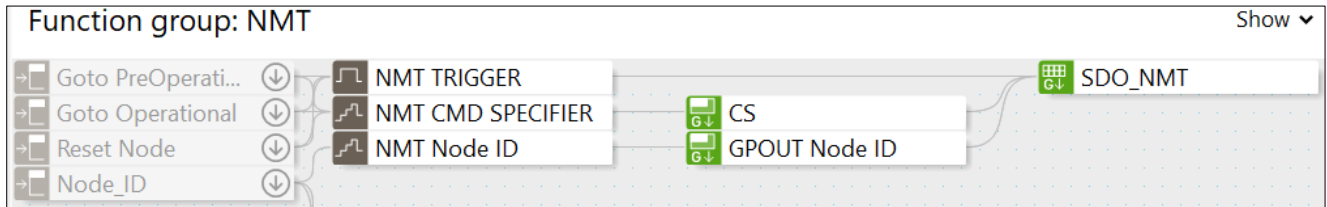


each function block implements a specific set of operations like in this case the **EMCY service, heartbeat activation, NMT state, PDO mapping enabled and cyclic receive/transmit PDO**.



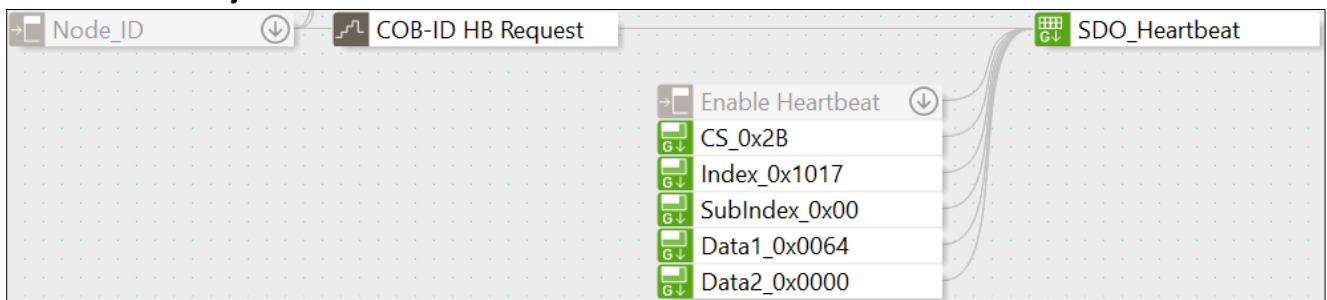
a) Heartbeat implementation and Network Management

The NMT service defines the communication behavior of the AC20 CANopen device, it can be used to initiate, start, monitor, reset or stop CANopen devices. The SDO (Service Data object) is used to implement the NMT service and therefore to switch the state machine of the AC drive.



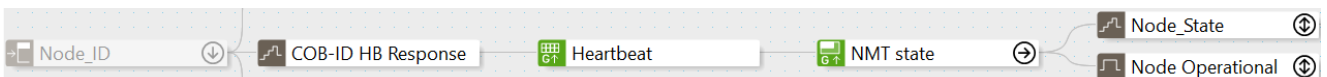
SDO OUT	COB-ID	Node ID (AC Node Address)	Command specifier (CS)	Comments
NMT	0x00	1..127	0x80	Preoperational
			0x01	Operational
			0x81	Reset Node

The CANopen network management uses the **Heartbeat** message as the confirmation of the NMT command sent by the controller device. The heartbeat feature is not activated into the AC Drive and therefore need to be enabled using a SDO (Service Data Object) command to enter a value greater than “0” in the **Producer Heartbeat Time object**.



SDO OUT	COB-ID	CMD Specifier	Index	Sub Index	Data	Comments
Producer Heartbeat Time	600+NodeID	0x2B	0x1017	0x00	0x00000064	Ex: Set 100 ms

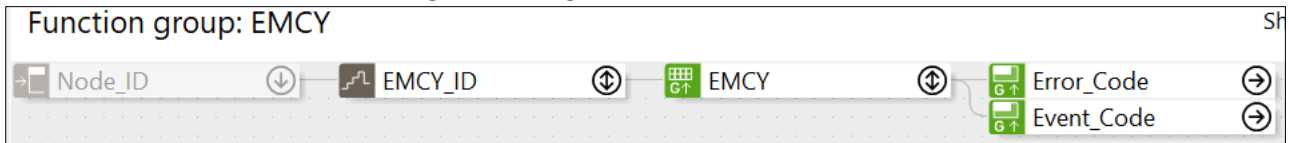
When the heartbeat is activated, the device transmits at regular intervals a heartbeat message which contains the status of the device via a specified COB-ID.



SDO IN	COB-ID	NMT State Value	Comments
Heartbeat	700+NodeID	0	Bootup
		4	Stopped
		5	Operational
		127	Preoperational

b) EMCY Service

This service is used to send a message indicating some detected errors.



AC Drive transmit error code and the error ID via the specified COB-ID

SDO IN	COB-ID	EMCY Value	Comments
EMCY	0x80+NodeID	Error Code	are defined in the communication or drive profile
		Event Code	Emergency Event code

c) PDO mapping configuration

The AC Drive CANopen does not have a default PDO Mapping, so it should be defined using the SDO communication. In this application we will map the objects listed below

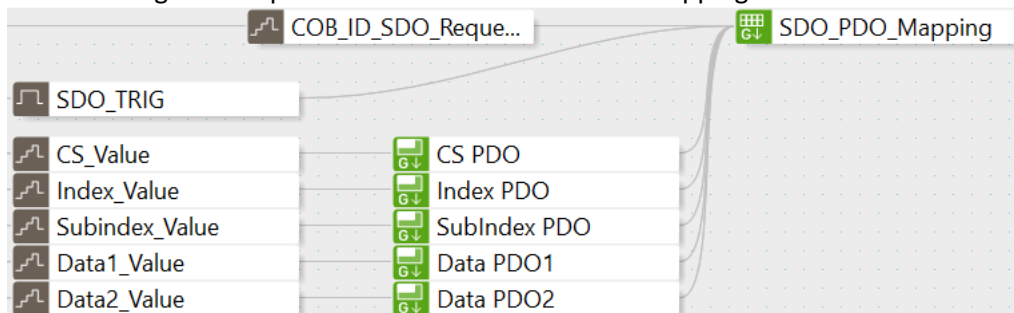
- Receive objects:

AC Drive parameter Tag	Data Type	Object Index= 2000h + parameter number(hex)	Subindex
'458' Comms Speed Setpoint	REAL	2000h+1CAh = 21CAh	00h
'436' Comms Command Word	WORD	2000h+1BAh = 21BAh	00h

- Transmit Objects:

AC Drive parameter Tag	Data Type	Object Index= 2000h + Parameter number(hex)	Subindex
'0507' Status Word	WORD	2000h+01FBh = 21FBh	00h
'0105' Speed Percent Feedback	REAL	2000h+0069h = 2069h	00h
'0462' Speed Reference	REAL	2000h+01CE = 21CEh	00h

The following code implement the SDO used for PDO mapping.

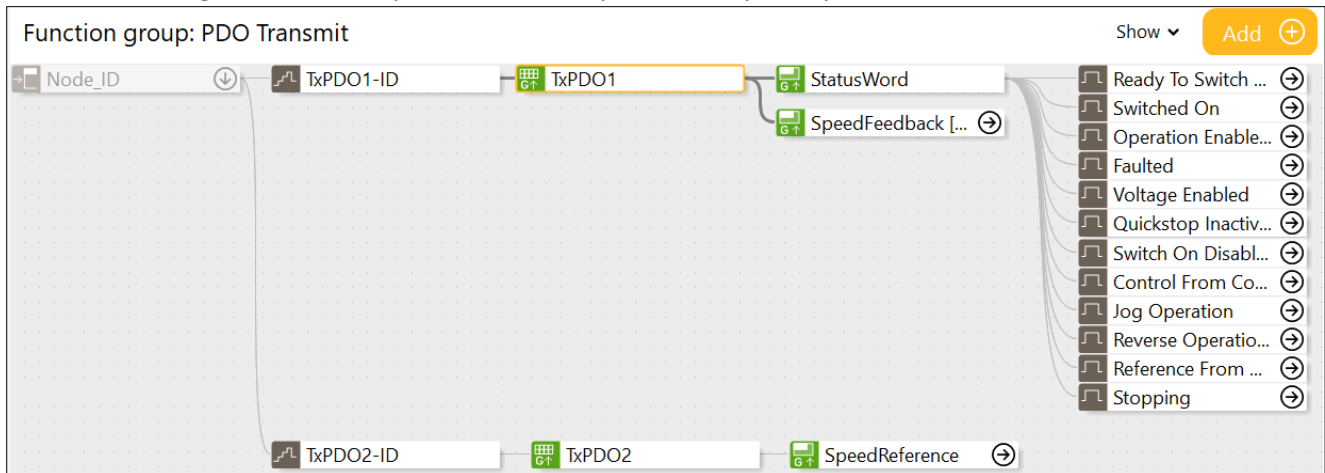


By using the code above, the steps listed in the table should be performed to map objects, the AC Drive network Management state should be in “**PRE-OPERATIONAL**” mode during this operation.

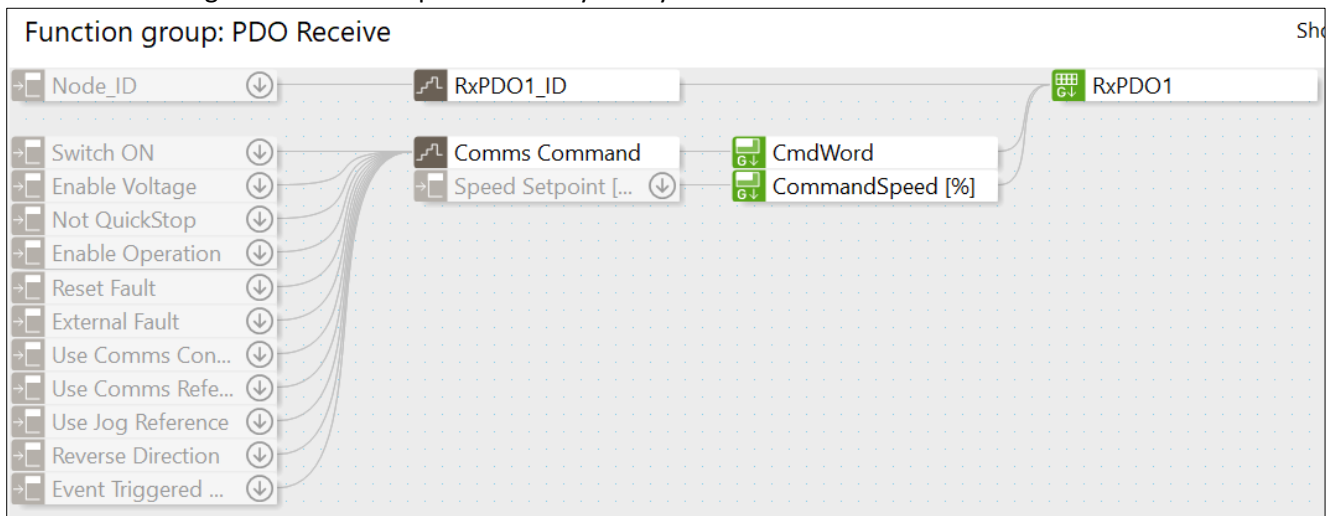
	SDO mapping	COB-ID	CMD Specifier	Index	Sub Index	Data	Comments
RPDO_1 Comms	Disable	600+NodeID	23h	1400h	01h	80000203h (Ex: node ID=3)	Set bit 31 to 1 and bit 0-10 to CAN-ID (0X0200 + Node ID)
	Transmission	600+NodeID	2Fh	1400h	02h	000000FEh	Set Event driven
RPDO_1 Mapping	Disable	600+NodeID	2Fh	1600h	00h	00000000h	Set 0 for disable
	Map object 1	600+NodeID	23h	1600h	01h	21CA0020h	Set Object index (Bit 16-31), subindex (Bit 8-15), data size (bit 0-7)
	Map object 2	600+NodeID	23h	1600h	02h	21B40010h	Set Object index (Bit 16-31), subindex (Bit 8-15), data size (bit 0-7)
	Enable	600+NodeID	2Fh	1600h	00h	00000002h	Set N° objects mapped
RPDO_1 Comms	Enable	600+NodeID	23h	1400h	01h	00000203h (Ex: node ID=3)	Set bit 31 to 0 and bit 0-10 to CAN-ID (0X0200 + Node ID)
TPDO_1 Comms	Disable	600+NodeID	23h	1800h	01h	C0000183h (Ex: node ID=3)	Set bit 31 to 0 and bit 0-10 to CAN-ID (0X0180 + Node ID)
	Transmission	600+NodeID	2Fh	1800h	02h	000000FEh	Set Event driven
	Disable	600+NodeID	2Fh	1A00h	00h	00000000h	Set 0
	Map Object 1	600+NodeID	23h	1A00h	01h	21FB0010h	Set Object index (Bit 16-31), subindex (Bit 8-15), data size (bit 0-7)
	Map Object 2	600+NodeID	23h	1A00h	02h	20690020h	Set Object index (Bit 16-31), subindex (Bit 8-15), data size (bit 0-7)
	Enable	600+NodeID	2Fh	1A00h	00h	00000002h	Set N° objects mapped
TPDO_1 Comms	Enable	600+NodeID	23h	1800h	01h	40000183h (Ex: node ID=3)	Set bit 31 to 0 and bit 0-10 to CAN-ID (0X0180 + Node ID)
TPDO_2 Comms	Disable	600+NodeID	23h	1801h	01h	C0000283h (Ex: node ID=3)	Set bit 31 to 1 and bit 0-10 to CAN-ID (0X0280 + Node ID)
	Transmission	600+NodeID	2Fh	1801h	02h	000000FEh	Set Event driven
TPDO_2 Mapping	Disable	600+NodeID	23h	1A01h	00h	00000000h	Set 0
	Map Object 1	600+NodeID	23h	1A01h	01h	21CE0020h	Set Object index (Bit 16-31), subindex (Bit 8-15), data size (bit 0-7)
	Enable	600+NodeID	2Fh	1A01h	00h	00000001h	Set N° objects mapped
TPDO_2 Comms	Enable	600+NodeID	23h	1801h	01h	40000283h (Ex: node ID=3)	Set bit 31 to 0 and bit 0-10 to CAN-ID (0X0280 + Node ID)

d) Transmit PDO operation.

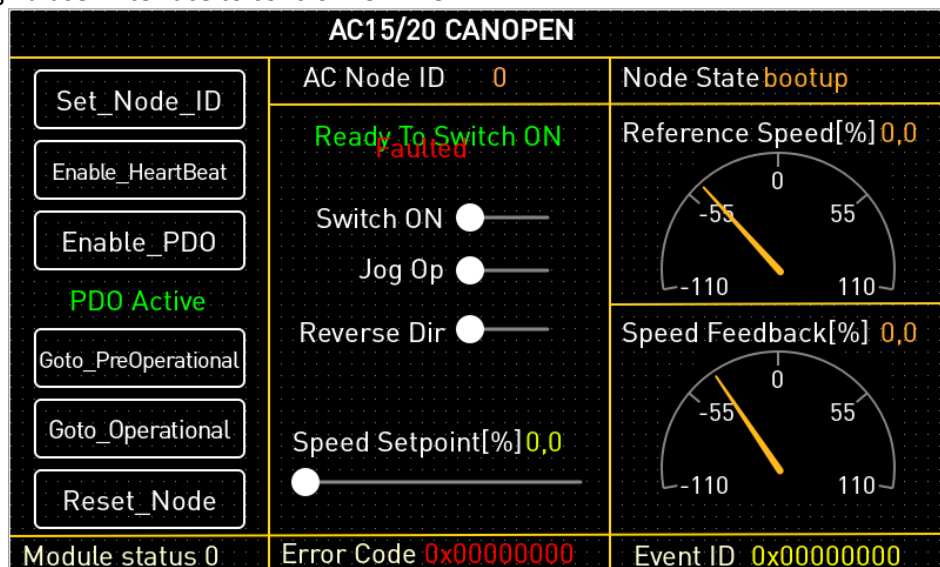
You can use the generic frame input to read CANopen frame cyclically from the AC Drive

**e) Receive PDO operation.**

You can use the generic frame output to write cyclically the commands to the AC Drive

**3.2.2 User interface**

Build and design a user interface to control AC Drive



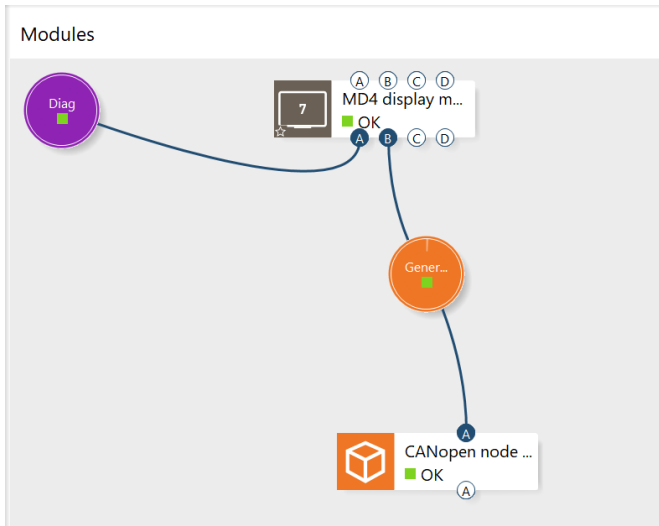
3.3 Run AC20 CANopen Drive

Compile and download the program into the controller.



Make sure the devices are physically connected, use the command from the display to manage AC20 CANopen drive running process.

Click the “**Set_Node_ID**” button to enter the corresponding node address of your AC20 CANopen, then click on “**Enable_Heartbeat**” to enable the heartbeat, read the state of the AC20 Drive and to establish the connection.



with the node state in “**Preoperational**”, click “**Enable_PDO**” to configure the PDO mapping, when the green message Active appears in the HMI, you can now click “**Goto Operational**” to enable cyclical data exchange between the IQAN controller and the AC CANopen.

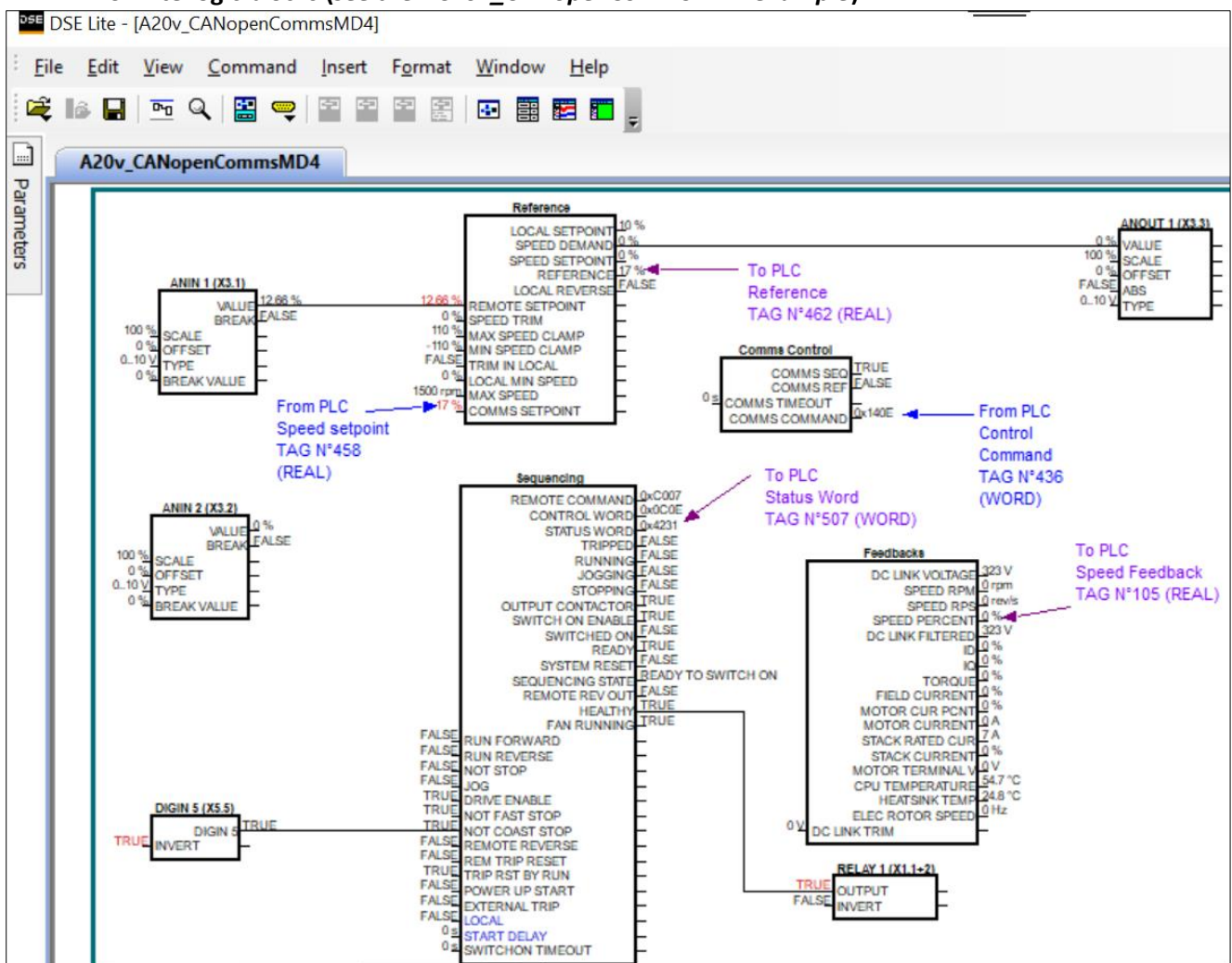
To run the drive, set the “**Speed Setpoint [%]**”, then use the command “**Switch ON**” to start the motor. Switch to local speed using the “**Jog OP**” command and use the “**Reverse Dir**” to manage the sense of motor rotation.

AC20 CANopen		0,6%
Node_ID	3	Node Sta... erational
Enable H...	False	Ready To ... True
Enable P...	False	Switched ... True
Goto Pre...	False	Operatio... True
Goto Op...	False	Faulted False
Reset No...	False	Voltage E... True
Speed Se...	45,00	Quicksto... True
Switch ON	True	Switch O... False
Enable Vo...	True	Control F... True
Not Quic...	True	Jog Oper... False
Enable O...	True	Reverse ... False
Reset Fault	False	Reference... True
External F...	False	Stopping False
Use Com...	True	SpeedFee... 45,96
Use Com...	True	SpeedRef... 45,00
Use Jog R...	False	Error_Cod... 0
Reverse D...	False	Event_Co... 0
Event Trig...	False	

✓ DSE Lite Online Monitor

DSE Monitor List	
Parameter	Value
Comms Control::COMMS COMMAND	0x0C0F
Feedbacks::SPEED PERCENT	45.69 %
Reference::COMMS SETPOINT	45 %
Reference::REFERENCE	45 %
Sequencing::STATUS WORD	0x4237

✓ DSE Lite logic blocks (see the AC20v_CANopenCommsMD4 example)



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