

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

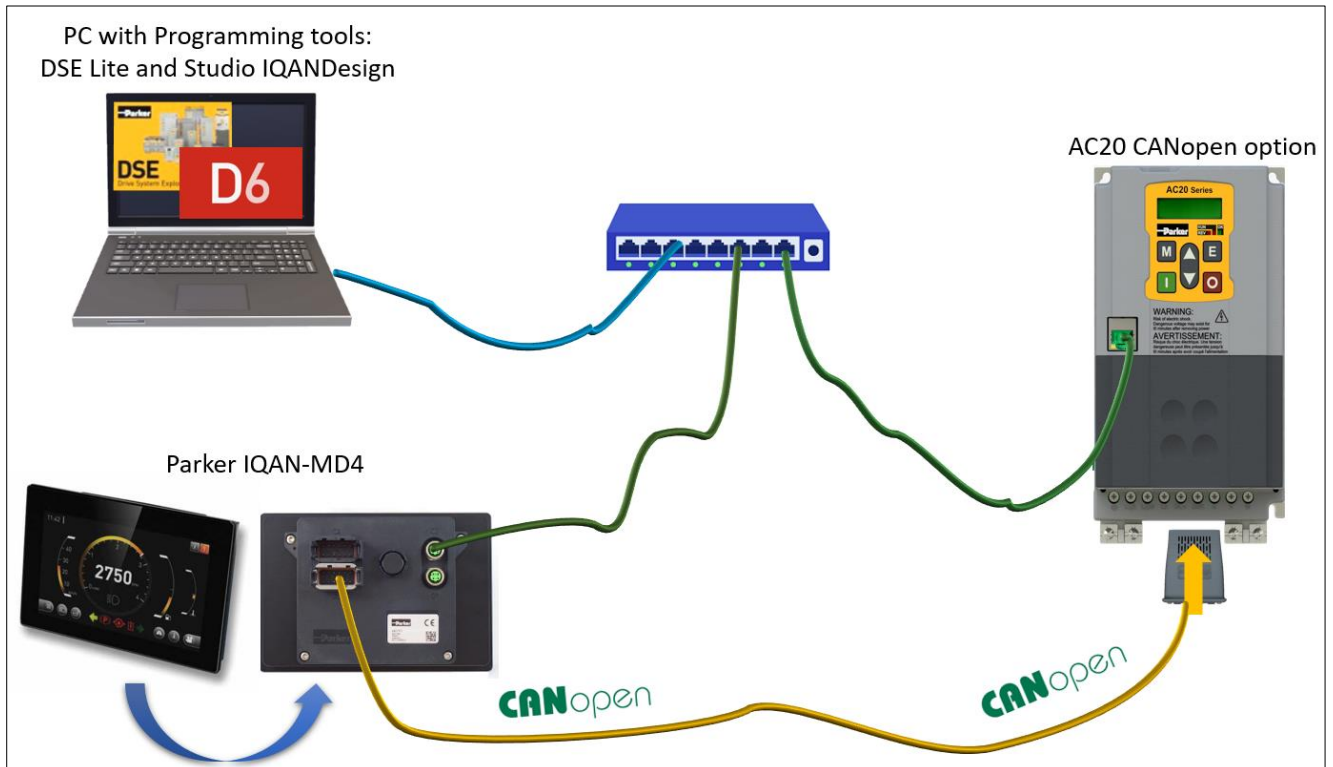
1.1 About this document

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

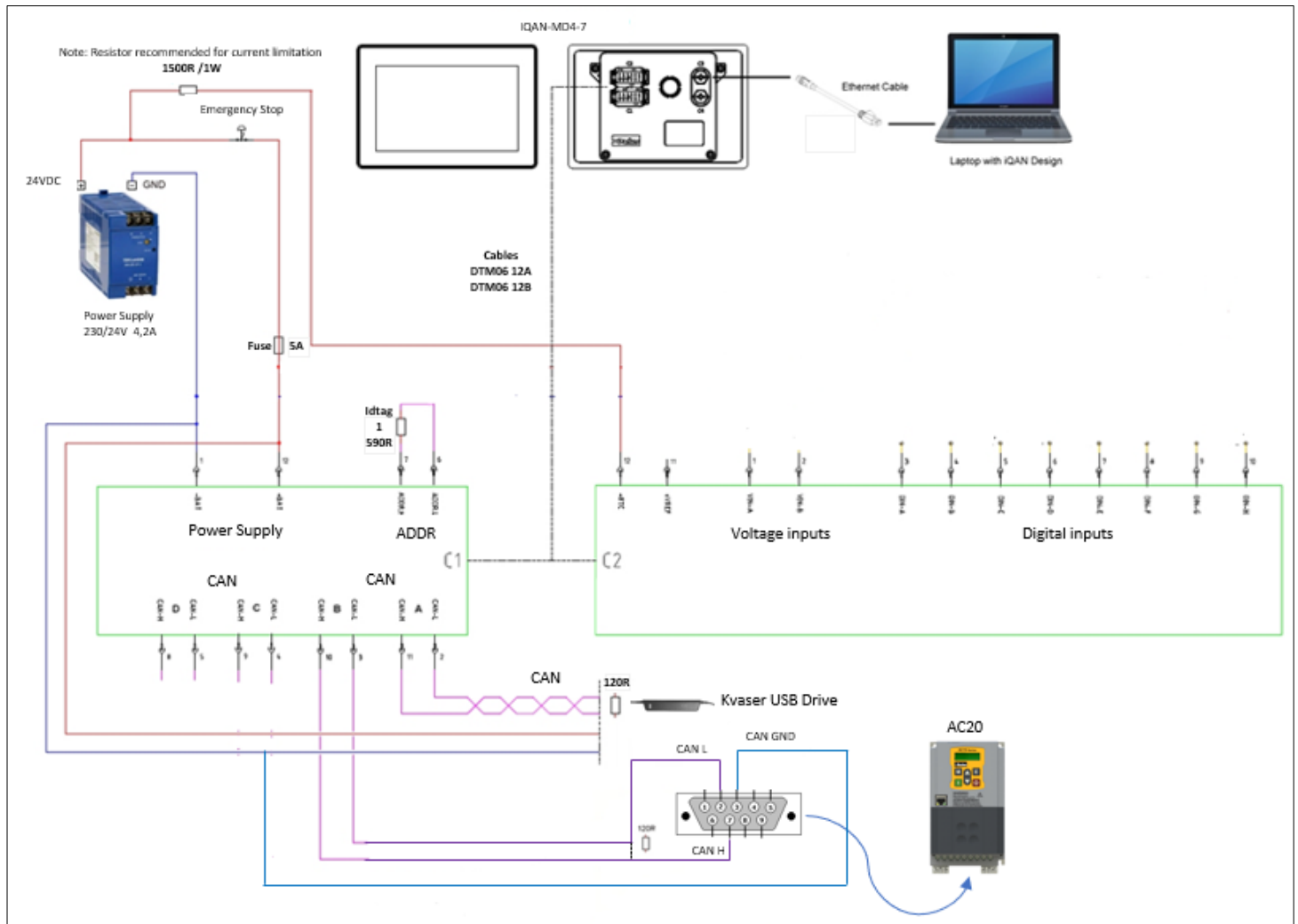
1.2 Tools

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
	PDOMapper	2.04



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

The screenshot shows the Parker AC20 Webserver interface for Ethernet configuration. The top navigation bar includes the Parker logo and tabs for Summary, Parameters, and Passwords. The left sidebar shows the user role as ENGINEER and a Monitor button. The main content area displays the breadcrumb path: Home ► Engineer ► Communications ► Ethernet. A list of parameters is shown, with 0640 through 0645 highlighted in yellow. The state is Configuration and the drive is OK.

Parameter	Value
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

The screenshot shows the Parker AC20 Webserver interface for CANopen option comms configuration. The top navigation bar includes the Parker logo and tabs for Summary, Parameters, and Passwords. The left sidebar shows the user role as ENGINEER and a Monitor button. The main content area displays the breadcrumb path: Home ► Engineer ► Communications ► Option Comms. A list of parameters is shown, with 0691, 0763, and 0764 highlighted in yellow. The state is Configuration and the drive is OK.

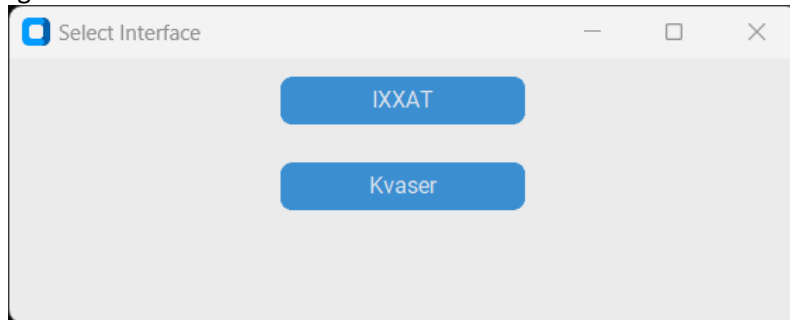
Parameter	Value
0691: Comms Required	CANOPEN
2566: MasterMapping	☒
2586: InMappingStatus +	
2619: OutMappingStatus +	
0763: Node Address	30
0764: CANopen Baud	250 KBPS
0769: Comms Fitted	UNKNOWN

3 PDO Mapping configuration with “PDOMapper”

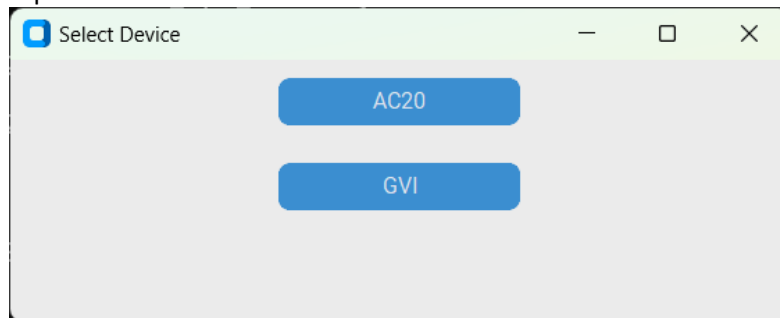
The AC20 Drive CANopen does not have a default PDO Mapping, so it should be defined using the SDO communication or “PDOMapper” tool. In this application we will use the “PDOMapper” tool.

Make sure the AC20 is physically connected with the PC through a CANopen to USB convert device.

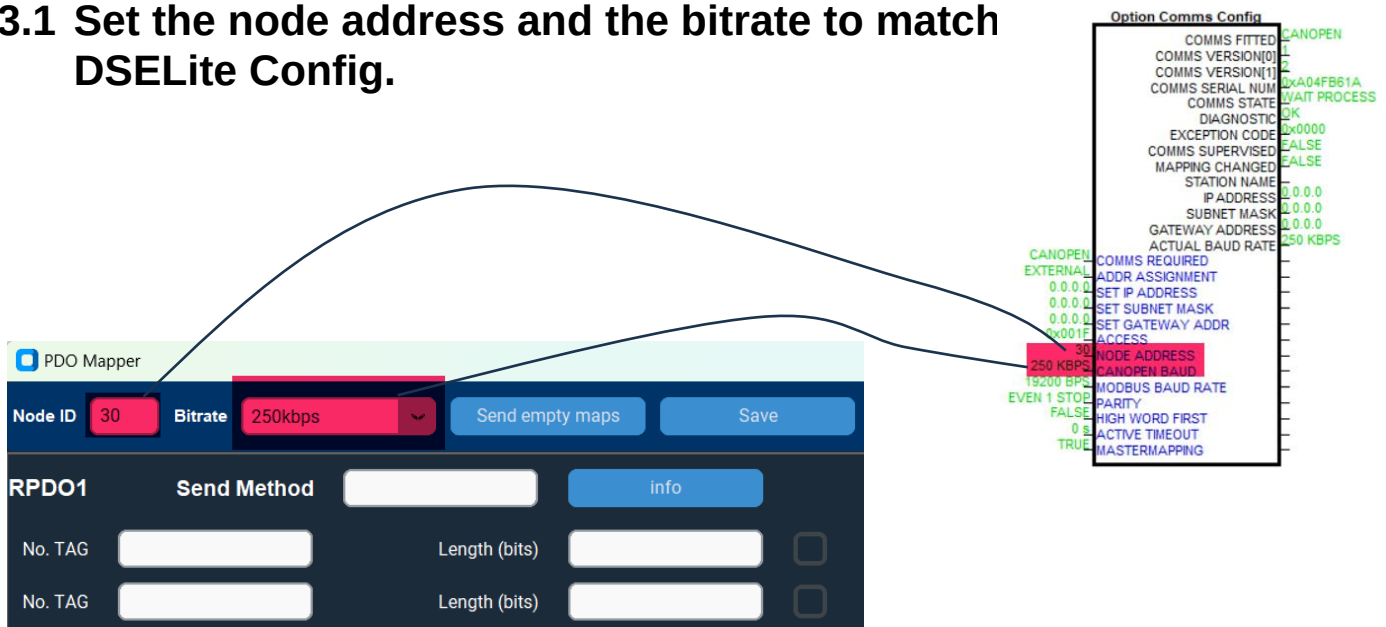
Open the PDOMapper tool from PC wait till the following interface appear, then select your physical interface; in our case we are using “KVASER” as interface.



Select AC20 drive from pane below to access the main windows.



3.1 Set the node address and the bitrate to match DSELite Config.



3.2 Receive and transmit objects added in PDOMapper table

Enter parameters tag number, data size in bit and transmission type (Send Method) into the “PDOMapper” interface. Each RPDO or TPDO can transfer up to 64 bits.

- Receive objects

AC Drive parameter Tag	Data Type	Bit size
'458' Comms Speed Setpoint	REAL	32
'436' Comms Command Word	WORD	16

The "Send Method" is set as continuous transmission (254 = 0xFE) click on "info" to see the other types. Check the box at the end of the row to enable the send option.

Node ID: 30 Bitrate: 250kbps

Send empty maps Save Open Get current maps

RPDO1 Send Method: 254 info

No. TAG	458	Length (bits)	32	☒
No. TAG	436	Length (bits)	16	☒
No. TAG		Length (bits)		☐
No. TAG		Length (bits)		☐
No. TAG		Length (bits)		☐

Send mapping ☐ Store parameters Heartbeat Preoperational Operational Reset node

- Transmit objects

AC Drive parameter Tag	Data Type	Bit size
'0507' Status Word	WORD	16
'0105' Speed Percent Feedback	REAL	32
'0462' Speed Reference	REAL	32

The "Send Method" is set as continuous transmission (254 = 0xFE) click on "info" to see the other types, set in "Event Timer" the send frequency for continuous transmission. Check the box at the end of the row to enable the send option.

Node ID: 30 Bitrate: 250kbps

Send empty maps Save Open Get current maps

TPDO1 Send Method: 254 info Event timer (ms): 5

No. TAG	507	Length (bits)	16	☒
No. TAG	105	Length (bits)	32	☒
No. TAG		Length (bits)		☐
No. TAG		Length (bits)		☐
No. TAG		Length (bits)		☐
No. TAG		Length (bits)		☐
No. TAG		Length (bits)		☐

TPDO2 Send Method: 254 info Event timer (ms): 5

No. TAG	462	Length (bits)	32	☒
No. TAG		Length (bits)		☐

Send mapping ☐ Store parameters Heartbeat Preoperational Operational Reset node

3.3 Load PDO mapping into AC20 Device

Check the “Store parameters” box, click “Reset Node”.

The heartbeat feature is not activated into the AC Drive and therefore need to be enabled, so click on button “Heartbeat”.

Go to **Preoperational** state by clicking the corresponding button then send the PDO mapping by clicking “Send mapping” and click on “Operational” to switch the state of the AC20.



The screenshot shows the PDO Mapper application window. At the top, the Node ID is set to 30 and the Bitrate is 250kbps. There are buttons for "Send empty maps", "Save", "Open", and "Get current maps". Below this, there are two sections for TPDO1 and TPDO2. Each section has a "Send Method" dropdown set to 254, an "info" button, and an "Event timer (ms)" field set to 5. Under TPDO1, there are several rows for "No. TAG" and "Length (bits)". The first row has TAG 507 and Length 16, with a checked checkbox. The second row has TAG 105 and Length 32, also with a checked checkbox. The other rows have empty TAG and Length fields and unchecked checkboxes. Under TPDO2, there is one row with TAG 462 and Length 32, with a checked checkbox. At the bottom, there is a bar with six buttons: "Send mapping" (5), "Store parameters" (1, highlighted with a red box), "Heartbeat" (3), "Preoperational" (4), "Operational" (6), and "Reset node" (2).

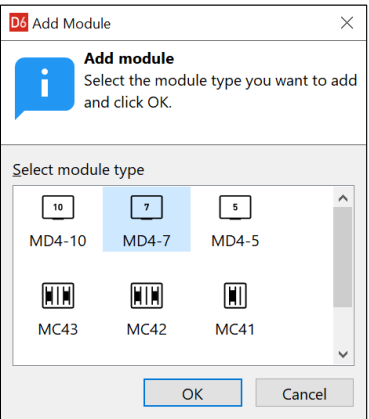
4 Configuration and programming with IQANDESIGN

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

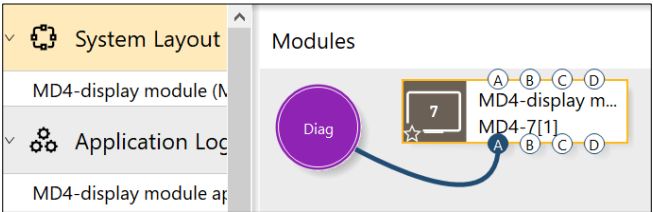
4.1 Configuration

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

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



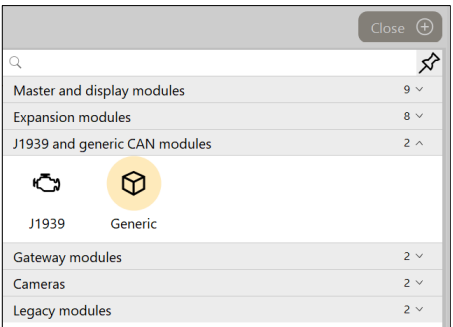
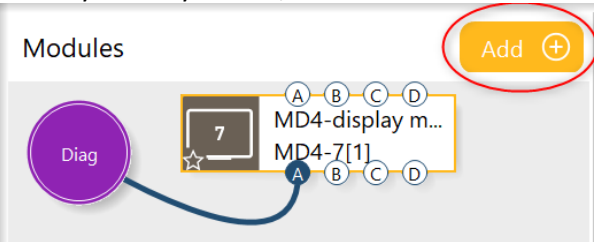
From system layout tab, select the module controller and set the properties at the left pane to match your physical configuration.



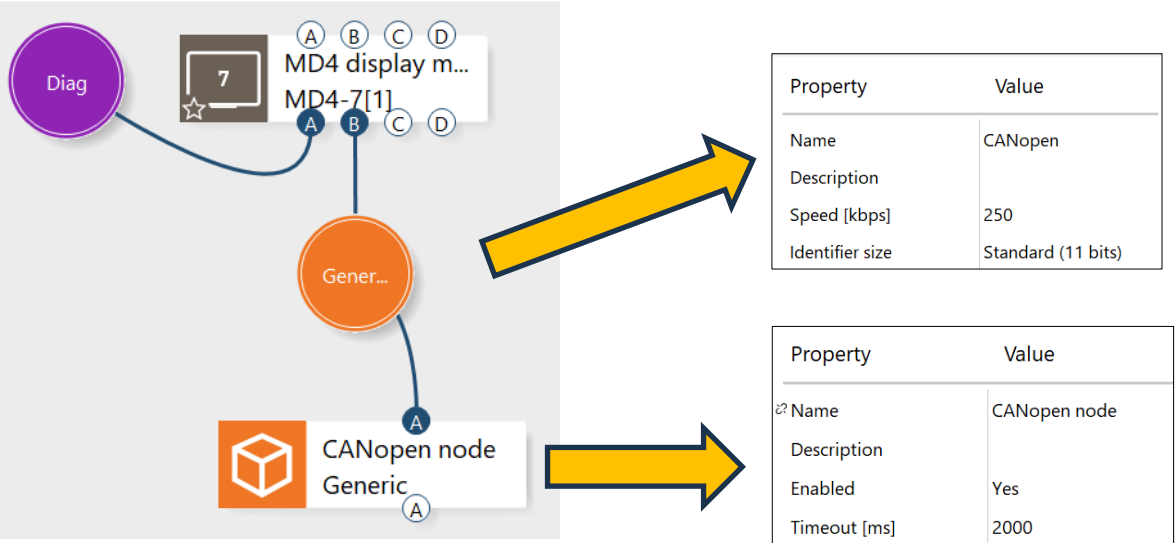
Property	Value
Name	MD4-display modu
Description	
Address	1
Optional	No
RTC enabled	Yes
> J1939	{39; No; Yes; Yes}
Terminate CAN-A	Yes
Terminate CAN-B	Yes
Terminate CAN-C	Yes
Terminate CAN-D	Yes
> Ethernet	{192.168.10.55; 255
IP address	192.168.10.55
Subnet mask	255.255.255.0
Default gateway	192.168.10.1
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.



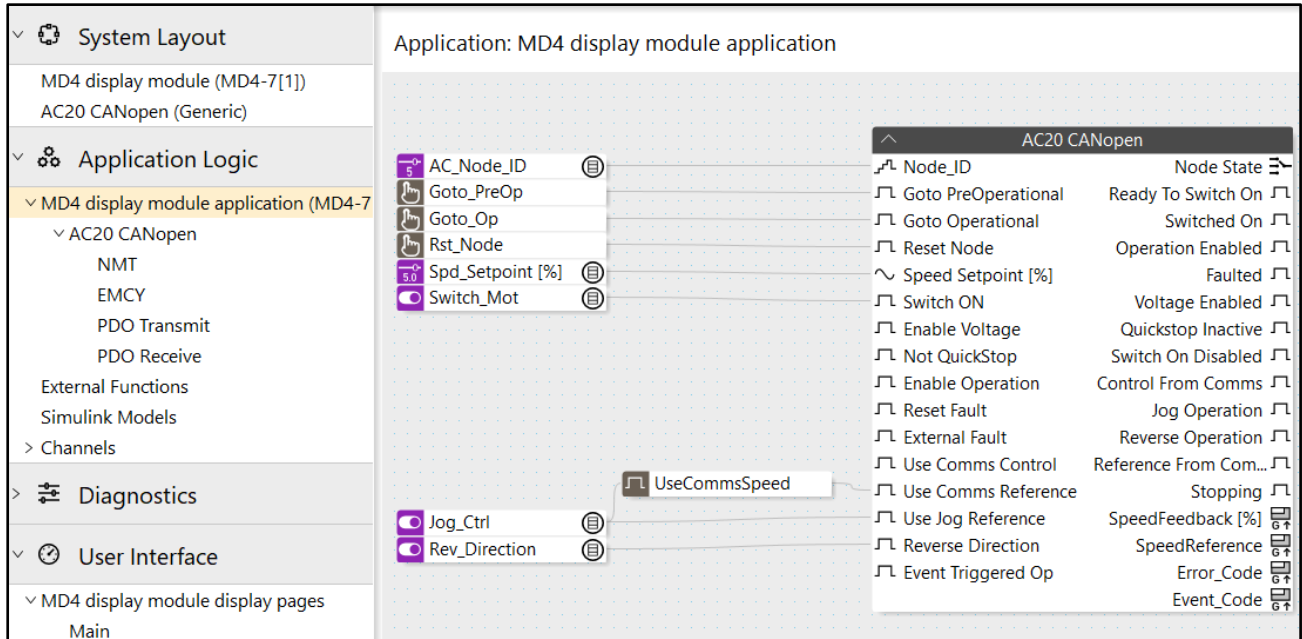
Drag and drop the just added generic module node “A” to the master node according to your physical connection. Select the generic module then the connection and set the properties at the left pane.



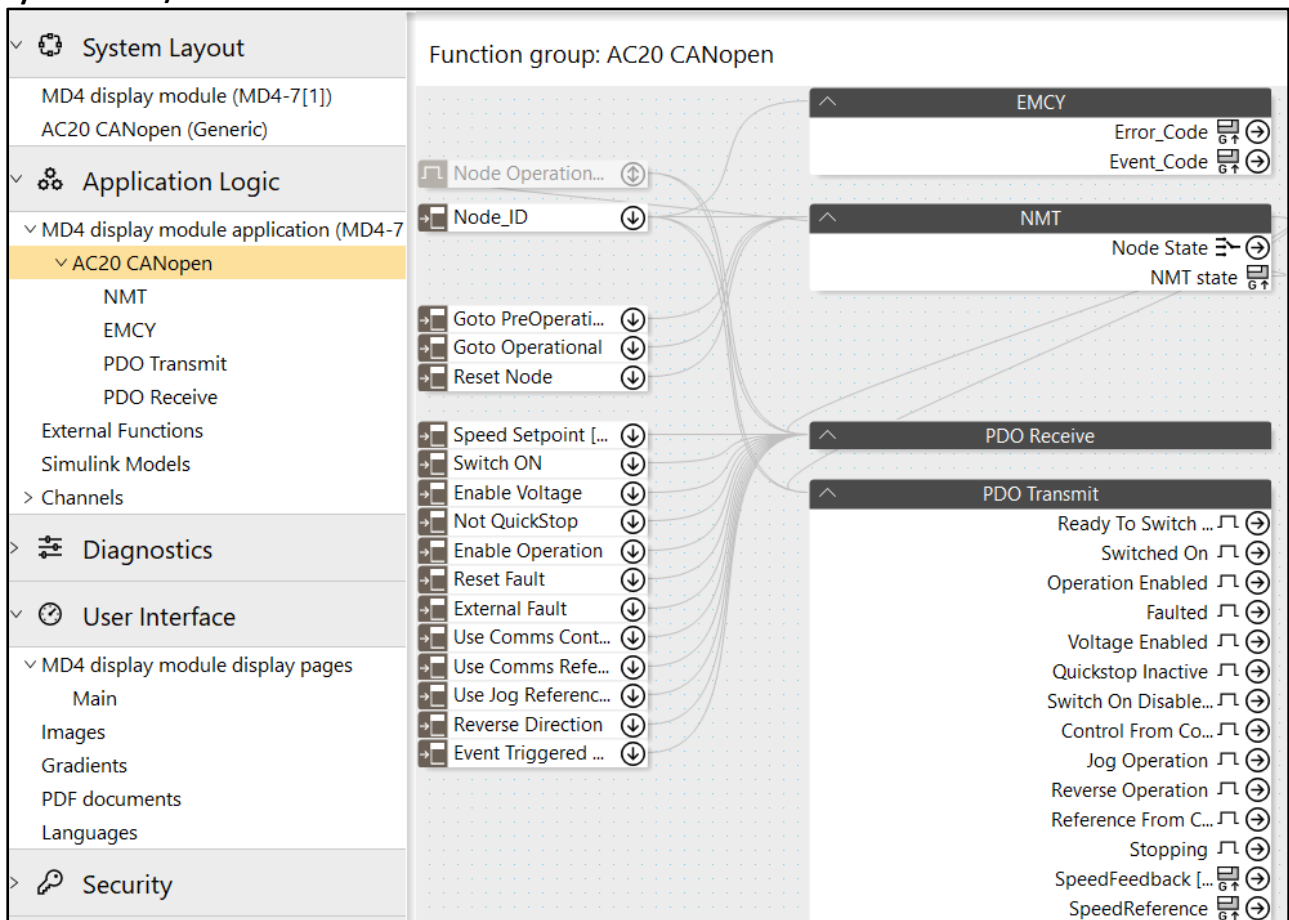
4.2 Programming

4.2.1 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.

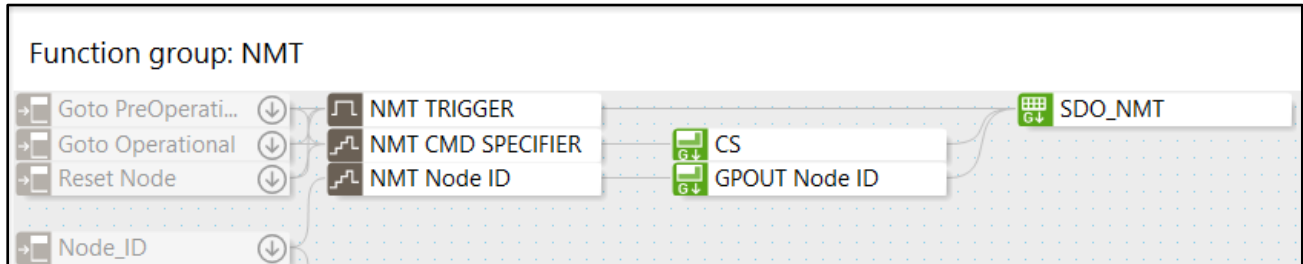


each function block implements a specific set of operations like in this case the **EMCY service**, **NMT state**, **cyclic receive/transmit PDO**.



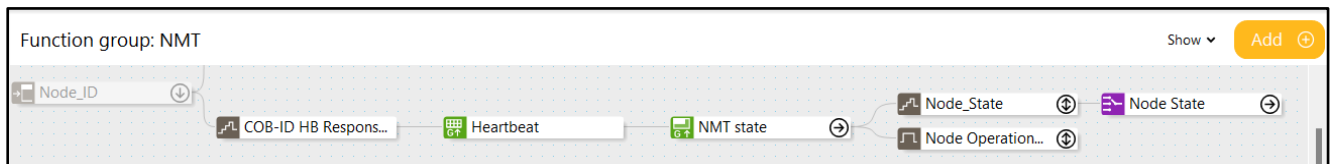
a) Network Management

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

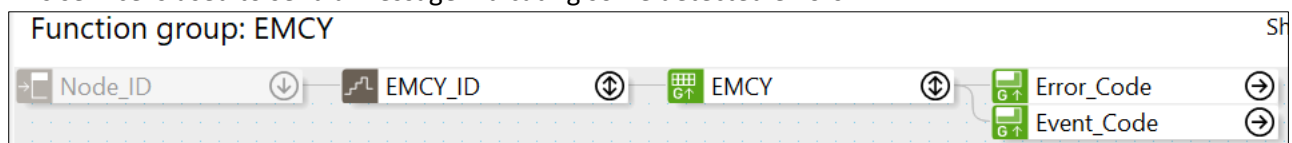
The device transmits at regular intervals a heartbeat message which contains the status of the device via a specified COB-ID.



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.

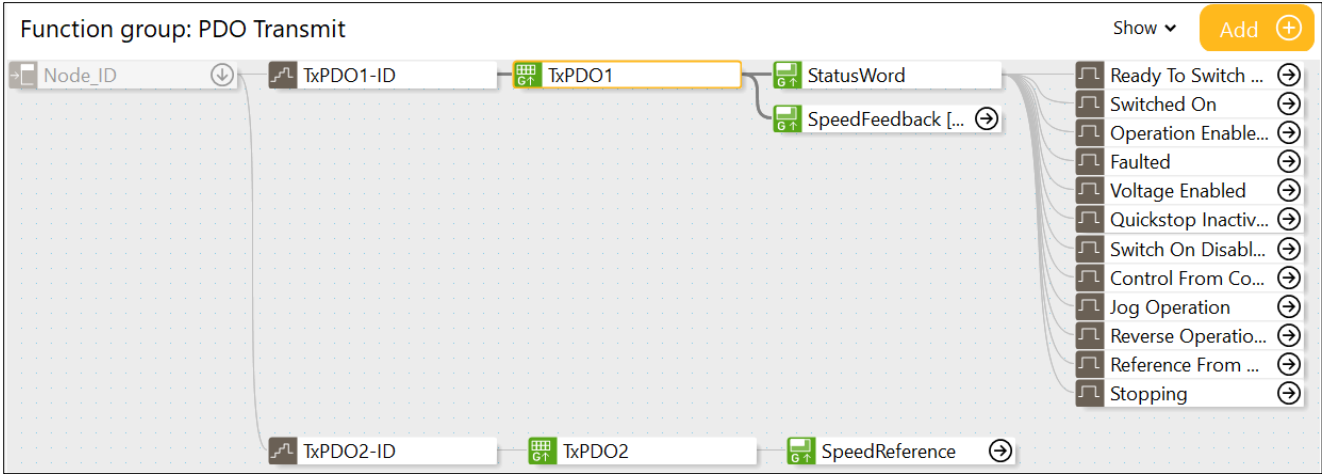


AC Drive transmit error code and the error ID via the specified COB-ID

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

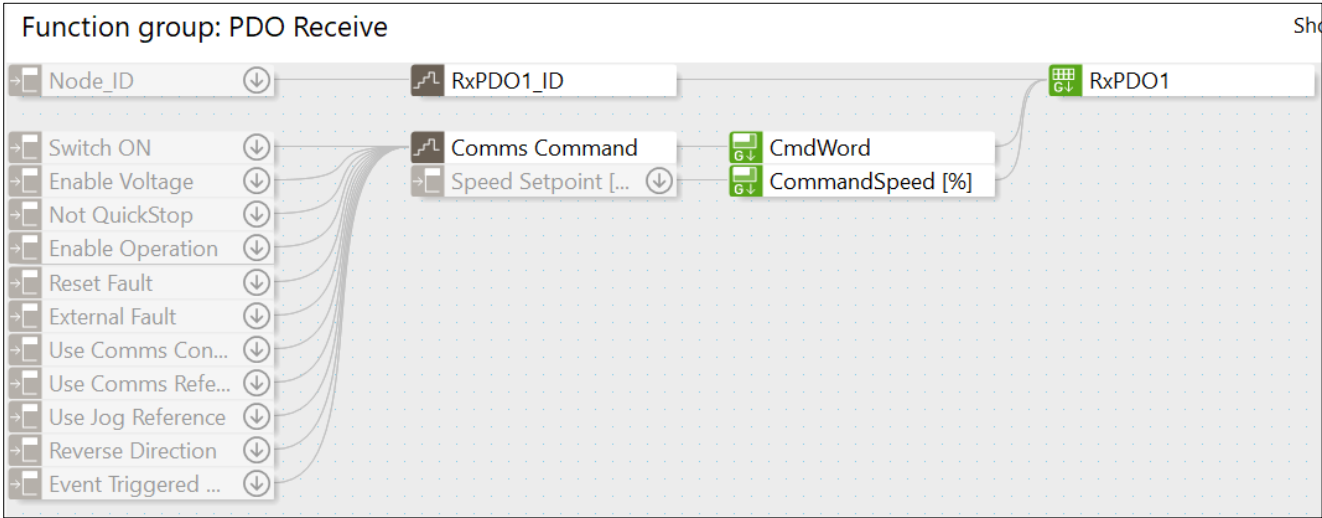
c) Transmit PDO operation.

The generic frame input is used to read CANopen frame cyclically from the AC Drive



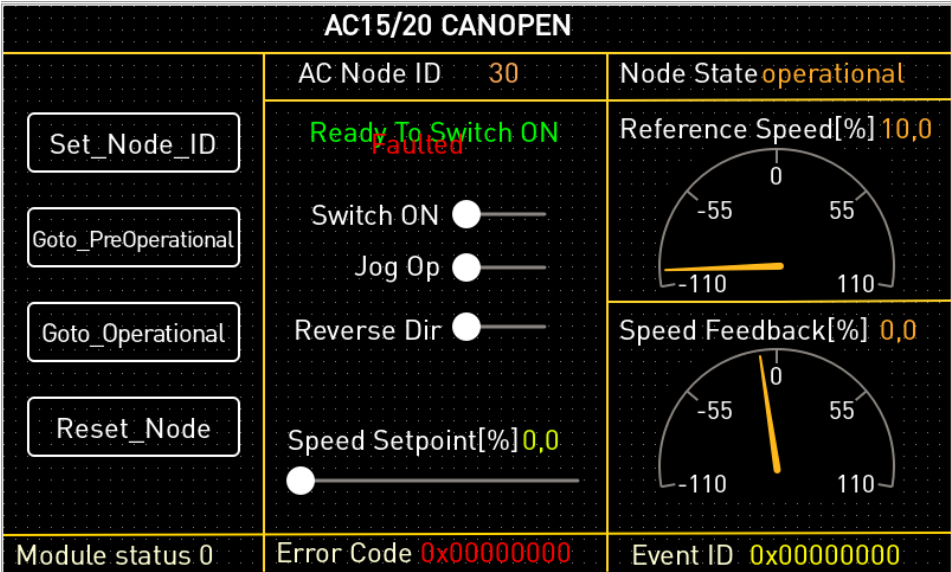
d) Receive PDO operation.

The generic frame output is used to write cyclically the commands to the AC Drive



4.2.2 User interface

Build and design a user interface to control AC Drive



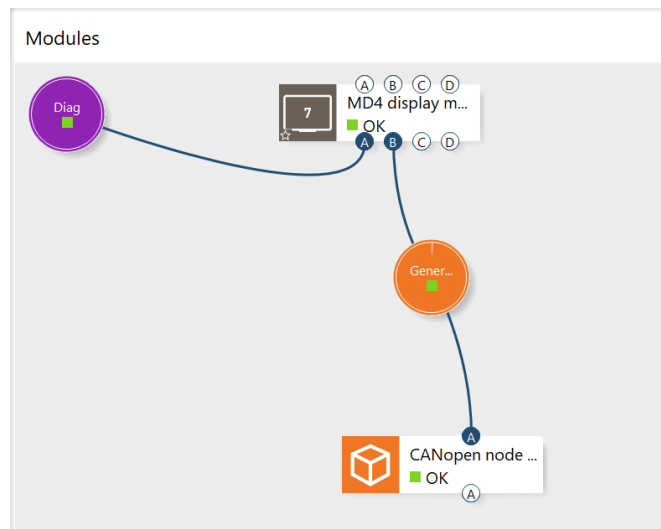
4.3 Run AC20 CANopen Drive

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 on IQAN HMI to enter the corresponding node address of your AC20 CANopen.



with the node state in **"Preoperational"**, click on **"Goto Operational"** to enable cyclical data exchange between the IQAN controller and the AC CANopen.

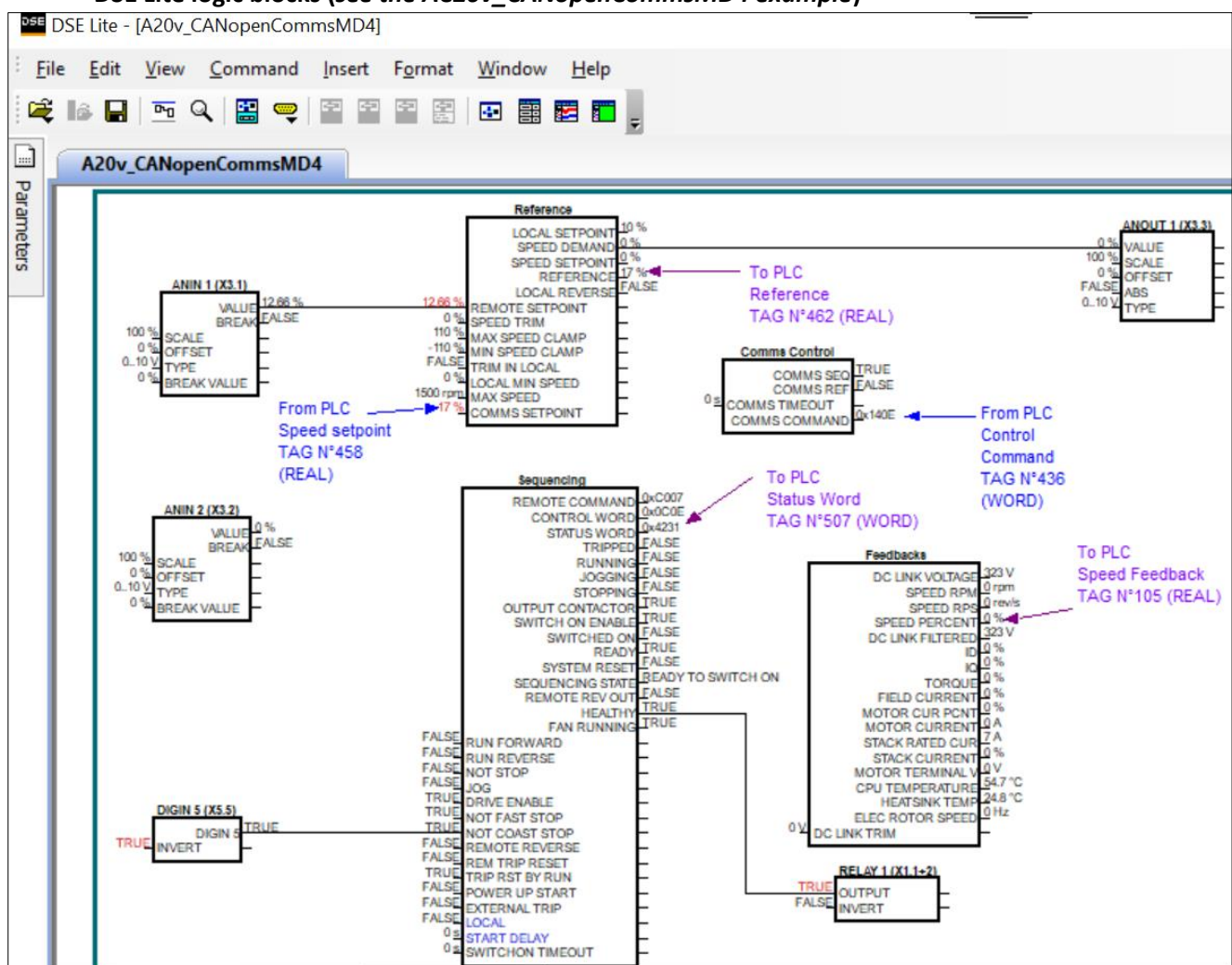
To run the drive, set the **"Speed Setpoint [%]"**, then use the command **"Switch ON"** to start the motor. Switch to local speed using the **"Jog OP"** command and use the **"Reverse Dir"** to manage the sense of motor rotation.

AC20 CANopen		0,3%
Node_ID	30	Node Sta... erational
Goto Pre...	False	Ready To ... True
Goto Ope...	False	Switched ... True
Reset No...	False	Operatio... True
Speed Se...	45,00	Faulted ... False
Switch ON	True	Voltage E... True
Enable Vo...	True	Quickstop... True
Not Quick...	True	Switch On... False
Enable O...	True	Control Fr... True
Reset Fault	False	Jog Oper... False
External F...	False	Reverse O... False
Use Com...	True	Reference... True
Use Com...	True	Stopping ... False
Use Jog R...	False	SpeedFee... 45,67
Reverse D...	False	SpeedRef... 45,00
Event Trig...	False	Error_Cod... 0
		Event_Co... 0

✓ 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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