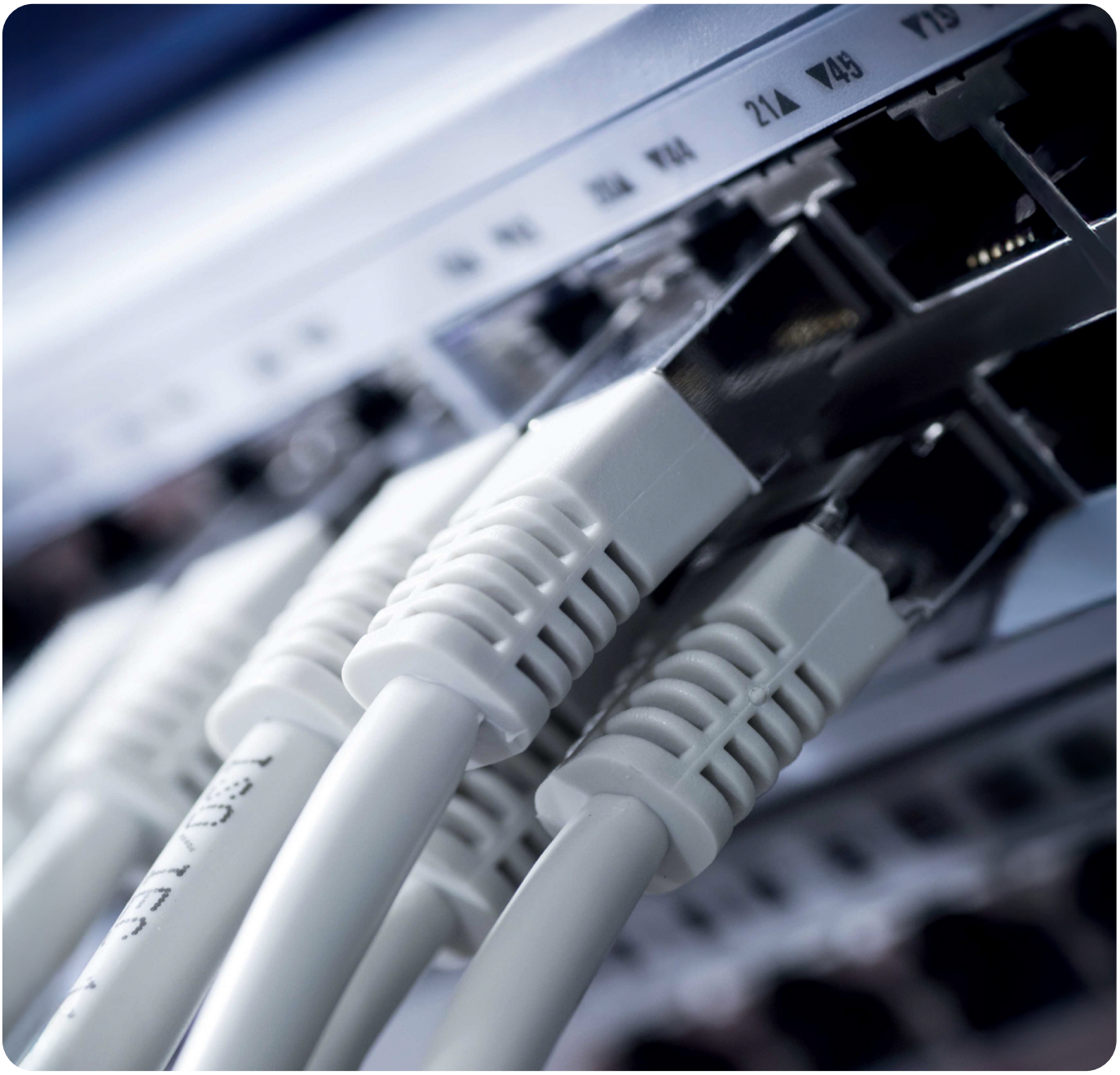
Installation Guide

VLT® EtherNet/IP MCA 121

VLT® HVAC Drive FC 102, VLT® Refrigeration Drive FC 103, VLT® AQUA Drive FC 202, VLT® AutomationDrive FC 301/FC 302, VLT® Decentral Drive FCD 302



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Contents

1 Introduction

1.1 Purpose of the Installation Guide

This installation guide provides information for the quick installation of a VLT® EtherNet/IP MCA 121 in a VLT® drive.

The installation guide is intended for qualified personnel. Users are assumed to be familiar with:

- VLT® drives.
- EtherNet/IP technology.
- The PC or PLC that is used as a master in the system.

Read the instructions before installation and ensure that the instructions for safe installation are observed.

1.2 Trademarks

VLT® is a registered trademark for Danfoss A/S.

EtherNet/IP™ is a trademark of ODVA, Inc.

1.3 Additional Resources

Resources available for the drives and for optional equipment:

- The drive-specific operating guide of the relevant drive provides the necessary information for getting the drive up and running.
- The drive-specific design guide of the relevant drive provides detailed information about capabilities and functionality to design motor control systems.
- The drive-specific programming guide of the relevant drive provides greater details on working with parameters.
- The *VLT® Ethernet Fieldbuses MCA 12X Installation Guide* provides information about installing and troubleshooting the EtherNet/IP interface.
- The *VLT® EtherNet/IP MCA 121 Programming Guide* provides information about configuring the system, programming, and troubleshooting.
- The *VLT® Motion Control Tool MCT 10 Operating Guide* provides information for installation and use of the software on a PC.

Supplementary publications and guides are available from Danfoss. See www.danfoss.com for listings.

1.4 Document and Software Versions

This manual is regularly reviewed and updated. All suggestions for improvement are welcome.

The original language of this guide is English.

Table 1: Document and Software Versions

Edition	Remarks	Software version
AN304840617560, version 0601	Editorial updates	7.00

1.5 Product Overview

1.5.1 Intended Use

This installation guide relates to the EtherNet/IP interface.

Code number:

- 130B1119 (uncoated)
- 130B1219 (conformal coated)

The VLT® EtherNet/IP MCA 121 interface is designed to communicate with any system complying with the CIP EtherNet/IP standard. EtherNet/IP provides network tools to deploy standard Ethernet technology for manufacturing applications while enabling internet and enterprise connectivity.

VLT® EtherNet/IP MCA 121 is intended for use with:

- VLT® HVAC Drive FC 102.
- VLT® Refrigeration Drive FC 103.
- VLT® AQUA Drive FC 202.
- VLT® AutomationDrive FC 301/FC 302.
- VLT® Decentral Drive FCD 302.

1.5.2 Items Supplied

When the fieldbus option is not factory-mounted, the following items are supplied:

- Fieldbus option
- LCP cradle
- Front covers (in various sizes)
- Stickers
- Accessory bags
- Strain relief (only for A1 and A2 enclosures)
- Installation guide.

1.5.3 More Accessories

To allow more space for Ethernet connectors, Danfoss provides several fixtures. The fixtures are to the right of the control card.

Table 2: Code Numbers for Ethernet Fixtures

Enclosure sizes	Code numbers
A5, B1, B2, C1, and C2	130B5436
A4	130B5612

1.6 Approvals and Certifications

More approvals and certifications are available. For more information, contact a local Danfoss partner.

1.7 Disposal

Do not dispose of equipment containing electrical components together with domestic waste.
Collect it separately in accordance with local and currently valid legislation.

2 Safety

2.1 Safety Symbols

The following symbols are used in Danfoss documentation and products.

⚠ DANGER

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

Indicates information considered important, but not hazard-related (for example, messages relating to property damage).

	ISO warning symbol for general warnings
	ISO warning symbol for hot surfaces and burn hazard
	ISO warning symbol for high voltage and electric shock
	Symbol for indicating the required discharge time of the capacitors in the product.
	ISO action symbol for referring to the instructions

2.2 Qualified Personnel

To allow trouble-free and safe operation of the unit, only qualified personnel with proven skills are allowed to transport, store, assemble, install, program, commission, maintain, and decommission this equipment.

Persons with proven skills:

- Are qualified electrical engineers, or persons who have received training from qualified electrical engineers and are suitably experienced to operate devices, systems, plants, and machinery in accordance with pertinent laws and regulations.
- Are familiar with the basic regulations concerning health and safety/accident prevention.
- Have read and understood the safety guidelines given in all manuals provided with the unit, especially the instructions given in the operating guide.
- Have a good knowledge of the generic and specialist standards applicable to the specific application.
- Are cleared by the asset owner to have access to the work zone according to the security level in the zone.

2.3 Safety Precautions

⚠ WARNING

LACK OF SAFETY AWARENESS

This guide provides important information on preventing injury and damage to the equipment or the system. Ignoring this information can lead to death, serious injury, or severe damage to the equipment.

- Make sure to fully understand the dangers and safety measures present in the application.
- Before performing any electrical work on the drive, lock out and tag out all power sources to the drive.

⚠ WARNING

HAZARDOUS VOLTAGE

Drives contain hazardous voltage when connected to the AC mains or connected on the DC terminals. Failure to perform installation, start-up, and maintenance by qualified personnel can result in death or serious injury.

- Only qualified personnel must perform installation, start-up, and maintenance.

⚠ WARNING

UNINTENDED START

When the drive is connected to AC mains, DC supply, or load sharing, the motor may start at any time. The motor may start by activation of an external switch, a fieldbus command, an input reference signal from the LCP or LOP, via remote operation using MCT 10 Set-up software, or after a cleared fault condition. Unintended start during programming, service, or repair work can result in death, serious injury, or property damage.

- Disconnect the drive from the mains.
- Press *[Off/Reset]* on the LCP before programming parameters.
- Ensure that the drive is fully wired and assembled when it is connected to AC mains, DC supply, or load sharing.

⚠ WARNING

DISCHARGE TIME

The drive contains DC-link capacitors, which can remain charged even when the drive is not powered. High voltage can be present even when the warning indicator lights are off.

Failure to wait the specified time after power has been removed before performing service or repair work could result in death or serious injury.

- Stop the motor.
- Disconnect AC mains, permanent magnet type motors, and remote DC-link supplies, including battery backups, UPS, and DC-link connections to other drives.
- Wait for the capacitors to discharge fully before performing any service or repair work. The discharge time is specified on the drive product label.
- Use a measuring device to make sure that there is no voltage before opening the drive or performing any work on the cables.

⚠ WARNING

ELECTRICAL SHOCK HAZARD - HIGH LEAKAGE CURRENT

Leakage currents exceed 3.5 mA. Failure to connect the system properly to protective earth may result in death or serious injury.

- Ensure reinforced protective earthing conductor according to IEC 60364-5-54 cl. 543.7 or according to local safety regulations for high touch current equipment. The reinforced protective earthing of the converter can be done with:
- PE conductor with a cross-section of at least 10 mm^2 Cu or 16 mm^2 Al.
- PE conductor completely enclosed within an enclosure or otherwise protected throughout its length against mechanical damage.

⚠ WARNING

INTERNAL FAILURE HAZARD

An internal failure in the drive can result in serious injury when the drive is not properly closed.

- Ensure that all safety covers are in place and securely fastened before applying power.

3 Installation

3.1 Safety Instructions

See 2.3 Safety Precautions for general safety instructions.

3.2 EMC-compliant Installation

To obtain an EMC-compliant installation, follow the instructions provided in the product-relevant operating guide and design guide. Refer to the fieldbus master manual from the PLC supplier for further installation guidelines.

3.3 Grounding

- Ensure that all stations connected to the fieldbus network are connected to the same ground potential.
- When distances between the stations in a fieldbus network are long, connect the individual station to the same ground potential. Install equalizing cables between the system components.
- Establish a grounding connection with low HF impedance, for example, by mounting the drive on a conductive mounting plate.
- Keep the ground wire connections as short as possible.
- To establish electrical contact between the cable shield and the drive enclosure, use metal grommets or the clamps provided on the equipment.
- Use high-strand wire to reduce burst transient.

3.4 Cable Routing

For more information on cabling, refer to the product-specific design guide and installation guide included in the shipment.

NOTICE

EMC INTERFERENCE

Failure to isolate fieldbus communication, motor, and brake resistor cables can result in unintended behavior or reduced performance.

- Use shielded cables for motor and control wiring, and separate cables for fieldbus communication, motor wiring, and brake resistor.
- A minimum of 200 mm (7.9 in) clearance between power, motor, and control cables is required. For power sizes above 315 kW (450 hp), increase the minimum distance to 500 mm (20 in).

NOTICE

CABLE ROUTING

- When the fieldbus cable intersects with a motor cable or a brake resistor cable, ensure that the cables intersect at an angle of 90°.

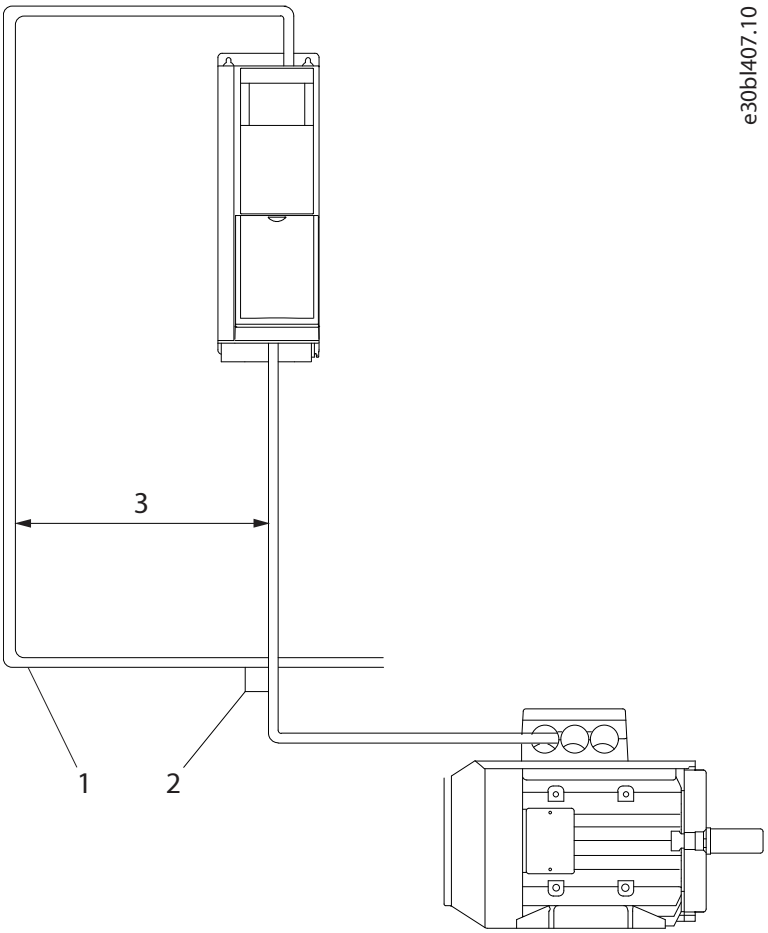


Figure 1: Cable Routing

1	Fieldbus cable	2	90° intersection
3	≥200 mm (7.9 in) (≥ 500 mm (20 in) for power sizes >315 kW (450 hp))		

3.5 Topology

3.5.1 Overview of Topology

The VLT® EtherNet/IP MCA 121 module features a built-in Ethernet switch with 2 Ethernet RJ45 connectors. The fieldbus module enables the connection of several EtherNet/IP options in a line topology as an alternative to a traditional star topology.

The 2 ports are equal. If only 1 connector is used, either port can be used.

3.5.2 Star Topology

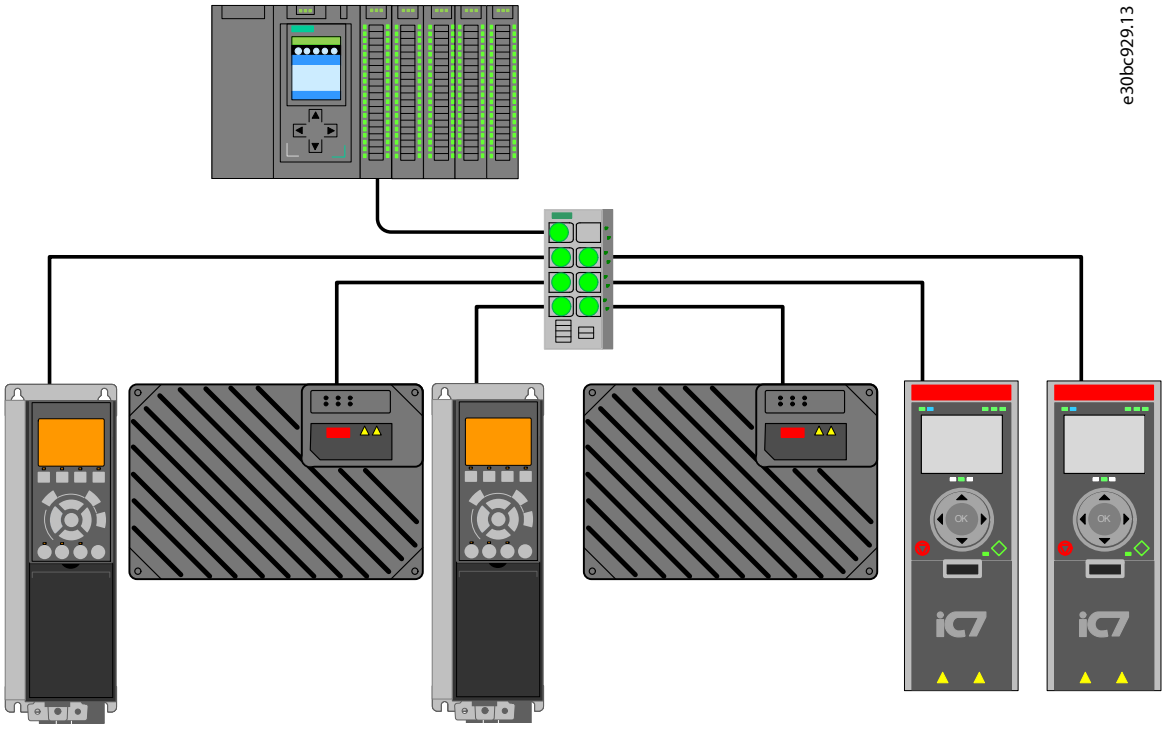


Figure 2: Star Topology

3.5.3 Line Topology

In many applications, line topology enables simpler cabling and the use of smaller or fewer Ethernet switches. The EtherNet/IP interface supports line topology with its 2 ports and a built-in Ethernet switch.

When using line topology, take precautions to avoid timeout in the PLC when more than 8 drives are installed in series. Each drive in the network adds a small delay to the communication due to the built-in Ethernet switch. When the update time is too short, the delay can lead to a timeout in the PLC. Set the update time as shown in Table 3. The numbers given are typical values and can vary from installation to installation.

Table 3: Minimum Update Time

Number of drives connected in series	Minimum update time [ms]
<8	2
8–16	4
16–32	8
33–50	16
>50	Not recommended

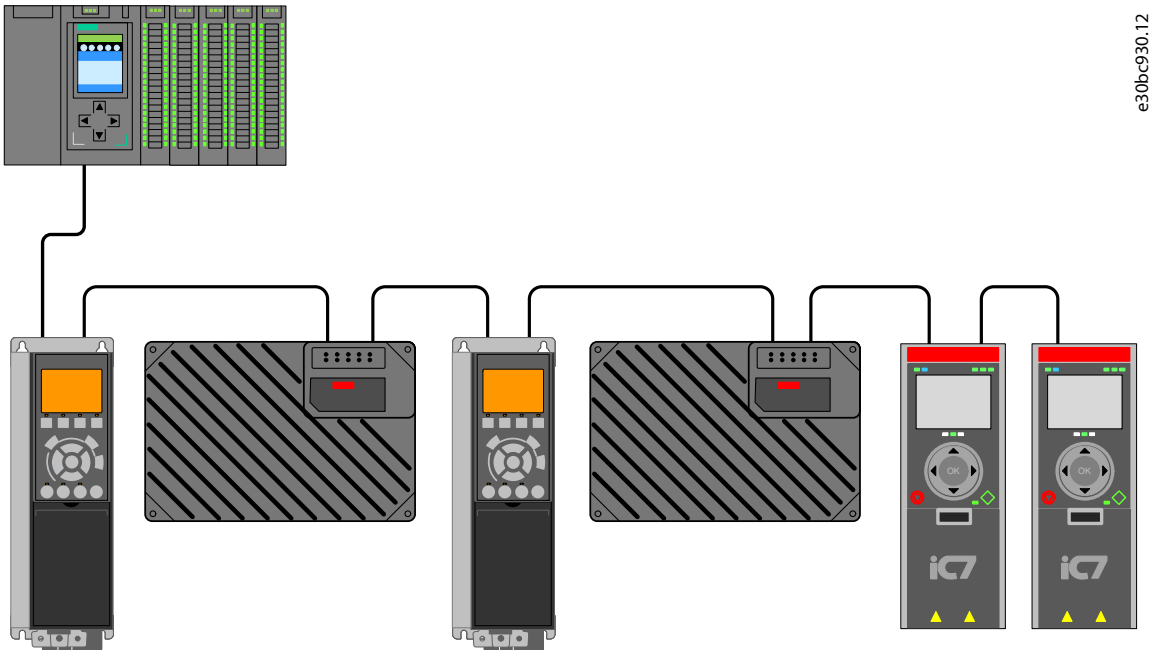


Figure 3: Line Topology

In a line topology, all drives must be powered, either by mains or by their 24 V DC option cards for the built-in switch to work.

Mounting of different power sizes in a line topology may result in unwanted power-off behavior when using control word timeout (parameter ***8-02 Control Word Source***). Smaller drives discharge faster than bigger drives. This can result in loss of link in the line topology, which may lead to control word timeout. To avoid this timeout, mount the drive with the longest discharge time first in the topology.

3.5.4 DLR

3.5.4.1 DLR Function

DLR is an ODVA-defined method of managing communication on an Ethernet ring topology.

The DLR architecture defines the following:

- The method to avoid that messages circulate forever.
- Supervisor and ring nodes.
- How to detect a break in the network and how to reconfigure into a linear network.
- How to detect that the network is repaired.
- How to establish the network into ring mode.

Advantages:

- Simple installation
- Resilience to a single point of failure on the network.
- Fast recovery time when a single fault occurs on the network.

3.5.4.2 DLR Architecture

The DLR network is made up of supervisor nodes and ring nodes.

A supervisor node is labeled to 1 of the devices in the ring topology. It is also possible to have a backup supervisor node (optional). All other devices in the ring topology are referred to as ring nodes.

- Active ring supervisor:
  - When multiple nodes are enabled as supervisor, the node with the numerically highest precedence becomes the active ring supervisor.
- Backup supervisor node:
  - Danfoss recommends configuring at least 1 other supervisor-capable node to act as a backup supervisor.

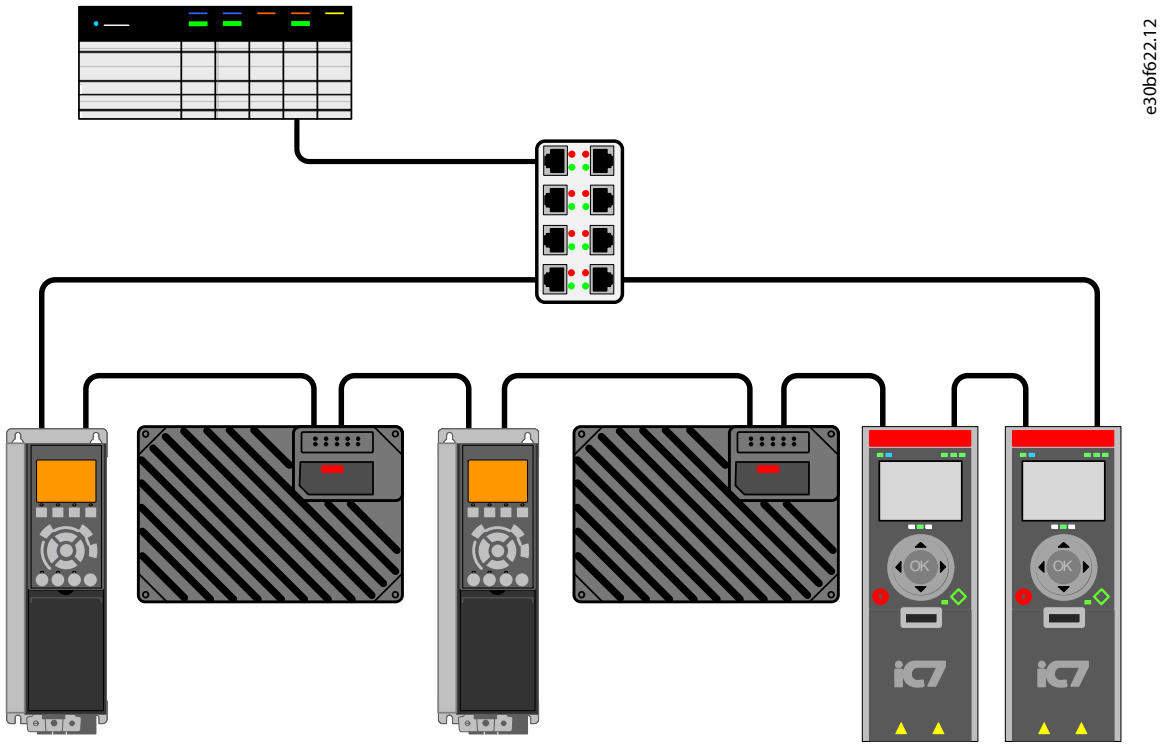


Figure 4: DLR Architecture

3.5.4.3 Working Principle

One of the nodes is defined as the supervisor and manages the network traffic.

The supervisor sends out a message from both ports, called a beacon frame. This message monitors the integrity of the ring.

Data packets are sent out through the primary port only. The secondary port is blocked from sending data.

A ring node receives the message. If it is the intended recipient, it consumes the message. Otherwise, the node forwards the message.

A ring node can also send messages. These messages are only received on the primary port as the secondary port is blocked. The following beacon-related parameters can be configured:

- Beacon interval:
  - The frequency that the active ring supervisor uses when sending a beacon frame through both of its ring ports.
- Beacon timeout:
  - The amount of time that the supervisor or ring nodes wait before timing out the reception of beacon frames and taking appropriate action

DLR is designed for up to 50 nodes in a DLR ring. If the application requires more than 50 nodes, use 2 or more DLR rings. Adding more than 50 nodes lead to malfunction and loss of communication.

Smaller networks give the following advantages:

- Better management of network traffic.
- Networks are easier to maintain.
- Lower risk of multiple fans.

Configure the application to monitor the condition of the ring.

3.5.4.4 Recovery

When the ring breaks, the beacon frame does not reach the secondary port of the supervisor. Hence, the ring node sends a link status message to the supervisor. Now, packets are sent through both ports of the supervisor. The ring acts as a linear topology.

Once the ring is repaired, the primary port of the supervisor continues to send a beacon frame. The supervisor then returns to sending the packets through the primary port only.

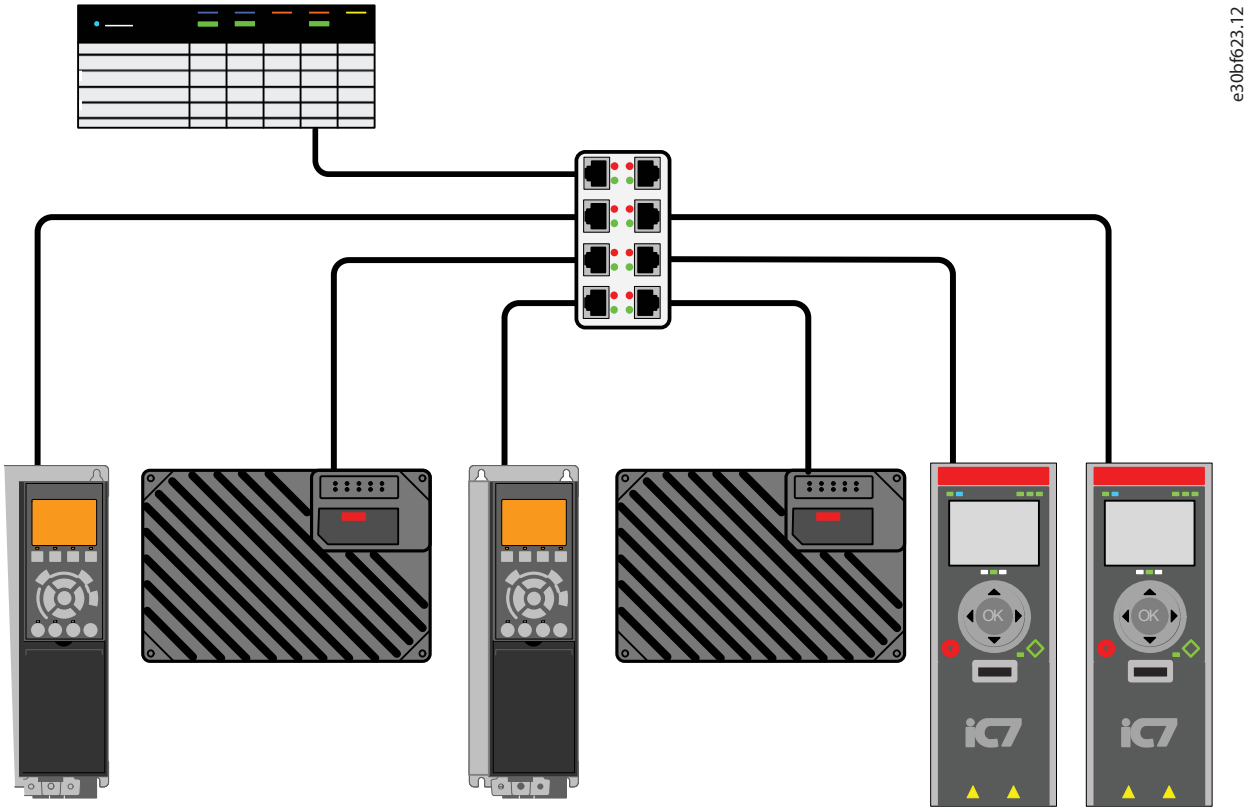


Figure 5: Ring Acting as Linear Topology

3.5.4.5 Set Up and Configure

To configure a DLR network, connect all devices to the network. Temporarily, avoid physically connecting 2 ring nodes, as DLR devices default to linear/star mode or operate as ring nodes within existing DLR networks.

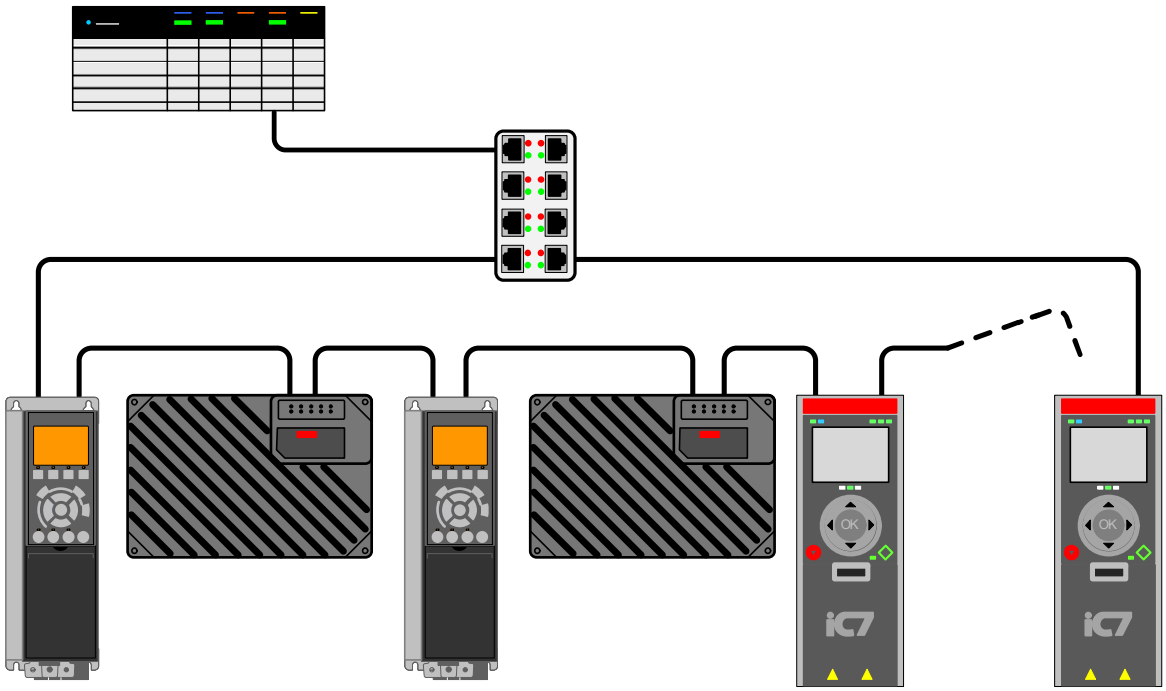


Figure 6: Configuration with 1 Physical Connection Left Out

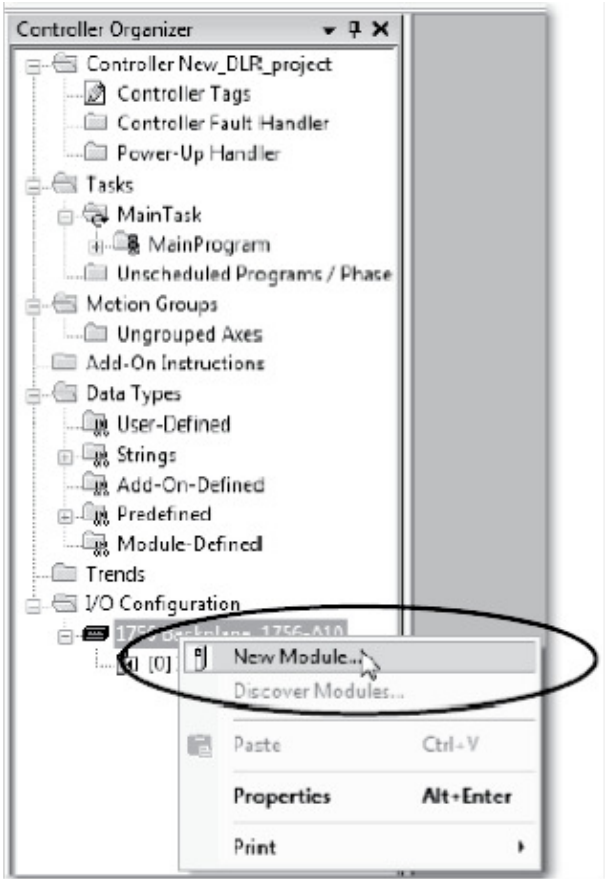
Recommended tools for configuration:

- Logix Designer application, version 21.000.000 or later.
- RS Logix 5000 software, version 17.00.01 to 20.xx.
- RSLinx® Classic Software, version 2.56.00 or later.

3.5.4.6 Configuration Tools

3.5.4.6.1 Setting Up with Logix Designer Application

1. Check that the controller is in program mode.
2. Right-click *1756 Backplane*.
3. Select *New Module*.



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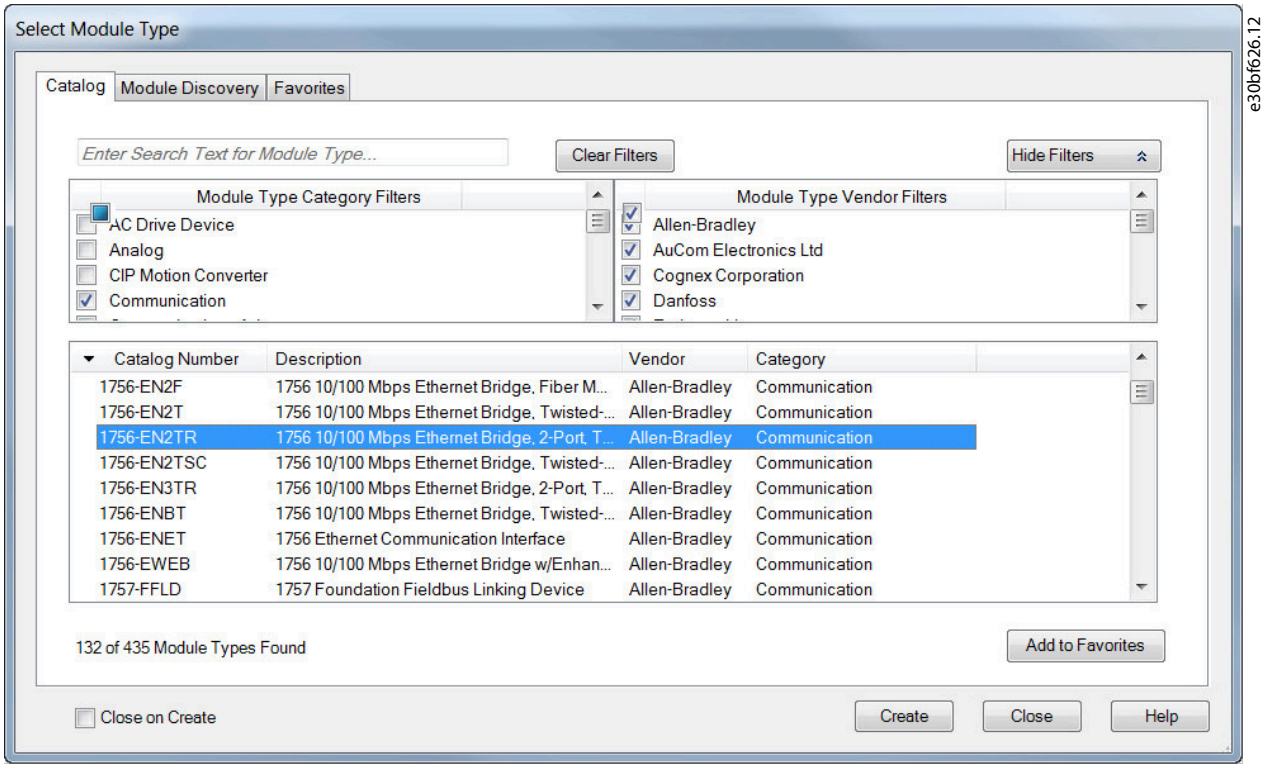
4. Select the module and click *Create*.



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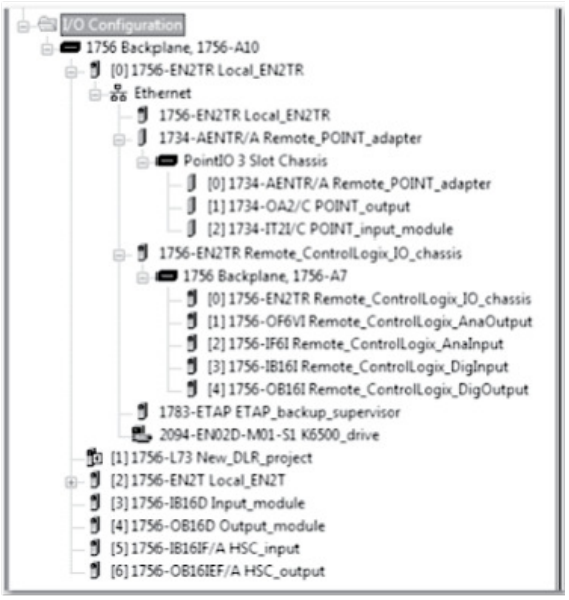
5. Configure the module and the rest of the project.



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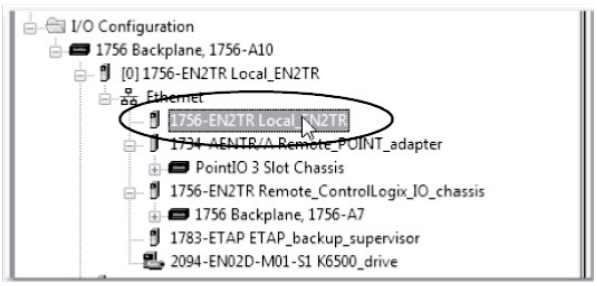
6. Download the project to the Logix controller.
7. Go online with the controller and leave it in program mode.

3.5.4.6.2 Setting Up with RX Logix 5000 Application

Prerequisites:

Ensure that the project is online on the controller.

1. Double-click a supervisor-capable device in the I/O configuration tree.



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2. On the *Network* tab, check the *Enable Supervisor Mode* checkbox.

   Communication takes effect immediately without clicking *Apply* or *OK*.

3. Click the *Advanced* button.
4. Configure supervisor-related parameters.
5. Click *Set*.

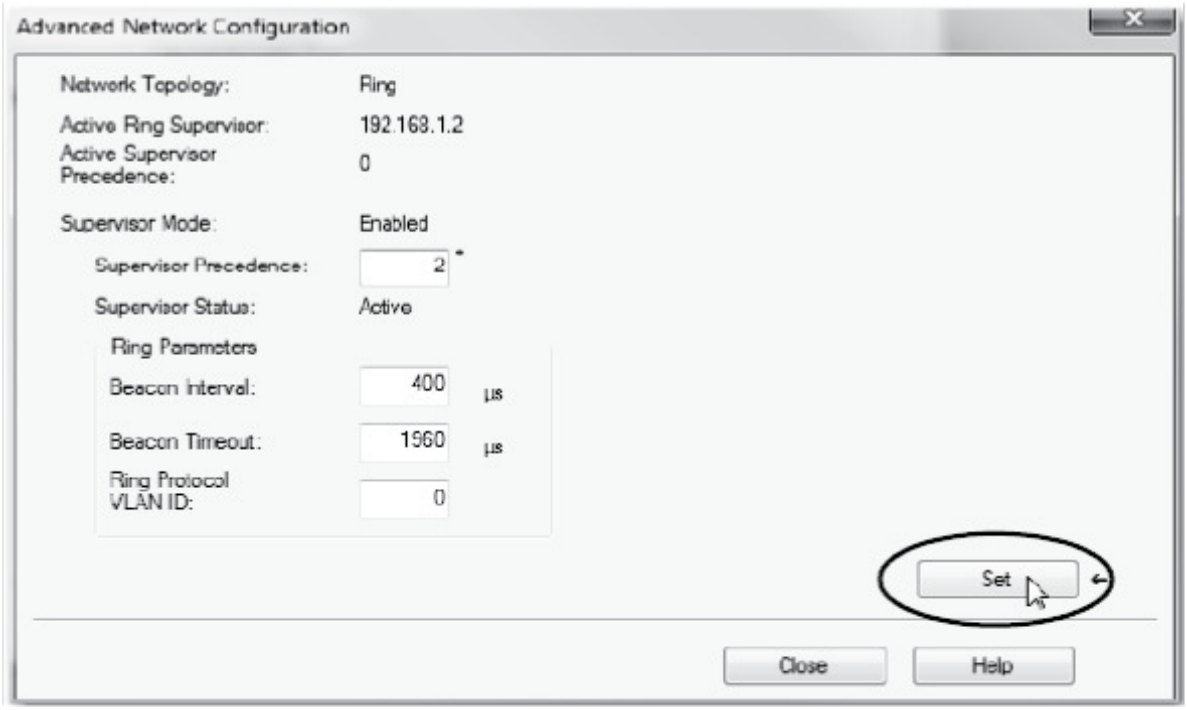

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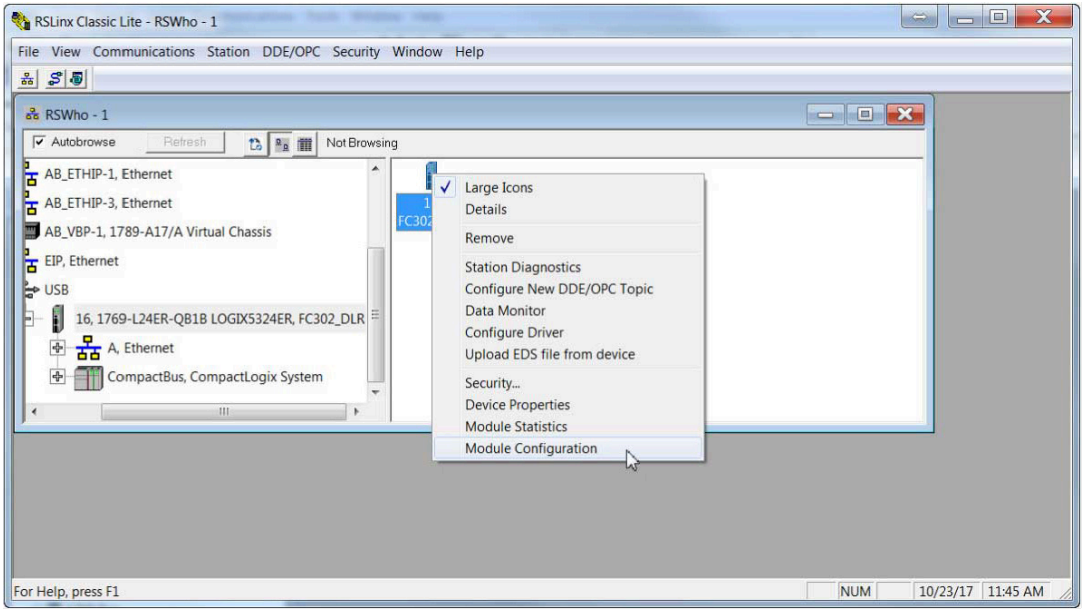
Table 4: Default Value of Functions

Function	Description	Default value
Supervisor precedence	It is possible to configure a supervisor precedence number for each device configured as a ting supervisor. The highest possible precedence value is 255. When multiple nodes are enabled as supervisor, the node with the highest precedence value is assigned as the active ring supervisor. The other nodes automatically become backup supervisor. • Configure at least 1 backup supervisor. • Set the wanted active ring supervisor with a relatively high supervisor-precedence value compared to the backup nodes. • Track the supervisor-precedence value of the network. If multiple supervisors are configured with the same precedence value, the node with the highest MAC address becomes the active supervisor. The factory setting value for all supervisor-capable devices is 0.	0
Beacon interval	The frequency of the active ring supervisor sending a beacon frame through both of its Ethernet ports. The parameter is user-configurable for any time from 200–100000 µs.	400 µs
Beacon timeout	The beacon timeout is the time that nodes wait before timing out the reception of beacon frames and taking appropriate action. Supervisors support a range of 400–500000 µs.	1960 µs
Ring protocol VLAN	Reserved for future use.	0

3.5.4.6.3 Setting Up with RSLinx Classic Application

1. Launch the RSLinx Classic software.
2. Browse to the DLR network.

3. Right-click the properties of the supervisor-capable node.
4. Select *Module Configuration*.



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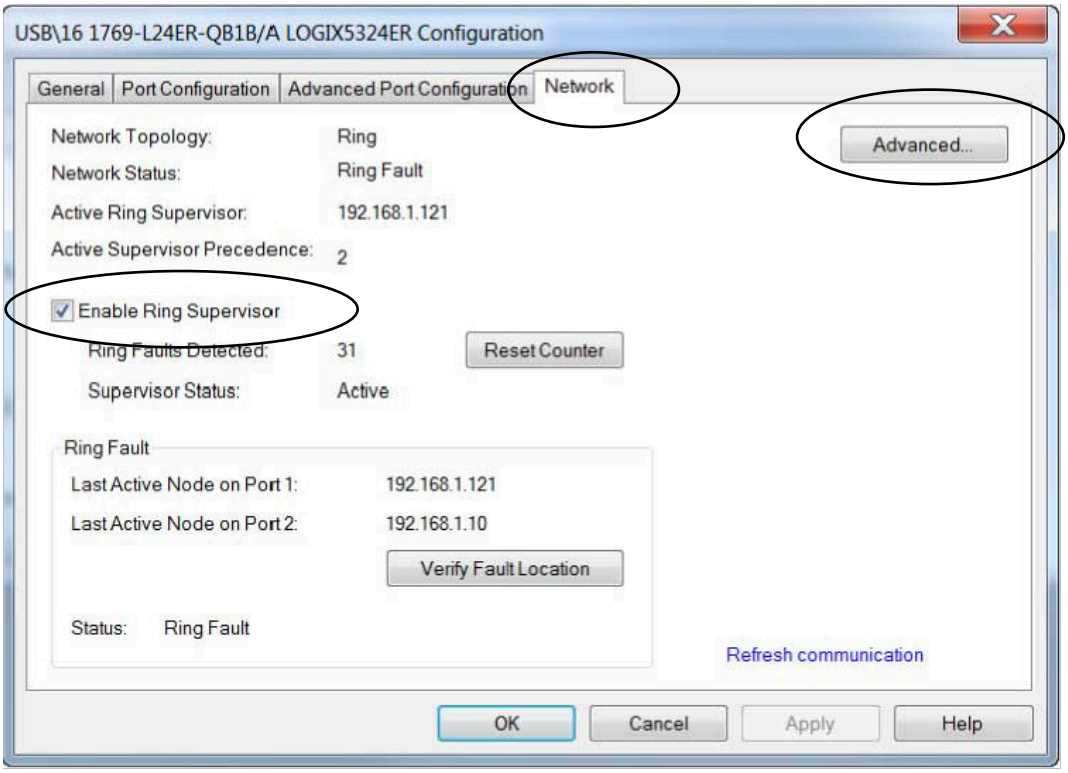
5. On the *Network* tab, checkmark *Enable Supervisor Mode*.
6. Click *Advanced*.



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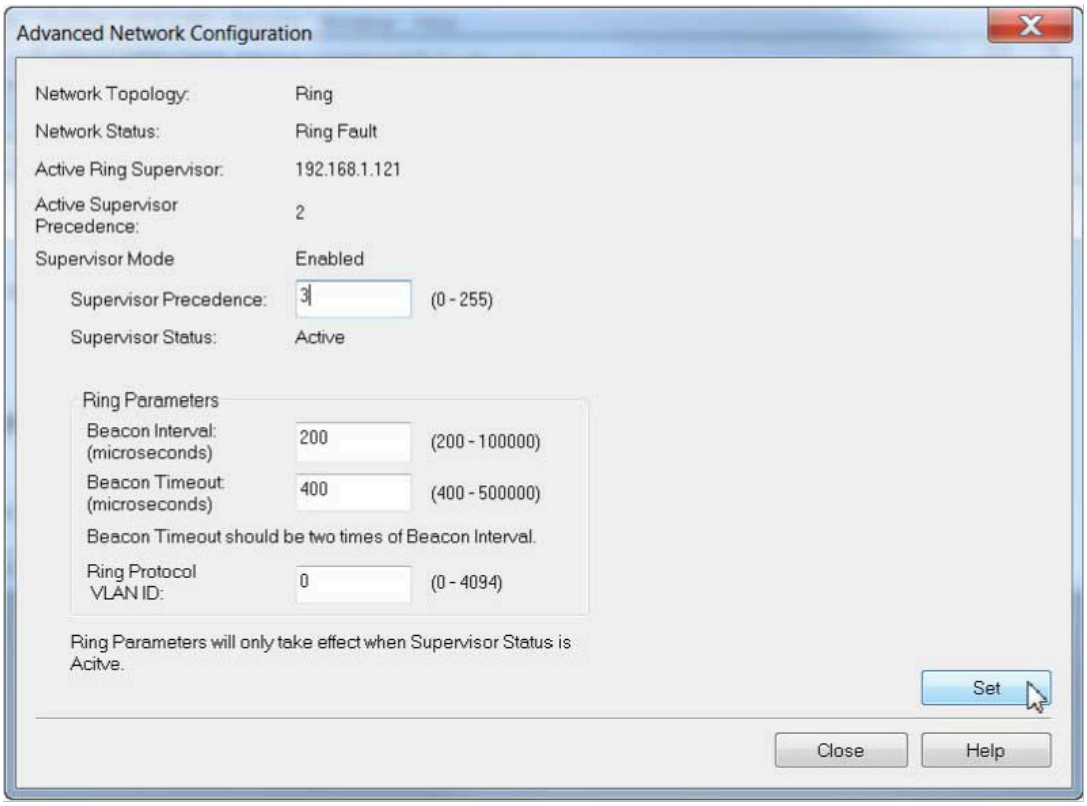
7. Configure the supervisor-related parameters as needed.



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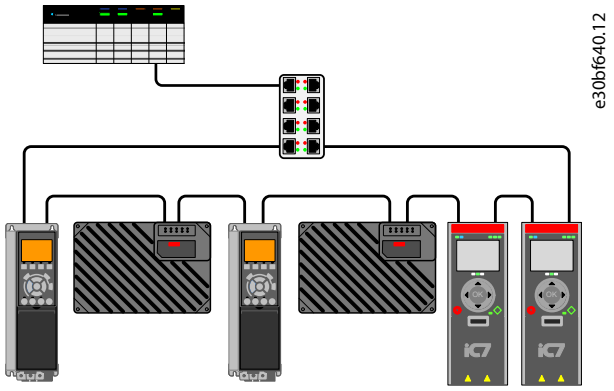
8. Click *Set*.
9. After configuring and enabling the ring supervisor nodes, establish a complete and fully functioning DLR network.



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3.5.4.6.4 Verifying the DLR Connection

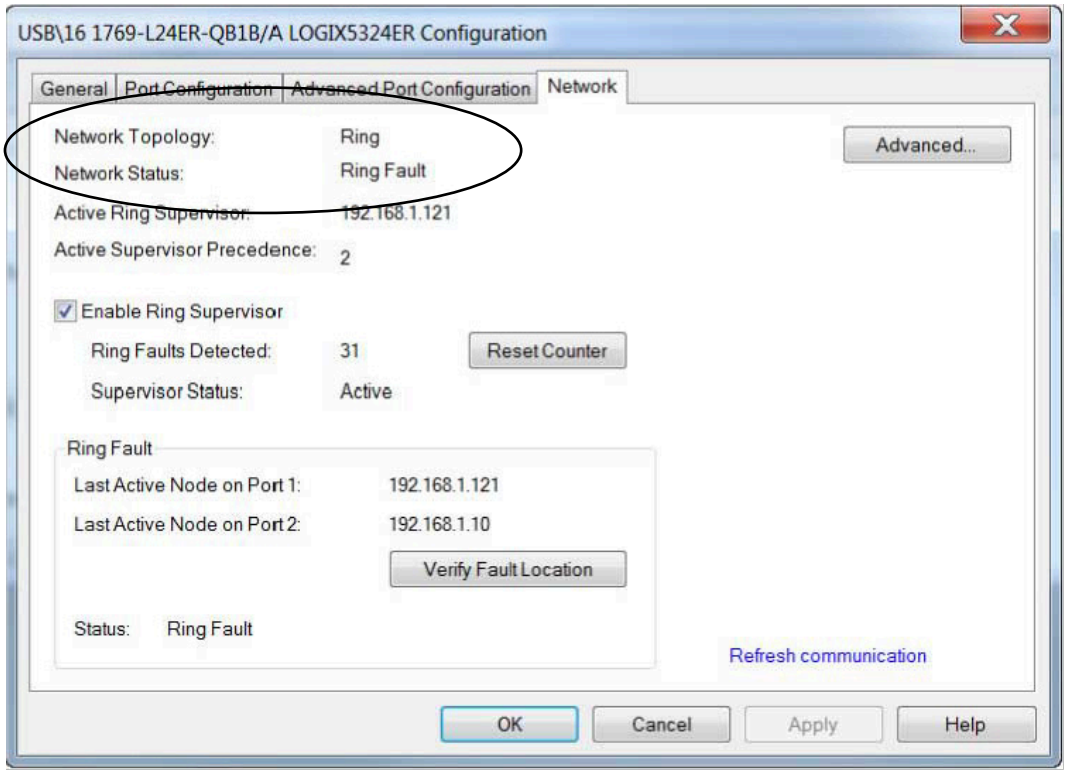
Verify the configuration and overall DLR network status in either Logix Designer application or RSLinx Classic software.

Table 5: Network Status

Network topology	Status
Linear/star	There is 1 supervisor configured for the network,
Ring	There is at least 1 node configured as supervisor.
Normal	There are no faults on the network.

1. Access the properties of the supervisor node.
2. Click the *Network* tab.

3. Check the *Network Topology* and *Network Status* fields.



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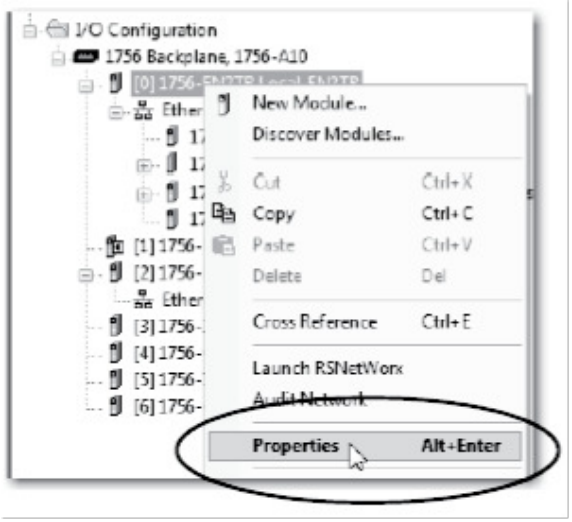
3.5.4.7 Monitoring Tools

3.5.4.7.1 Monitoring Network via Logix Designer

Versions 21.00.00 and later provide status pages to monitor the network. Monitoring the diagnostic information of the network is possible in online mode only.

1. Right-click the active supervisor node.
2. Select *Properties*.



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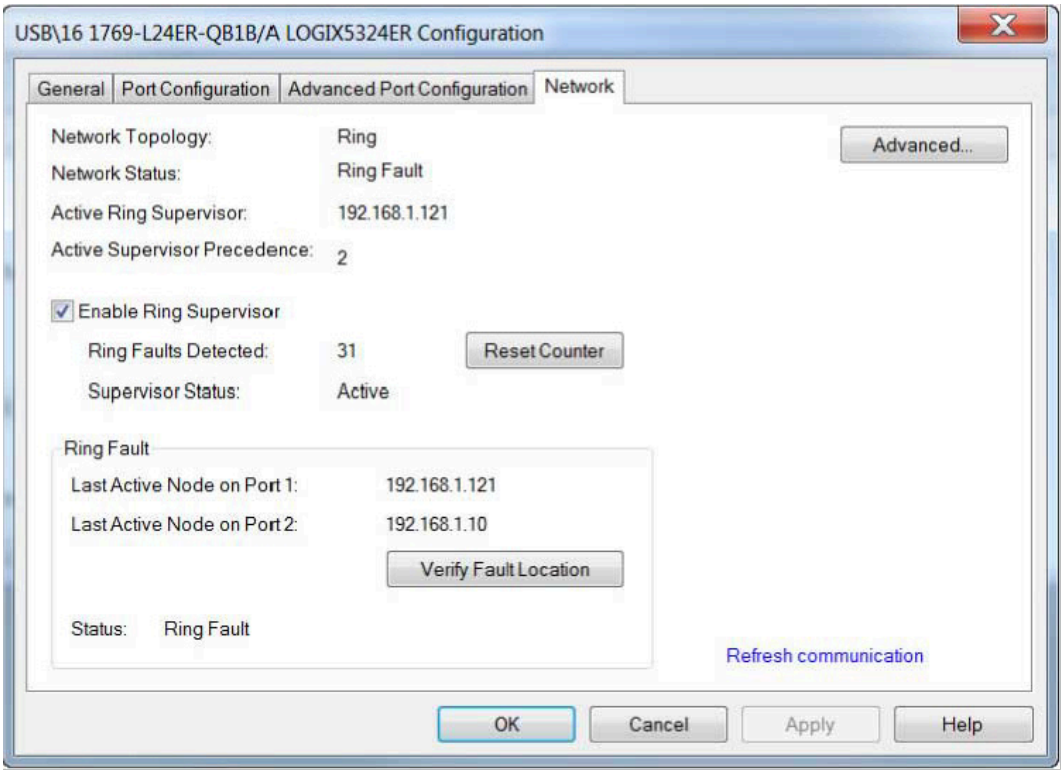
3. Select the *Network* tab to monitor diagnostics.



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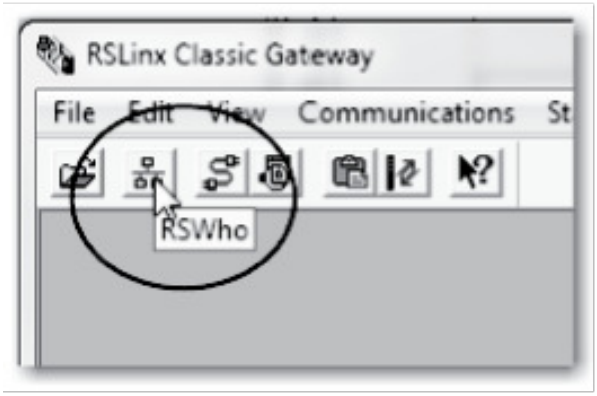
3.5.4.7.2 Monitoring via RSLinx Classic Software

Versions 2.55.00 or later support the monitoring feature.

1. Browse the network.



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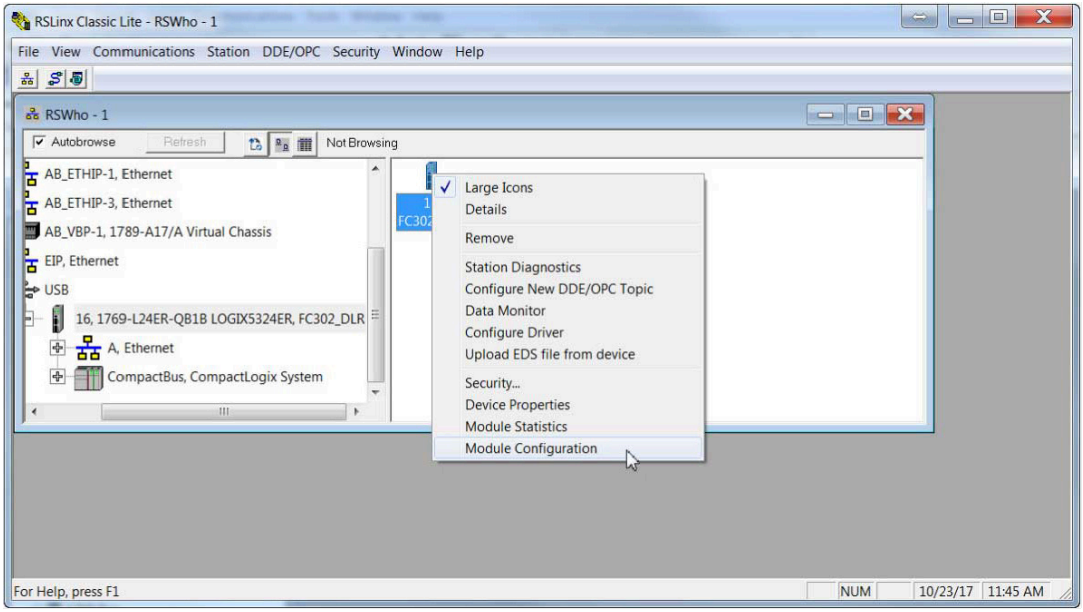
2. Browse to the active supervisor node.
3. Right-click the node.
4. Select *Module Configuration*.



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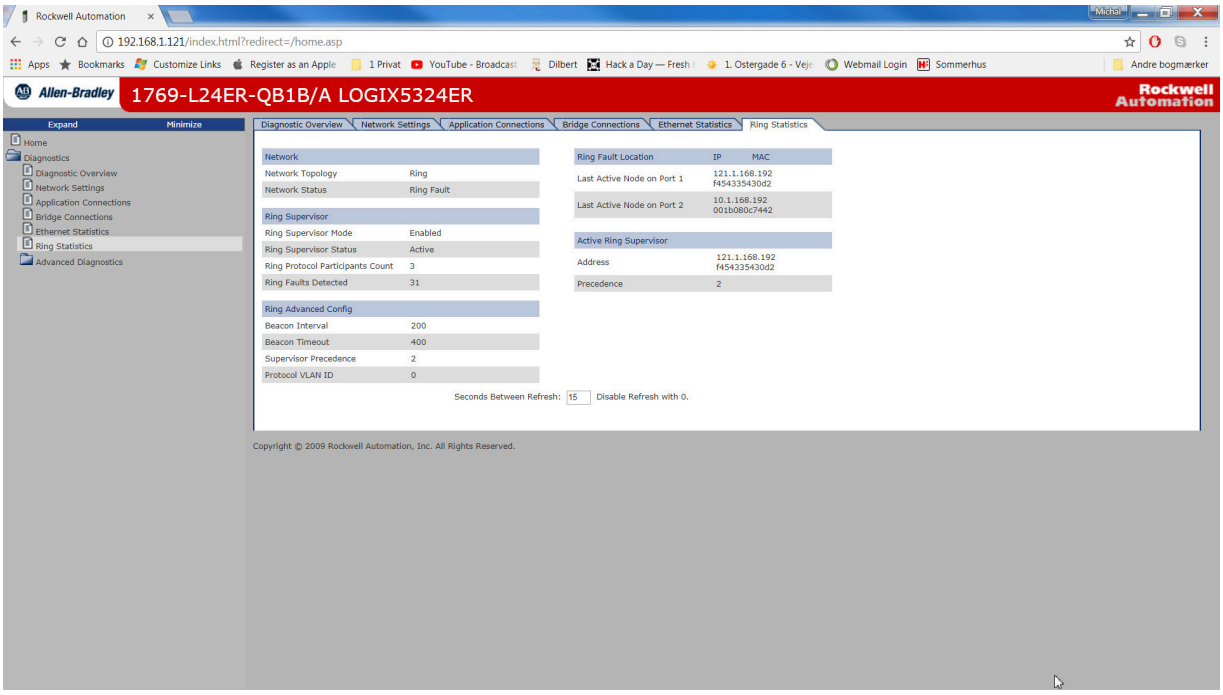
The module configuration dialog box appears with multiple tabs. Each tab shows configuration information. Refer to 3.5.4.7.3 Monitoring via Device Web Pages to see an example of a ring fault between nodes at IP addresses 192.168.1.3 and 192.168.1.2.

3.5.4.7.3 Monitoring via Device Web Pages

Another way of monitoring the network diagnostic information with supervisor-capable nodes is to use the diagnostic web pages of the module.

1. Open the web browser.
2. Enter the IP address of the module.



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The links on the left-most navigation bar show each available web page.

3.5.4.7.4 Programming via an Msg Instruction

The Logix Designer application allows programming via msg instructions. By creating a small program, it is possible to read out network diagnostic information.

Programming examples:

- Request all ring diagnostic information.
- Request a ring participant list.
- Request the active supervisor information.
- Clear rapid ring faults.
- Verify a fault location.
- Enable and configure a ring supervisor.
- Initiate the Restart_Sign_On service.

The information can be shown on an HMI device or manipulated in the project core.

3.5.4.8 DLR Object

See Table 6 for an explanation of the configuration and status information interface for the DLR protocol. Implement the DLR object in all multi-port EtherNet/IP devices that support the DLR protocol. Devices are allowed to implement only 1 instance of the DLR object.

Table 6: CIP Class 0x47 DLR Object

Attribute	Name	Description
1	Network topology	The network topology readout attribute is used for diagnosis of a faulty or misconfigured ring.
2	Network status	The network status readout attribute is used for diagnosis of a faulty or misconfigured ring.
10	Active supervisor address	This attribute is used for identifying the active ring supervisor. A value of 0 means that no supervisor has been identified since the last power-up.
12	Capability flags	Capability flags are used by the ring supervisor and monitoring devices to configure and use the DLR capable node correctly.

3.5.5 Ring/Redundant Line Topology

Ring topology can increase the availability of an Ethernet network.

For ring topology:

- Install a special switch (redundancy manager) between the PLC and the drives.
- Configure the redundancy manager switch to define clearly the ports that connect to the ring.

When the ring operates, the main redundancy manager sends test frames into the ring to detect possible faults, for example, broken cables or unpowered devices. If the switch detects a fault in the ring, it reconfigures the ring into 2 lines instead. The transition time from 1 ring into 2 lines is up to 500 ms depending on the components installed in the ring. Set the timing of the PLC controller to ensure that the transition time does not lead to a timeout fault.

NOTE: For ring/redundant topology, ensure that the redundancy manager switch supports the detection of loss of line topology. The switch inside the interface does not support this detection, as the redundancy manager has to perform this task.

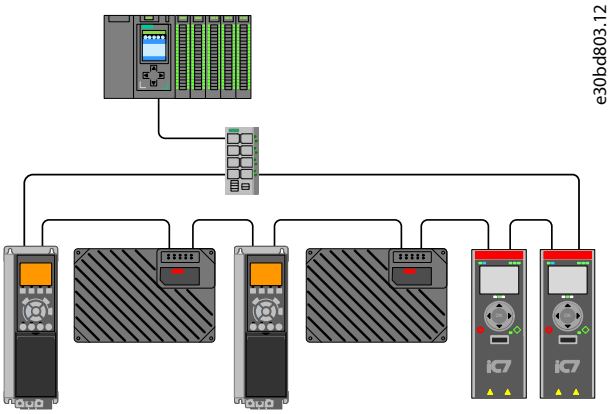

Figure 7: Ring/Redundant Line Topology

3.6 Mounting the Fieldbus Option

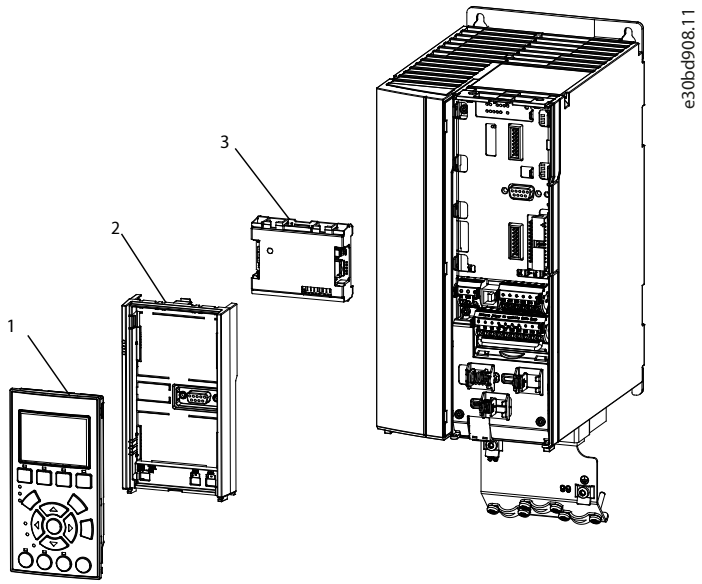

Figure 8: Exploded View of Drive and Fieldbus Option

1	LCP	2	LCP cradle
3	Fieldbus option		

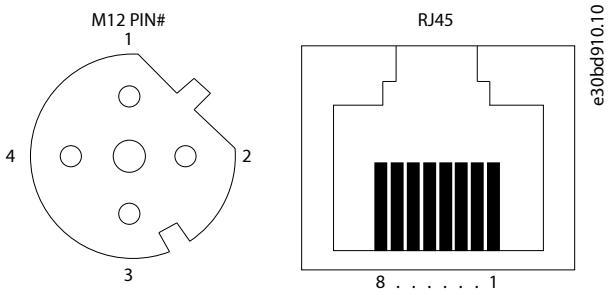

Figure 9: Ethernet Connectors

Table 7: Connector Signals

Signal	M12 PIN#	RJ45
RX +	1	1
TX +	2	3
RX -	3	2
TX -	4	4

1. Check whether the fieldbus option is already mounted in the drive. If the option is already mounted, go to step 6.
2. Remove the LCP or blind cover from the drive.
3. Use a screwdriver to remove the front cover and the LCP cradle.
4. Mount the fieldbus option with the Ethernet port facing upwards for top cable entry (enclosure sizes A1–A3) or facing downwards (enclosure sizes A4–A5, B–E).

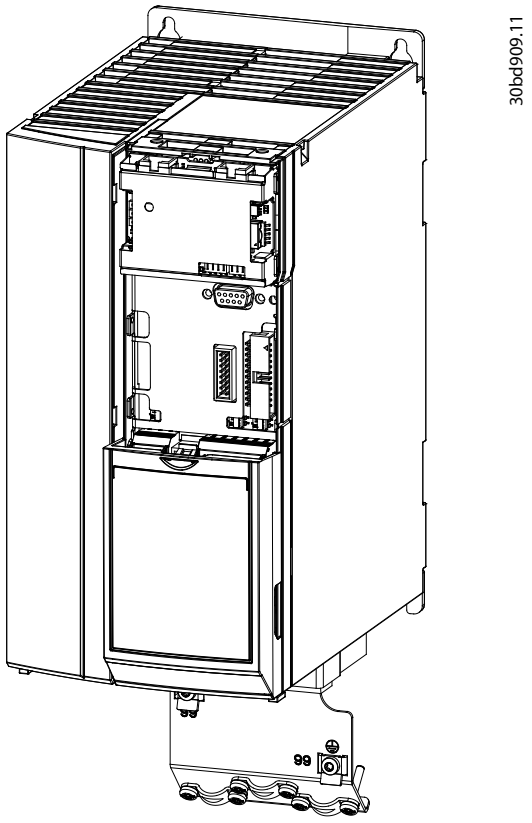

Figure 10: Option Mounted with the Ethernet Port Facing Upwards (A1–A3 Enclosures)

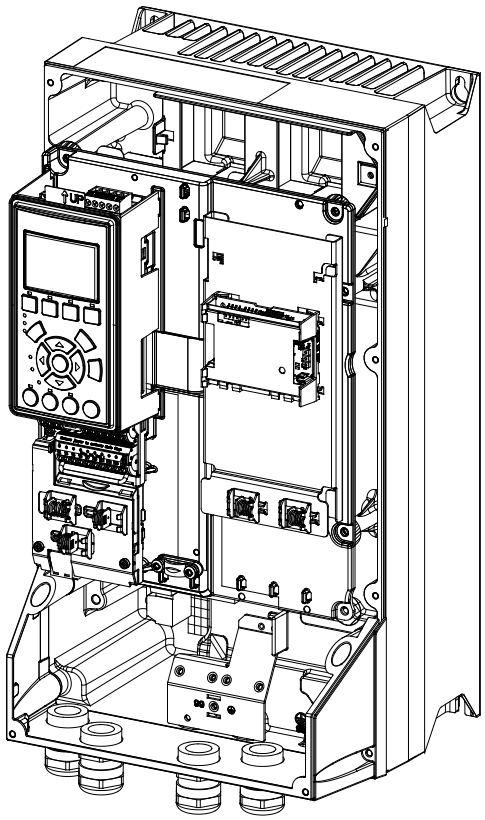

Figure 11: Option Mounted with the Ethernet Port Facing Downwards (A4, A5, B, C, D, and E Enclosures)

5. Remove the knockout plate from the new LCP cradle.
6. Mount the new LCP cradle.

3.7 Electrical Installation

3.7.1 Cabling Requirements

- Select cables suitable for Ethernet data transmission. Normally, CAT5e and CAT6e cables are recommended for industrial applications.
- Both types are available as unshielded twisted pair and shielded twisted pair. Shielded cables are recommended for use in industrial environments and with drives.
- A maximum cable length of 100 m (328 ft) is allowed between the switches.
- Use optical fibers for gapping longer distances and for providing galvanic isolation.

3.7.2 Wiring - Enclosure Sizes A1–A3

1. Mount the preconfigured cable wires with the connectors on the fieldbus option.

   For A1 and A2 enclosures, mount the supplied strain relief on top of the drive with 2 screws, as shown in Figure 12. For cable specifications, refer to 3.7.1 Cabling Requirements.

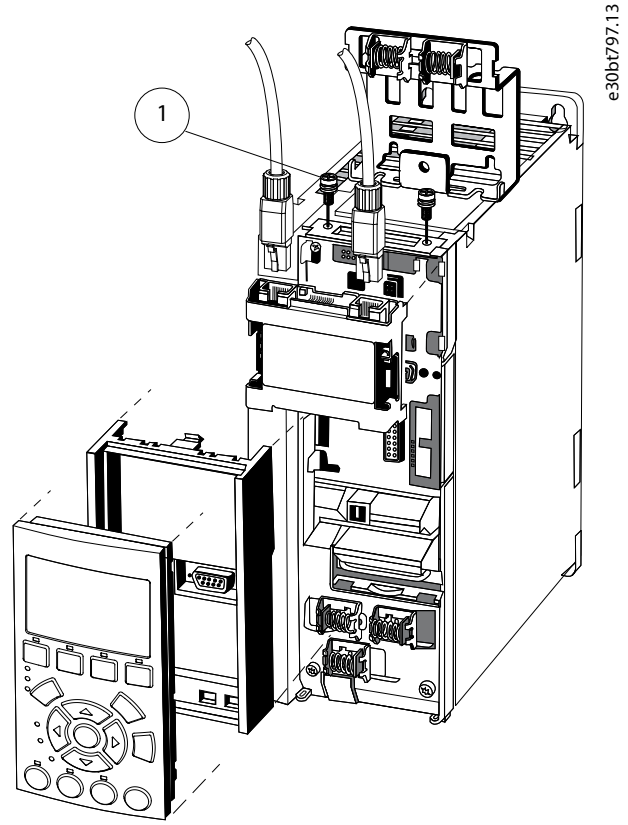

Figure 12: Wiring of Enclosures A1–A3

1	Strain relief mounted with screws

2. Position the cable shield between the spring-loaded metal clamps to establish mechanical fixation and electrical contact between cable and ground.

3.7.3 Wiring - Enclosure Sizes A4, A5, B1–B4, and C1–C4

1. Put the cable through the cable glands.
2. Mount the preconfigured cable wires with the connectors on the fieldbus option. For cable specifications, refer to 3.7.1 Cabling Requirements.
3. Fix the cable shield to the metal base plate using the springs.

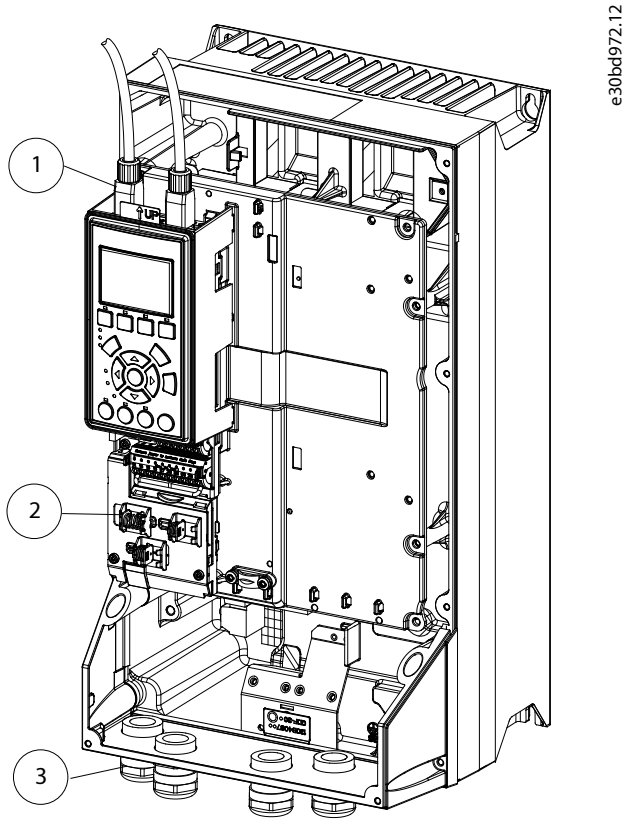

Figure 13: Wiring of Enclosure Sizes A4, A5, B1–B4, and C1–C4

1	Cable wires with connectors	2	Springs
3	Cable glands		

4. Tighten the cable glands securely.

3.7.4 Wiring - Enclosure Sizes D and E

NOTE: Do not strip the Ethernet cable. Do not ground it via the strain relief plate. Ground the shielded Ethernet cables through the RJ45 connector on the EtherNet/IP interface.

1. Mount the preconfigured cable wires with the connectors on the fieldbus option. For cable specifications, refer to 3.7.1 Cabling Requirements.
2. Fix the cable to the metal base plate using the springs.

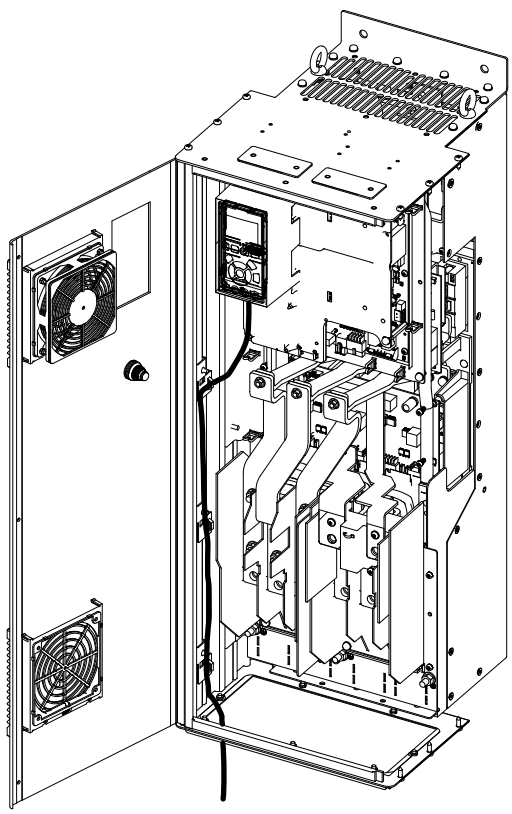

Figure 14: Wiring of Enclosure Sizes D and E

3. Tie down the cable and route it with other control wires inside the unit as shown in Figure 14.

3.8 Reassembling the Cover

1. Mount the new front cover and the LCP.
2. Attach the sticker with the correct product name to the front cover.

3.9 Applying Power

Follow the instructions in the drive-specific operating guide to commission the drive. The drive automatically detects the EtherNet/IP interface. Parameter group ***12-** Ethernet*** appears.

3.10 Checking Network Cabling

NOTE: After installing the VLT® EtherNet/IP MCA 121, be aware of the following parameter settings:

- Parameter ***8-01 Control Site***: ***[2] Control word only*** or ***[0] Digital and control word***.
- Parameter ***8-02 Control Word Source***: ***[3] Option A***.

4 Troubleshooting

4.1 Warnings and Alarms

NOTE: Refer to the drive-specific operating guide for an overview of warning and alarm types, and for the full list of warnings and alarms.

Alarm words and warning words are shown in the display in hex format. When there is more than 1 warning or alarm, the sum of all warnings and alarms is shown. Warning words and alarm words are shown in parameter ***16-90 Alarm Word*** to parameter ***16-99 Ext. Status Word 3*** and in parameter ***18-67 Alarm Word 4*** to parameter ***18-68 Warning Word 4***.

4.2 LED Status

The EtherNet/IP interface has 3 bicolored LEDs that allow a fast and detailed diagnosis. Each LED is linked to its unique part of the EtherNet/IP interface, see Table 8

Table 8: LED Label

LED label	Description
MS	Module status, reflects the activity on the EtherNet/IP stack.
NS1	Network status 1, reflects the activity on port 1.
NS2	Network status 2, reflects the activity on port 2.

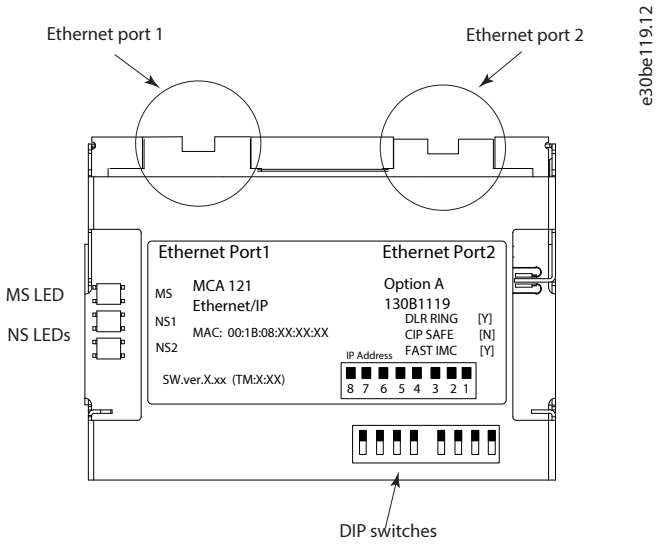

Figure 15: Overview of the EtherNet/IP Module

Table 9: MS: Module Status

State	LED		Description
Standby		Flashing green	The device needs commissioning.
Device operational		Solid green	The device is operational.
Major recoverable fault		Flashing red	The device has detected a recoverable fault (MAR).

Table 9: MS: Module Status - (continued)

State	LED		Description
Major unrecoverable fault		Solid red	The device has detected an un-recoverable fault (MAU).
Self-test		Flashing red/green	The EIP option is in self-test mode.
			

Table 10: NS1 + NS2: Network Status (1 per Port)

State	LED		Description
No connections		Flashing green	There are no established CIP connections to the device.
Connected		Solid green	There is at least 1 established CIP connection to the device.
Connection timeout		Flashing red	1 or more CIP connections have timed out.
Duplicate IP		Solid red	The IP address assigned to the device is already in use.
Self-test		Flashing red/green	The EIP option is in self-test mode.
			

4.3 No Communication with the Drive

If there is no communication with the drive, proceed with the following checks:

Check the link status

If CIP connection is not established, the status of the Ethernet link cannot be directly identified using the LEDs. Verify presence of the link in parameter ***12-10 Link Status***.

Verify that the link is steadily present in parameter ***12-11 Link Duration***. The parameter shows the duration of the present link and is preset to 00:00:00:00 when the link is broken.

Check the cabling

In rare cases of cabling misconfiguration, the option may show the presence of a link even if no communication is running. Exchange the cable if in doubt.

Check the IP address

Verify that the option has a valid IP address in parameter ***12-01 IP Address***. If the option has identified a duplicate IP address, the NS LEDs are solid red. If the option is set up for BOOTP or DHCP, verify that a BOOTP or DHCP server is connected in parameter ***12-04 DHCP Server***. If no server is connected, the parameter shows 000.000.000.000.

5 Appendix

5.1 Abbreviations

Abbreviation	Definition
API	Actual packet interval
CC	Control card
CIP™	Common industrial protocol
COS	Change of state
CTW	Control word
DHCP	Dynamic host configuration protocol
EIP	EtherNet/IP
EMC	Electromagnetic compatibility
FC	Frequency converter
I/O	Input/output
IP	Internet protocol
LCP	Local control panel
LED	Light-emitting diode
LSB	Least significant bit
MAR	Major recoverable fault
MAU	Major unrecoverable fault
MAV	Main actual value (actual output)
MIR	Minor recoverable fault
MRV	Main reference value
MSB	Most significant bit
Msg	Message
N/A	Not applicable
ODVA	Open DeviceNet Vendors Association
PC	Personal computer
PLC	Programmable logic controller
PNU	Parameter numbre
REF	Reference (=MRV)
RTC	Real-time clock
STP	Spanning tree control
STW	Status word

5.2 Conventions

- Numbered lists indicate procedures.
- Bulleted and dashed lists indicate listings of other information where the order of the information is not relevant.

- Bolded text indicates important information and section headings.
- Italicized text indicates the following:
  - Cross-reference.
  - Link.
  - Footnote.
  - Alarms/warnings
- Bolded and italicized text indicates the following:
  - Parameter name.
  - Parameter option.
  - Parameter group name.
- All dimensions in drawings are in metric values (imperial values in brackets).
- An asterisk (*) indicates the default setting of a parameter.

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