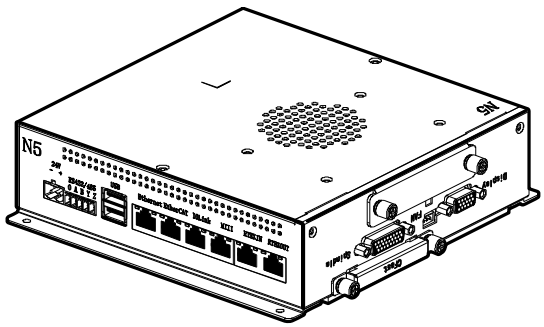
N5 Series Controller

Instruction manual

Please read the instructions thoroughly and fully understand their contents before using this controller.
Please designate a custodian to keep it safely in the designated location so that it can be read at any time.



Shanghai Lynuc CNC Technology Co., Ltd.

Summarize

About this manual

- Name N5 Series Controller Instruction Manual
- Type Electrical and structural characteristics and installation instructions for N5 series controller
- Version V2.7

Use of this instruction manual

This instruction should be used during installation.

This manual is intended to be read by

This instruction manual is oriented:

- Electrical engineer
- Product technicians
- Technical service staff
- Product users

Operational prerequisites

Readers should:

- Familiarize yourself with the relevant concepts in the installation instruction
- Trained in N5 controller installation

Reference information

Instruction manual version history

Version	Release Date	Revision description
V2.7	2020/04/13	Update Appendix A (Analog Wiring Recommendations)

☞ Reference documents (product specifications, operation manual, technical parameter manual)

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1. Safe use

summarize

N5 controller for precision electronic products, for the safety of the operator and machinery and equipment, please be sure to leave the installation and testing by professional electrical engineers and adjust the parameters, the product manual is labeled with "**Danger**", "**Warning**", " **Attention**"" and other symbols of the instruction, please be sure to read carefully, if there is any doubt, you can contact the company's branch offices around the world to consult, or directly with the company related to the known technical personnel consulting, our professionals will be happy to serve you.

1.1 Basic matters of safe operation

summarize

This manual includes safety-related precautions to ensure the safety of the installer and to prevent damage to the controller, and describes them in the body of the text as "**Warning**" and "**Attention**" according to their level of importance in terms of safety, and the related supplemental descriptions are described as Additional instructions are described as "**Description**".

These **DANGERS**, **WARNING**, **ATTENTION** and **DESCRIPTION** must be read before use.

Danger

Indicates that if this hazard cannot be avoided, the result is likely to be serious injury or death.

Warning

Indicates that there is a potential risk of serious injury or death if this hazard cannot be avoided.

Attention

Indicates that violating this precaution may damage the equipment or shorten its life.

Description	Indicate additional instructions other than danger, warning and caution.

1.2 Safe work practices for installation

summarize

The following describes safe work practices for installation.

For safe use of this equipment, please read carefully and be sure to observe the following.

Warnings

1. Please read the instruction manual thoroughly and understand its contents.

   The instruction manual describes how to operate the equipment for installation and commissioning. Before installing the equipment, be sure to read and fully understand the contents of the instruction manual. Do not operate the equipment using procedures or methods not described in the instructions.

2. Equipment operators must be appropriately qualified.

   The equipment operator must have received the necessary training on the installation and commissioning of the equipment, have sufficient knowledge of safe operation, and be authorized by the person responsible for safety in the user enterprise. The enterprise management should carry out the safety and operation of the work of the guidance.

3. Please observe the safety precautions.

   To operate this equipment safely, be sure to observe the safety precautions recorded in the instruction manual and the safety precautions recorded in the warning labels. Failure to observe the precautions may result in a major personal accident.

Attention

- When connecting to external devices, please use the standard cables.
- If standard cables are not used, misoperation may occur due to different specifications. For details, please consult the maintenance person in charge of our company.

1.3 Prevention of personal injury

summarize

The following is a description of safe work practices in terms of personal safety precautions.

To protect the safety of the installer, please read carefully and be sure to observe the following.

Warning

1. Use the connection cable supplied with the unit.
   - For interconnection of modules, use the connection cable supplied with the unit.
   - When selecting the main grid AC power cable, use the connection cable supplied with the unit.
   - To avoid discharge and fire, do not exceed the voltage range outside the limit panel of Lynuc.
2. Make sure all ground wires are properly connected.
   - To avoid leakage, connect all module grounds to the main ground. Make sure all ground connections are correct before connecting the unit's input and output.
   - Before adding power to the unit, make sure it is grounded. And to avoid leakage, make sure all ground connections are correct.

3. Ensure a safe working environment.
    - Do not work in a damp environment. To avoid electrical leakage, work in an environment where the relative humidity is less than 90% (no condensation) and the temperature is less than 58℃.
    - To avoid danger, do not work in explosive atmosphere.

1.4 Prevention of product damage

summarize

The following describes safe work practices for preventing product damage.

To protect the integrity of the product in use, please read and be sure to observe the following.

Warning

1. Avoidance matters:
    - Keep the CNC device as far away as possible from coolant, chemicals, impact objects, and other items that may cause damage to it.
    - Please keep away from sources of electromagnetic interference as far as possible, such as:

      -Large load sharing an AC power line with the equipment.

      -Portable transmitter (wireless telephones and transmitter).

      -Near the wireless/TC transmitter.

      -Arc welding machine.

      -High voltage wire.
    - Avoid interference from the machine tool. The machine tool must be uncoupled from all interference-generating factors (relay windings, current contactors, motors, etc.).
    - Please do not disassemble the controller by yourself, otherwise it will easily cause aging or damage to the connectors.

- Please do not remove the batteries from the controller card, so as not to lose the information of the board and cause the controller not to work normally. When replacing the batteries, please ensure that it is done within 2 hours.

2. About the power supply:
   - Use an externally regulated 24V DC power supply for input and output.
   - The zero voltage of the external power supply must be connected to the main grounding point of the machine tool.
   - Analog input and output are recommended to be connected with shielded cables and their shields connected to the corresponding pins.

3. About the work environment:
   - The operating environment must be between 0℃ and 58℃.
   - The storage temperature must be between -20℃ and 60℃.
   - To ensure sufficient space between the center unit and the surrounding walls, refer to the installation instruction.
   - The power switch must be easily accessible, with a clearance of between 0.7 m (27.5 in) and 1.7 m (5.5 ft) from the ground. Operate in a location free of conductive dust, corrosive metals and insulation-damaging gases or vapors.
   - Use in indoor settings.
   - If it is used in a special environment that does not meet the above conditions, the user should propose it at the time of ordering to ensure that the product can work reliably.

2. Product introduction

2.1 N5 Controller Product Overview

summarize

N5 series controller is a high-precision, high-performance, high-speed, high-lighting machine application controller of Shanghai Lynuc CNC Technology Co. Its body is small and exquisite, with powerful functions, supporting CNC closed-loop control, with a minimum servo cycle 125 μ s to ensure servo response. Its structure is safe, stable and reliable, and its machine tool panel can be customized and touch screen can be selected.

Model Description

N5 A - 0 2B

① ② ③ ④

① N5 Series Controller Products

② Motherboard version.

A: High performance CPU

D: Economic CPU

③ Structure Manufacturer's Version

0: All-in-one Controller, Fan C

1: All-in-one controller, fin C

2: All-in-one controller, fin A

9: Monoblock controller, fin C

④ Version number of the control card

Figure 2- 1 Fan Type

Figure 2- 2 Fin type

2.2 Product Features

The product features of the N5 controller are shown below:

Support for linear motors

- Supports many types of linear motors
- High speed, high acceleration, high precision, high response

High openness

- Can be equipped with Lynuc RTCP 5-axis CNC system
- Can be equipped with different models of Lynuc panels
- Can be equipped with various functions of the Lynuc CNC system.

Communication/Network Functions

- Supports high speed and high-capacity USB interface devices
- 100M network communication
- Supports remote diagnostics, monitoring and commissioning
- Support RS485 serial port

2.3 Product Specification

The specifications related to the hardware parameters and software parameters of the N5 series controllers are shown below:

◎	☆	×
standard	optional	none

Table 2- 1 Product hardware specification parametes

Item	Specification	N5A	N5D/C90
Industrial motherboards	Intel high performance processors	1.75G x2	1.46G x1
Memory	2GBytes	◎	◎

User storage	CFast card	4GB	4GB
Ferroelectricity	128KBytes	◎	◎
Network	100Mbps EtherNet	◎	◎
Bus	EtherCAT	◎	◎
	MECHATROLINK III	◎	◎
	RTEX	◎	◎
Serial bus	RS485	◎	◎
USB port	Mobile storage interface	◎	◎
Analog output	-10V to +10V	2	-
Pulse output	5V differential quadrature pulse output	◎	-
Digital Encoders	5V Differential Incremental Encoder	◎	-
Number of control axes	16 Minimum servo cycles for servo axes	125uS	500uS
Panel interface	YCP4S, YCP6S	◎	YCP6S only
Local digital I/O	IN/OUT	3/3	-
Extended I/O	IOLink I/O	◎	-
	EtherCAT I/O	◎	◎
Display interface	VGA	◎	-
	LVDS	◎	◎
	Touch Panel	☆	-

Table 2- 2 Product software specification parameters

Item	Description	N5A	N5D/C90
High-speed and high-precision GACC 0/1/2/3	High-speed contouring control function provides function packages for different machining needs of molds and parts.	◎	◎
RTCP positioning function	5-axis RTCP machining	☆	☆
Online simulation	Online simulation, providing line and solid simulation modes	◎	◎
Online tracing	Online tracing, line mode	◎	◎
QUI user-defined interface	Customized screen development	◎	◎
PVT (G5.1)	Hermite interpolation	☆	☆
PlugIN development	Support customers to carry out independent secondary development, and provide encryption protection for registration code.	☆	☆
NCExpert	Intelligent editor	◎	◎
Power outage reversion		◎	◎
Serial communication		◎	◎
Touch Panel Support		◎	-
Four-axis lettering machine	G43.6	☆	☆
Bus concurrent	EtherCAT, M3, RTEX, EtherCAT+M3, EtherCAT+RTEX	◎	◎
Dual Path Support	Dual path control can be supported	◎	◎

3. Hardware Interface and Installation Power Distribution

3.1 Device connection

The N5 controller device connection methods include the following types:

- 3.1.1 Full-bus EtherCAT system composition
- 3.1.2 Full-bus EtherCAT+EtherCAT+RTEX system composition
- 3.1.3 Full-bus EtherCatEtherCat+MIII system composition
- 3.1.4 Pulse servo + RTEX + EtherCAT system composition
- 3.1.5 Pulse Servo + MIII + EtherCAT system composition

The material specifications and other information corresponding to the serial number in the equipment connection diagram are shown in [3.1.6 Selection list 】.

Attention

1. In order to avoid being affected by power interference during use, please add a magnetic ring at each power line inlet.

   Use method: Wrap the power cord around the center of the magnetic ring three or more times, and keep the magnetic ring as close to the controller as possible when connecting.

   When using the IOE for expansion, you also need to use the magnetic ring, and the method of use is the same as that of the controller.

2. The N5 All-in-One Controller consists of a single controller and a panel, eliminating the need for a panel and VGA cable when choosing to use the N5 All-in-One Controller.

3.1.1 Full Bus EtherCAT System Composition

3.1.1.1 Full Bus EtherCAT+PRIO system Composition

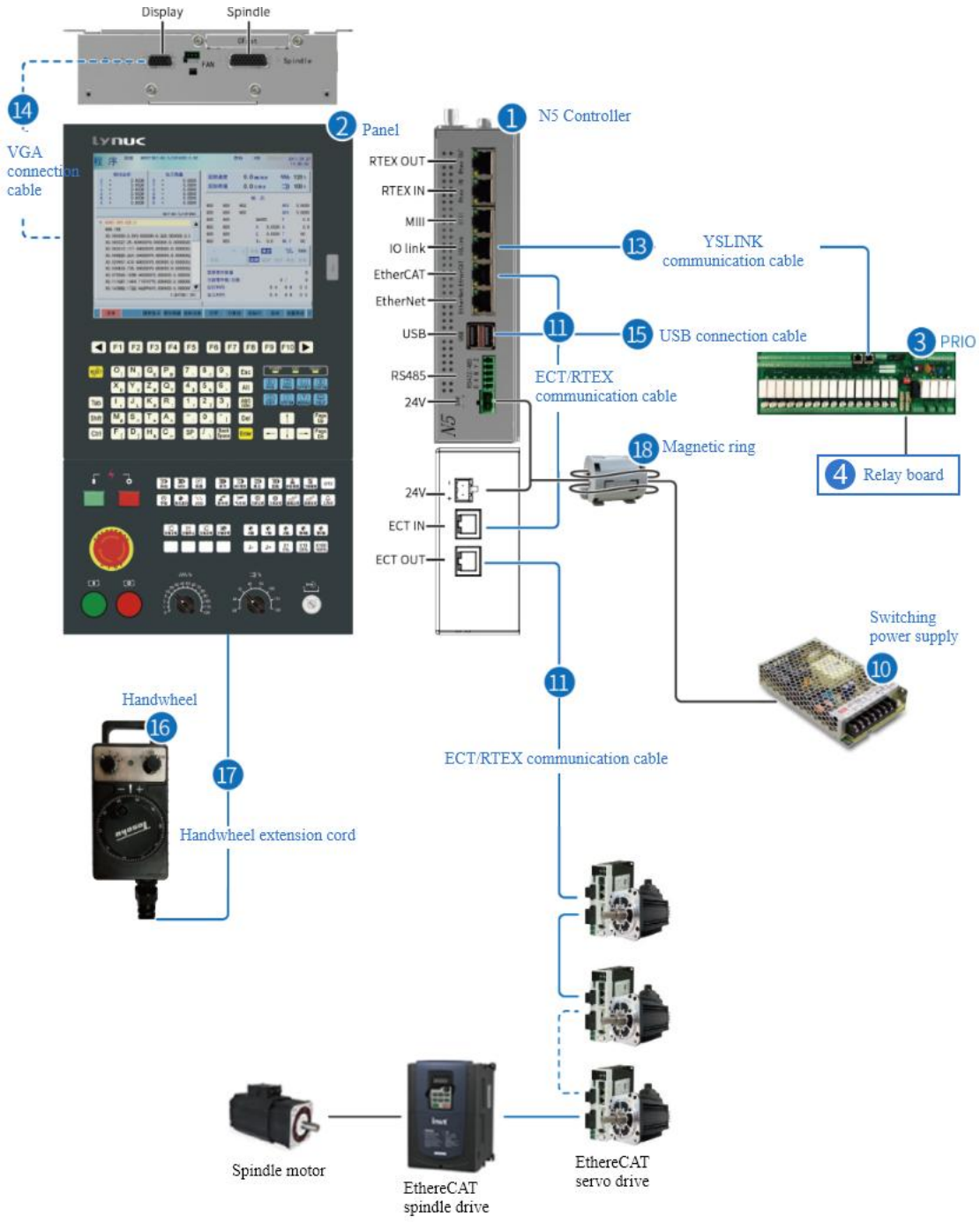


Figure 3- 1 Full-bus EtherCAT+PRIO system composition

3.1.1.2 Full Bus EtherCAT+IOE system composition

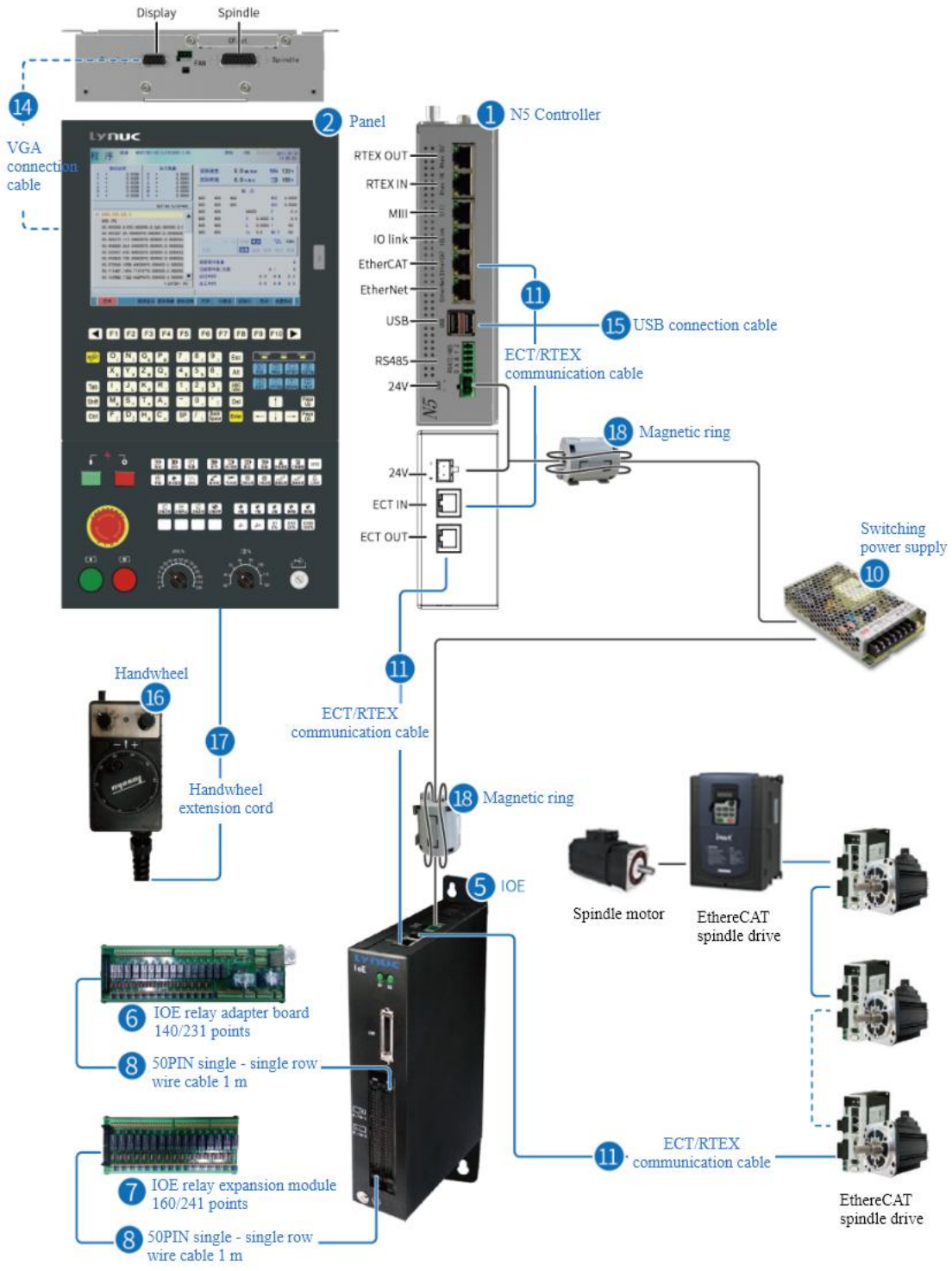


Figure 3- 2 Full-bus EtherCAT+IOE system composition

3.1.2 Full Bus EtherCAT+RTEX System Composition

3.1.2.1 Full Bus EtherCAT+RTEX+PRIO system composition

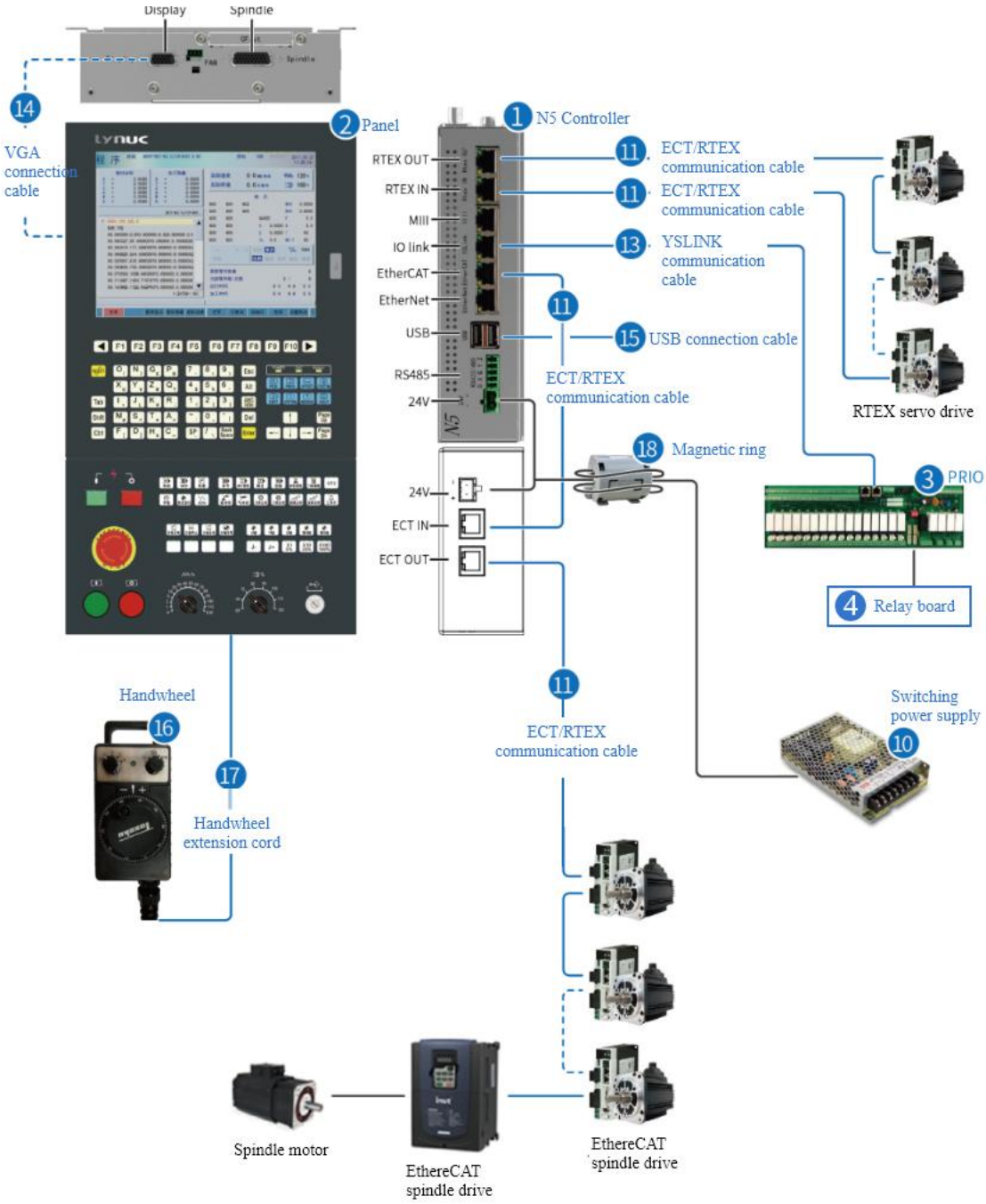


Figure 3- 3 Full-bus EtherCAT+RTEX+PRIO system compisition

3.1.2.2 Full Bus EtherCAT+RTEX+IOE system composition

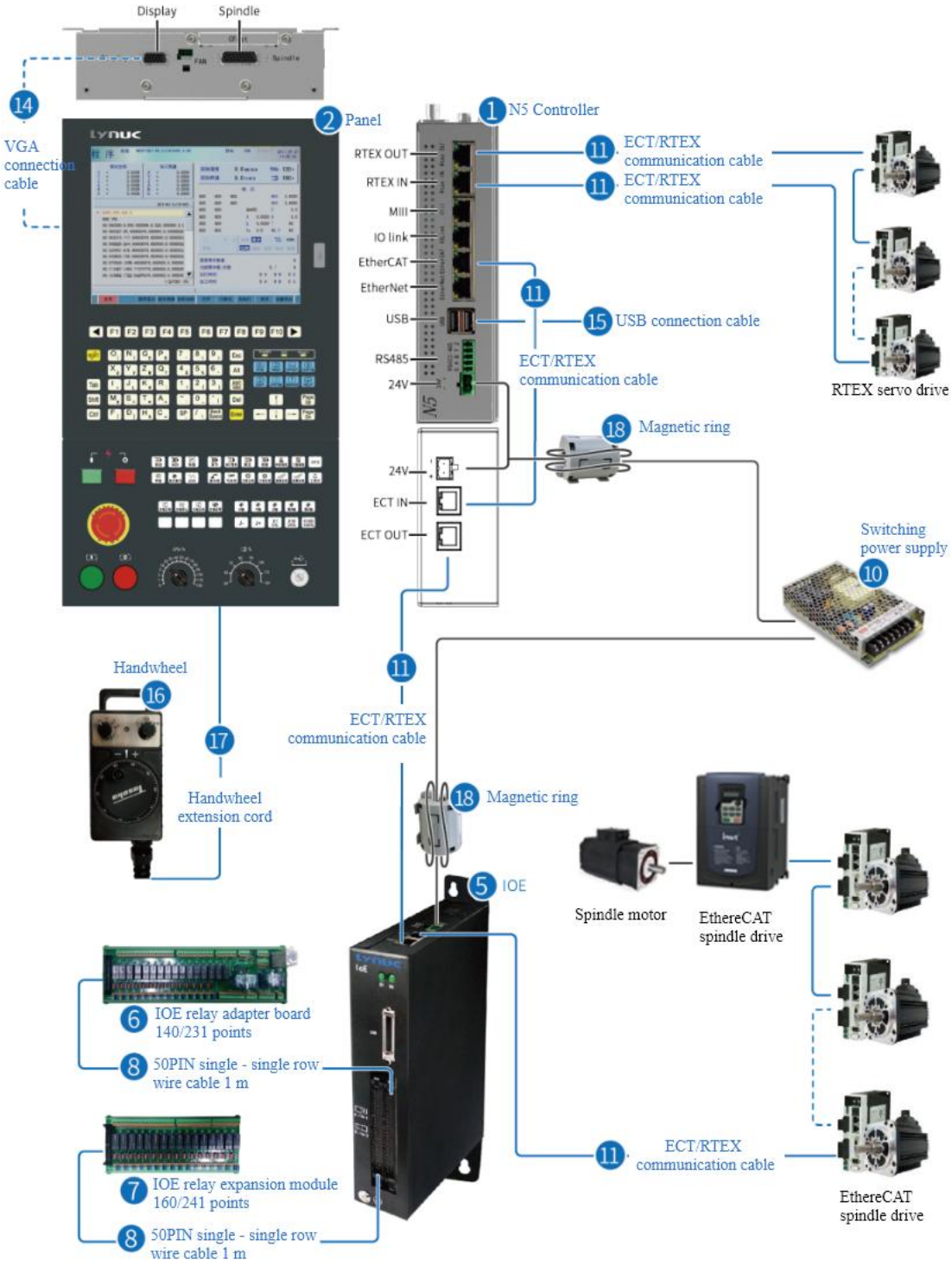


Figure 3- 4 Full-bus EtherCAT+RTEX+IOE system compisition

3.1.3 Full Bus EtherCat+MIII System Composition

3.1.3.1 Full Bus EtherCat+MIII+PRIO system composition

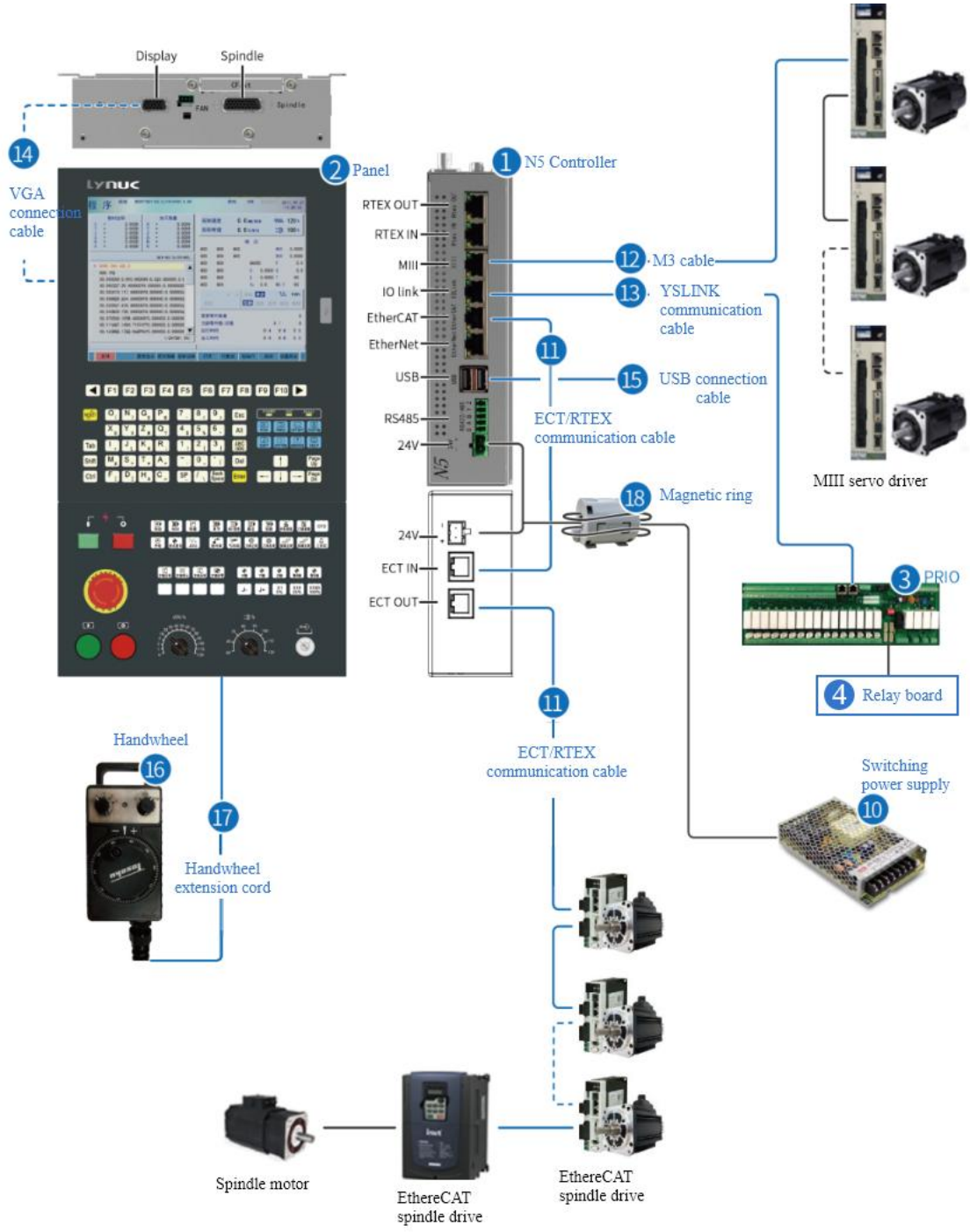


Figure 3- 5 Full-bus EtherCAT+MIII system composition

3.1.3.2 Full Bus EtherCat+MIII+IOE system composition

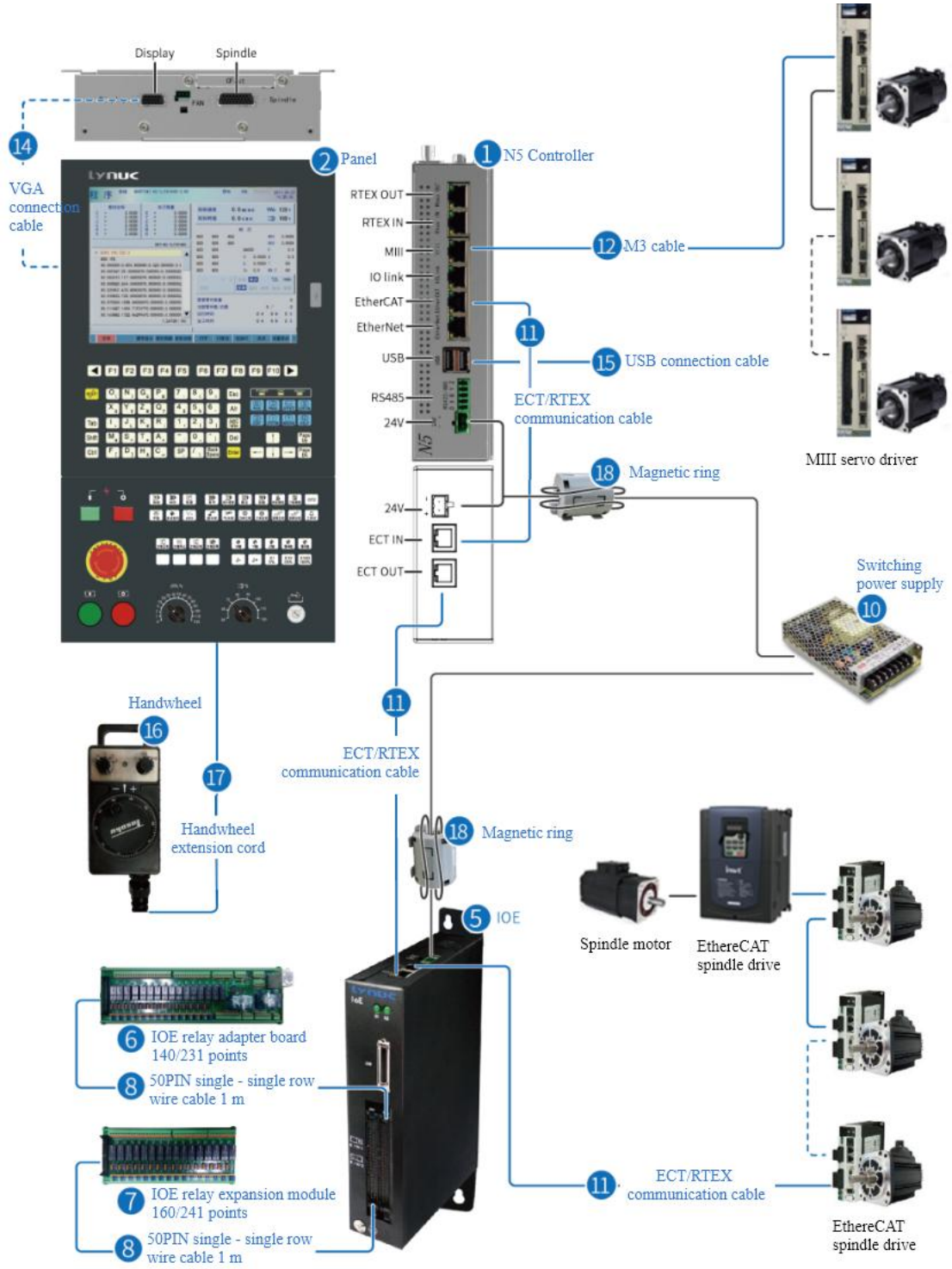


Figure 3- 6 Full Bus EtherCat+MIII+IOE system composition

3.1.4 Pulse Servo + RTEX + EtherCAT System Composition

3.1.4.1 Pulse servo + RTEX + EtherCAT + PRIO system composition

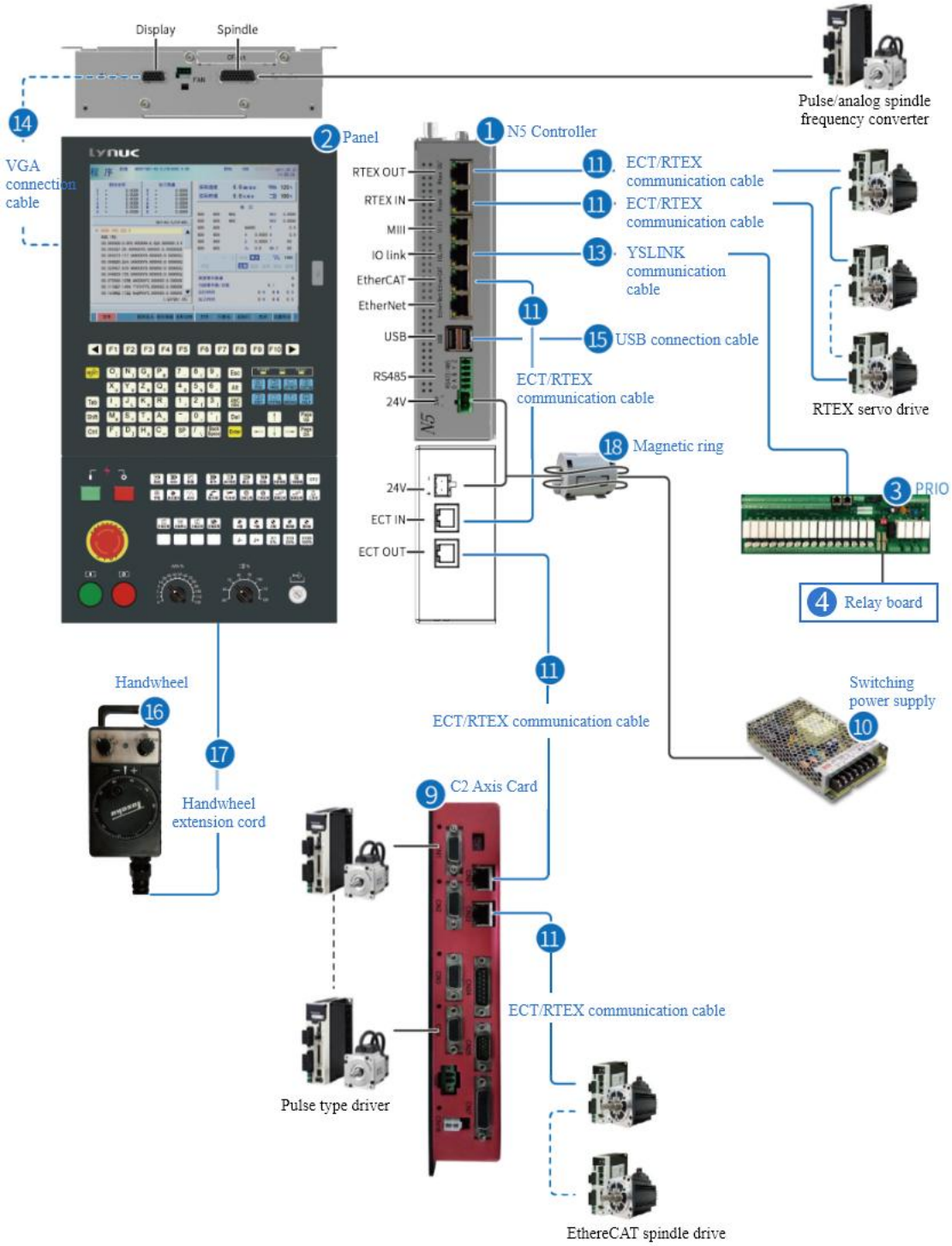


Figure 3- 7 Pulse servo + RTEX + EtherCAT + PRIO system composition

3.1.4.2 Pulse servo + RTEX + EtherCAT + IOE system composition

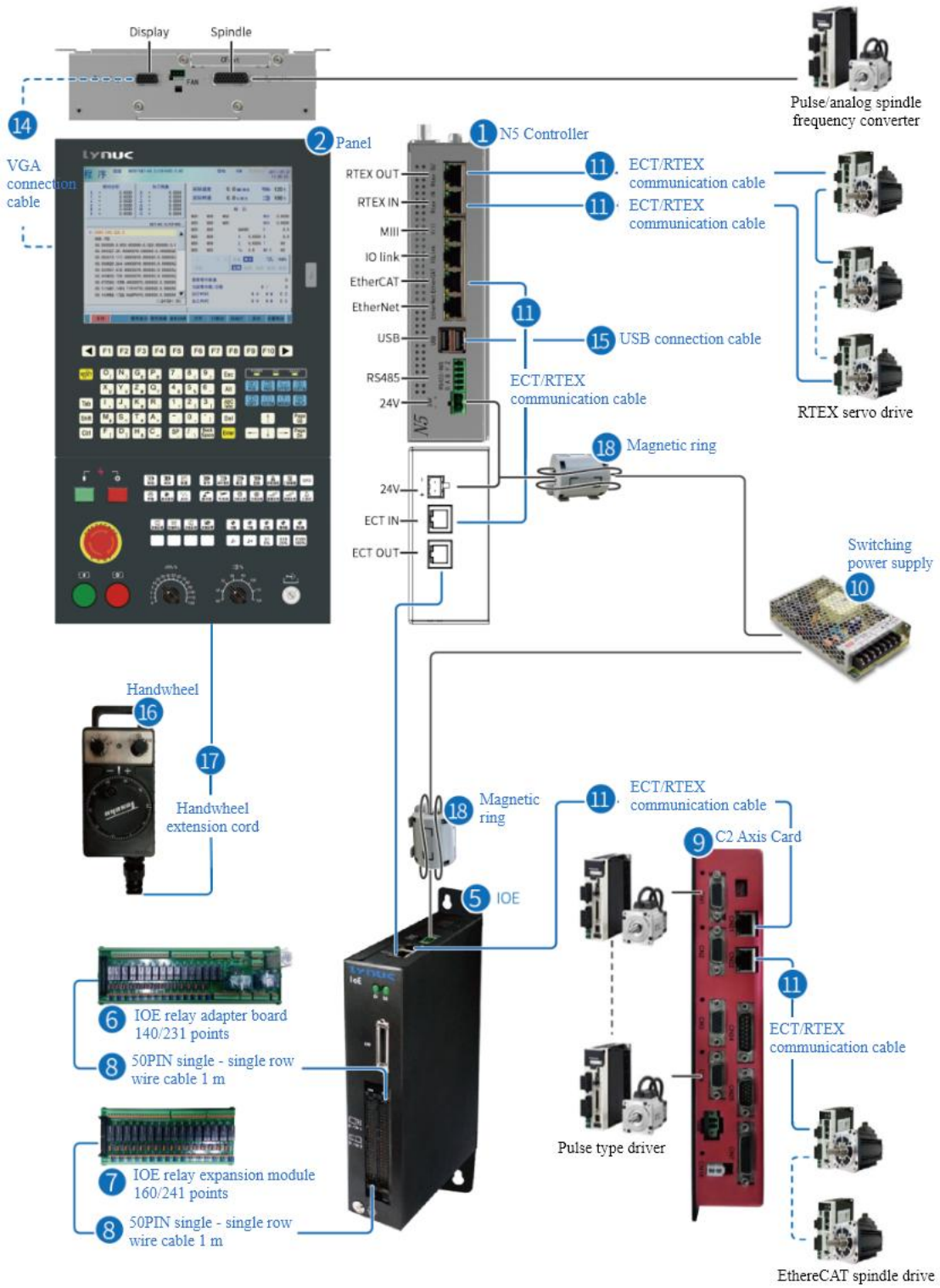


Figure 3- 8 Pulse servo + RTEX + EtherCAT + IOE system composition

3.1.5 Pulse Servo + MIII + EtherCAT System Composition

3.1.5.1 Pulse Servo + MIII + EtherCAT + PRIO system composition

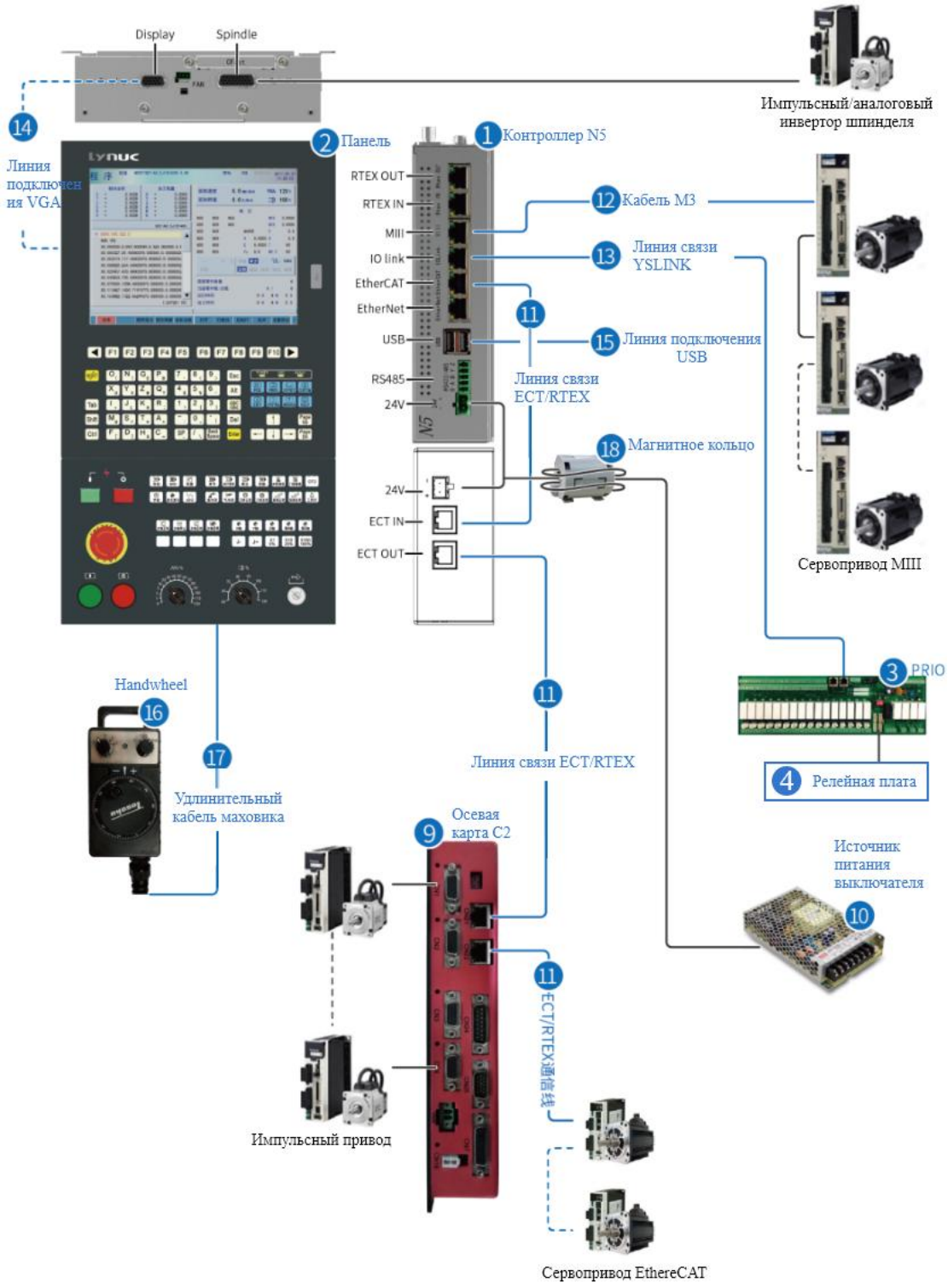


Figure 3- 9 Pulse Servo + MIII + EtherCAT + PRIO system composition

3.1.5.2 Pulse Servo + MIII + EtherCAT + IOE system composition

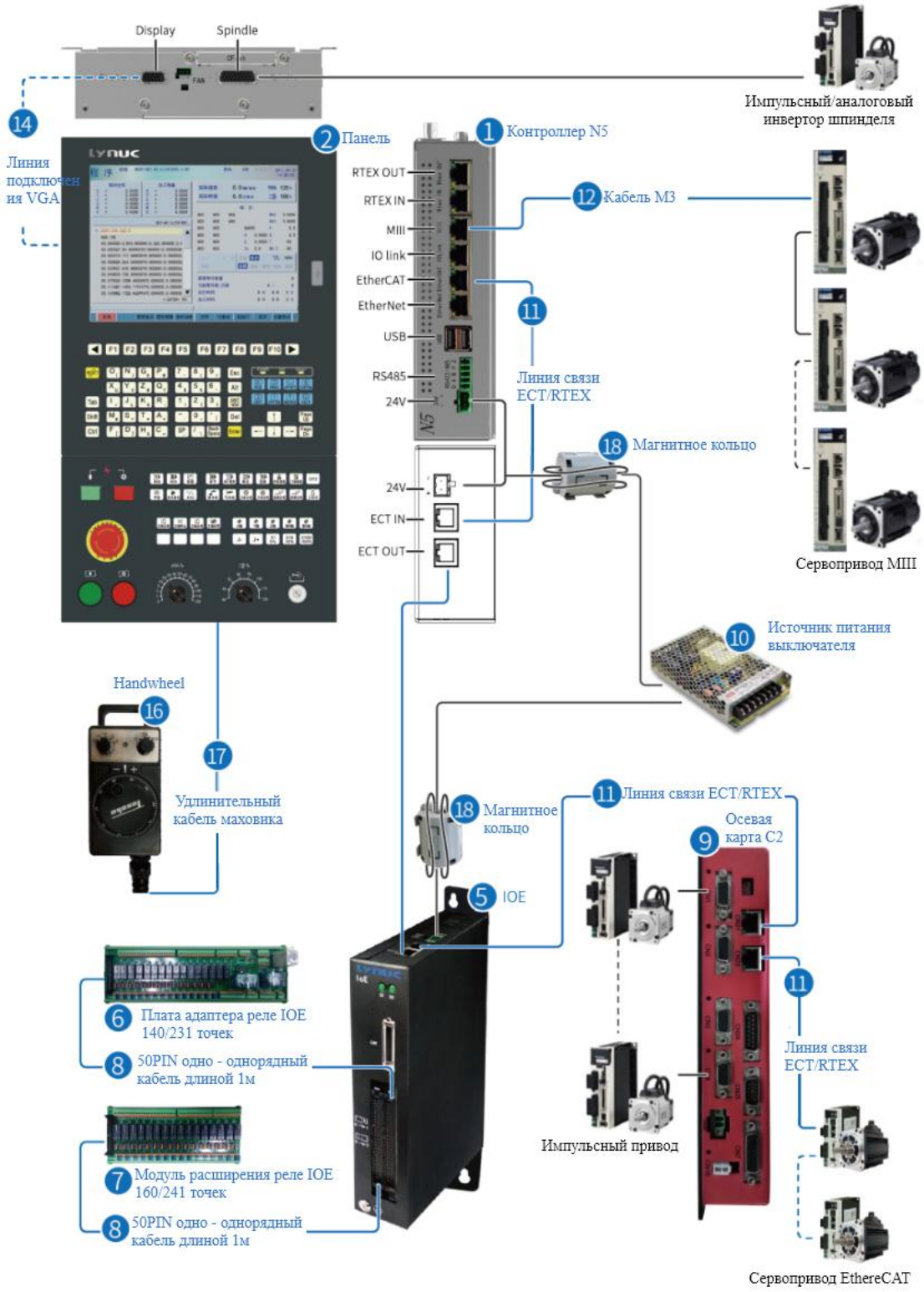


Figure 3- 10 Pulse servo + MIII + EtherCAT + IOE system compisition

3.1.6 Selection List

3.1.1 ~ 3.1.5 The material specifications and material numbers corresponding to the serial numbers in the equipment connection diagram are shown in the table below:

Table 3- 1 Controller Selection List

№	name			specification	material number
1	N5 controller	Monoblock Controller	N5A Monoblock Controller	N5A-92B	NCU00032
			N5D Monoblock Controller	N5D-92B	NCU00031
			N5 12-inch all-in-one controller 06S (N5A-92B finned monoblock controller C) Note: Special designation)	N5-MDI12-06S(JG)	NCU00033
		All-in-one Controller	N5A Fan 12" 06S All-in-One Controller C	N5A-02B	NCP00001
			N5A Fins 12" 06S All-in-One Controller C	N5A-12B	NCP00006
			N5A Fins 12" 06S All-in-One Controller A	N5A-22B	NCP00008
			N5D Fins 12" 06S All-in-One Controller C	N5D-12B	NCP00007
	Description: The N5 All-in-One Controller includes a single controller and panel, eliminating the need for a panel and VGA cable when choosing to use the N5 All-in-One Controller.				
2	Panel		15" stainless steel panel-06S upper-VGA-ZH-01	LNK-PANEL15-MDI	PCU00344
			15" stainless steel panel - 06S under - ZH-01	LNK-PANEL15-MCP	PCU00345
			10.4" all-in-one thin film printed circuit panel	PANEL10-RS-VGA	PCU00330
			12" panel - MDI-06S upper - VGA	PANEL12-MDI-YCP06S-VGA	PCU00336
			12" panel - 06S under (with on-board handwheel round buttons)	PANEL12-06S-MCP-HV6	PCU00338
			12" Panel - 06S under (no on-board handwheel round buttons)	PANEL12-06S-MCP-V4	PCU00324
			12" all-in-one panel B (VGA) kit 5m	PANEL12-03B-VGA-P50	01030001
3	PRIO		PRIO-01G finished product	PRIO-01G	3020260
4	PRIO Relay board		Relay expansion module 16 points	UM-RM116-02	03020012
			Relay expansion module 4 points	UM-RM104-02	80161
5	IOE finished product			IOE-01B	03020261
6	IOE Relay board		IOE relay adapter board 14O/23I points	IOE-RELAY-PW01	03020004
7			IOE relay expansion module 16O/24I points	IOE-RELAY-EX16	03020003
8	50PIN single - single row wire cable 1 m			LNK-WHH50/1M-FLEX	CA000433
9	C2 Axis Card			C2-ECAXIS0	13863

10	Switching power supply 24V 150W		RS-150-24	E0000032
11	ECT/RTEX communication cable	ECT/RTEX communication cable 0.5 m	LNK-RTEX/ECT-0.5	CA000162
		ECT/RTEX communication cable 0.25 m	LNK-RTEX/ECT-0.25	CA000374
		ECT/RTEX communication cable 2.0 m	LNK-RTEX/ECT-2.0	CA000190
		ECT/RTEX communication cable 5.0 m	LNK-RTEX/ECT-5.0	CA000123
12	M3 cable	M3 Cable-0.5M-RJ	JZSP-CM3RR00-00P5-E	CA000391
		M3 Cable-5M-RJ	JZSP-CM3RR00-05-E	CA000440
13	YSLINK communication cable	YSLINK Communication Cable 0.5m-RJ-RJ	LNK-YSLINK-0.5-RR	CA000183
		YSLINK Communication Cable 0.3m-RJ-RJ	LNK-YSLINK-0.3-RR	CA000382
		YSLINK Communication Cable 5m-RJ-RJ	LNK-YSLINK-5.0-RR	CA000182
		YSLINK Communication Cable 2.1m-RJ-RJ	LNK-YSLINK-2.1-RR	CA000377
14	VGA connection cable	VGA Connection Cable 1.8 meters	VGA-Q550-1.8	CA000154
		VGA Connection Cable 5 meters	VGA-Q550-5.0	CA000156
		VGA Connection Cable 10 meters	VGA-Q550-10.0	CA000174
15	USB connection cable	USB Connection Cable A/F1.5 meter	UM-USB2.0-A/F-1.5	CA000178
		USB Connection Cable A/F 5 meters	UM-USB2.0-A/F-5.0	CA000176
		USB Connection Cable A/F 10 meters	UM-USB2.0-A/F-10.0	CA000175
		USB Connection Cable A/A - 5 meters	UM-USB2.0-A/A-5.0	CA000423
16	Handwheel	4-axis selection handwheel – aviation connector	SY-4A-HK	E0000044
		5-axis selection handwheel - aviation connector	SY-5A-HK	E0000043
		Handwheel – aviation connector	LNK-HC11D-HK	E0000034
		Handwheel - aviation connector	LNK-HC11D-HK ((Handwheel wire length: 52cm(front end of spring wire) + 170cm(spring wire not stretched) + 25cm(back end of spring wire))	E0000060
17	Handwheel extension cord 1.0m, WP20 Pin aviation connector - DB26		LEHK-DB26-HW-1.0	CA000188
18	Magnetic ring		TDK ZCAT3035-1330	E0000028

3.2 Hardware interface

summarize

The schematic distribution of the front interface is shown below:

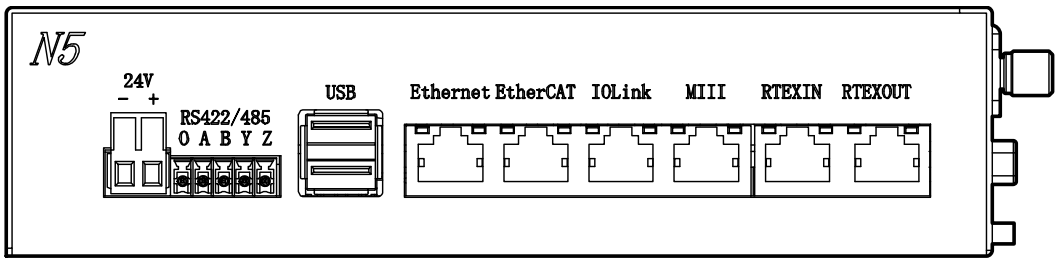


Figure 3- 11 N5 hardware interface-1

The interface is described in detail in the following table.

Table 3- 2 N5 Hardware Interface Details-1

№	interface	pin	function	interface description
1	24V	+	DC24V Positive input	24V±20% 2A (DC) power input
		-	DC24V Negative output	
2	RS485	Z	Signal negative	When used as a 485 interface, AY is shorted to the 485 A signal and BZ is shorted to the 485 B signal.
		Y	Signal positive	
		B	Signal negative	
		A	Signal positive	
		O	Reference level	
3	USB		USB interface	Two standard USB ports for standard USB slave devices only
4	Ethernet		Network interface	Standard Ethernet interface for Ethernet access and debugging, also for Modbus TCP communication
5	EtherCAT		EtherCAT bus interface	EtherCAT master interface to standard EtherCAT slave devices, including EtherCAT drives, I/O cards, and pulse converter card units with confirmed support from Lynuc.
6	IOLink		IO	Iolink interface for the LYNUC company's YSLINK protocol expansion interface, can be

		bus interface	connected with the LYNUC company's YSLINK protocol in line with the slave device, support for this protocol equipment are: YIO card, YCP card, PRIO card, etc.
7	MIII	Mechatrolink-III channel	Mechatrolink-III master interface to standard Mechatrolink-III slave devices
8	RTEXIN	RTEX input interface	RTEX is a Panasonic high-performance bus for real-time communication with drives. The interface supports all RTEX-compliant slave devices.

The top interface schematic distribution is shown below:

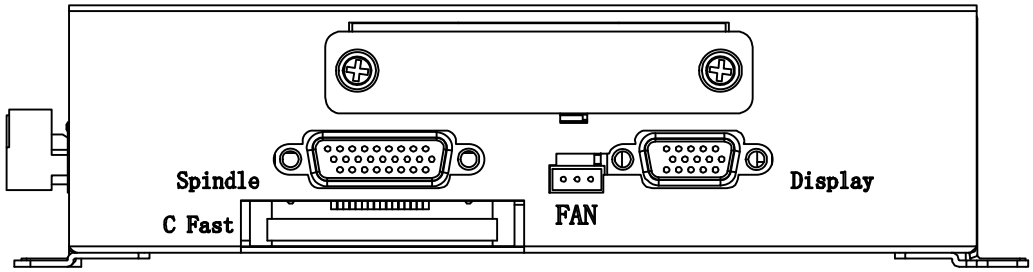


Figure 3- 12 N5 hardware interface-2

Table 3- 3 N5 Hardware Interface Details-2

№	interface	pin	function	interface description
10	VGA		Display interface	For connecting a VGA monitor
12	Spindle		Pulse Conversion Interface	Inverters for analog control / pulse control Receive multiple encoder feedback
			Digital Signal Input	Optocoupler isolated input (24V max)
			Digital Signal Output	Relay switching output (max. 24V, 0.5A)
			-10V~10V analog output	This output controls the analog spindle inverter.

3.2.1 Spindle interface

summarize

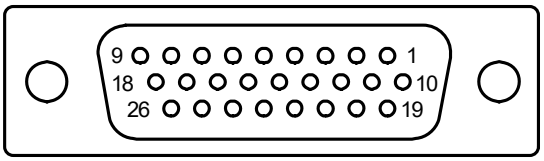
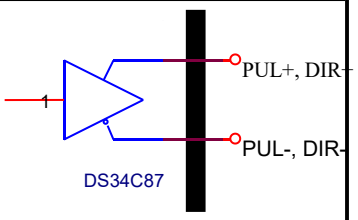


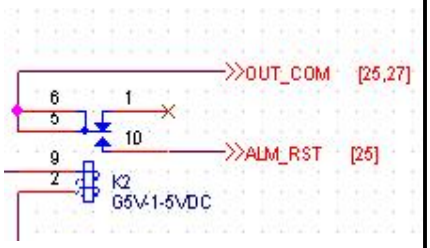
Figure 3- 13 Schematic diagram of the Spindle interface

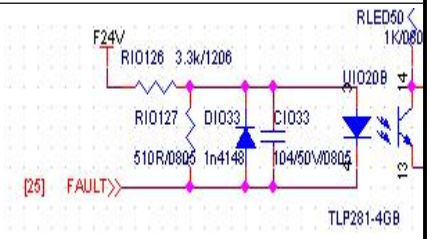
- Used to control PFM/DAC (position/speed control of servo drives) servo drives;
- Can be used for inverters with analog control/inverters with pulse control;
- Commands and feedback are all within the same interface.

Interface Description

Table 3- 4 Spindle Protocol Interface Description

pinout	abbreviation	functional description	circuit principle description
10	EA-	Encoder AB phase differential signal input	Bidirectional 485 interface
1	EA+		
11	EB-		
2	EB+		
12	EZ-	Differential signal input for encoder zero (Index)	
3	EZ+		
14	PULA-	Pulse command output	
5	PULA+		
15	PULB-		
6	PULB+		Maximum output frequency is 10 MHZ
7	DAC1	Two analogs	-10V~10V analog output
8	DAC2		
17	AGND	Analog Ground	

<table>
<tr><td>19</td><td>ENA</td><td>Servo ON (Servo ON) output</td><td rowspan="4"> 

Common 24V ground, normally open contact output</td></tr>
<tr><td>20</td><td>ALM_RST</td><td>Servo Alarm (ALARM)</td></tr>
<tr><td>21</td><td>OUT3</td><td>Universal output</td></tr>
<tr><td>25</td><td>OUT_COM</td><td>Common of the three output points</td></tr>
<tr><td>22</td><td>FAULT</td><td>Servo alarm (ALARM) signal input, input 0V active</td><td rowspan="3"> 

Maximum rate support 10KHZ</td></tr>
<tr><td>23</td><td>RDY</td><td>Ready signal</td></tr>
<tr><td>24</td><td>IN3</td><td>Universal input</td></tr>
<tr><td>13, 16</td><td>GND</td><td>5V Digital Ground</td><td></td></tr>
<tr><td>4</td><td>5V</td><td>Digital 5V</td><td></td></tr>
<tr><td>26</td><td>F24V</td><td rowspan="2">24V power input to optocoupler driver circuit</td><td></td></tr>
<tr><td>9, 18</td><td>FGND</td><td></td></tr>
</table>

Attention

When using Spindle's analog to control the drive/spindle, the analog may be disturbed and fluctuation exists, at this time, you can short the analog AGND (pinout 17) and shielding shell to reduce the impact of analog interference.

3.2.2 VGA interface

Typically used to connect the panel's display:

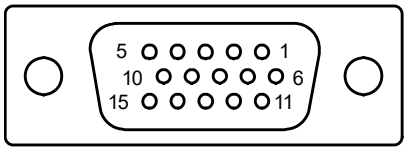


Figure 3- 14 Schematic diagram of VGA interface

Interface Description

Table 3- 5 VGA Protocol Interface Descriptions

pinout	abbreviation	Functional Description
1	RED	Red primary signal
2	GREEN	Green primary signal
3	BLUE	Blue primary signal
5	GND	Ground Signa
6		
7		
8		
9	KEY	Empty, No Pin
12	ID1	Display identification bit 1, address code, I2C interface, interface used by the host to view information such as the display ID and model number
13	HSYNC	Horizontal Synchronization
14	VSYNC	Vertical Synchronization
15	ID3	Display identification bit 3, address code, I2C interface, interface used by host computer to view information such as display ID and model number

3.2.3 MIII interface

summarize

The network basic protocol of the Mechatrolink-III system has functions equivalent to layers 1, 2, and 7 of the OSI basic model, and is capable of data connection services, exchange of data units, error notification (communication alarms), and latency determination.

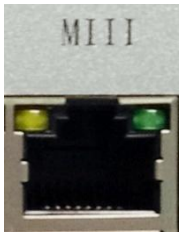


Figure 3- 15 MIII interface

Description

- The recommended RJ-45 plug in Mechatrolink-III is a locking plug, so please effectively plug the cable into place until it makes a locking sound.
- When the MIII is star-connected, a Mechatrolink-III-specific HUB must be used.

3.2.4 RTEX interface

summarize

- RTEX is a high-speed real-time network communication protocol.
- It can realize 32-axis network communication in 0.5ms time.
- RTEX has one exit and one entrance.
- RTEX forms a ring topology.

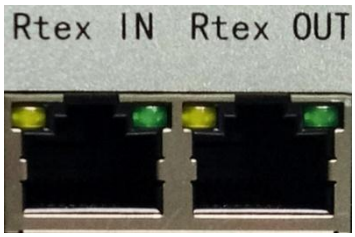


Figure 3- 16 RTEX Interface

Table 3- 6 RTEX Interface Status Indicator Description

interface	indicator light	status	description
RTEX IN	Green	Flashing	Fan speed is normal
		Always on	Abnormal fan speed
	Yellow	Always on	RTEX master chip works normally
		Off	RTEX master chip working abnormally
RTEX OUT	Green	Flashing	RTEX bus initialization successful, RTEX data frame normal
		Always on	RTEX bus initialization successful, no RTEX data frame
		Off	RTEX bus not initialized
	Yellow	Always on	Communication is normal
		Off	Communication is abnormal

Attention

The entire ring of RTEX must be kept connected for it to work properly, and the network is paralyzed in the event of an error or disconnection of one of the nodes.

3.2.5 EtherCAT interface

Figure 3- 17 EtherCAT bus interface

Table 3- 7 Functional description of the EtherCAT bus interface

interface	functional description	interface description
EtherCAT	Standard Ethernet interface	EtherCAT for N5 is an Ethernet-based fieldbus system with an open architecture. It has the characteristics of real-time nature of the system and the flexibility of the topology. It has the characteristics of high-precision equipment synchronization, optional cable redundancy and functional security protocol.

3.2.6 EtherNet interface

Figure 3- 18 EtherNET network interface

Table 3- 8 Network Interface Description

interface	functional description	interface description
EtherNet	Standard Ethernet interface	The N5's Ethernet (standard Ethernet) speeds are 1000 Mbps.

3.2.7 IOLink protocol interface

Iolink interface for LYNUC company's YSLINK protocol expansion interface, can be connected with the slave device in line with the LYNUC company's YSLINK protocol, support for the protocol of the device is: YIO card, YCP card, PRIO card and so on.

Figure 3- 19 IOlink interface

Table 3- 9 IOlink Status Indicator Description

indicator light	status	description
Yellow	On	System interruption
	Off	System timeout
	Flashing	System is normal.
Green	On	Communications blackout
	Off	IOLink timeout
	Flashing	IOLink is normal

3.2.8 Power Input Interface

Figure 3- 20 Power Input Interface

The power input interface specifications are as follows:

Table 3- 10 Power Input Interface Specifications

name	pin	functional description	specification
Power Input	+	DC24V Positive input	DC 24V±10%/2A
	-	DC24V Negative output	

Description:

In order to prevent and reduce the power supply interference from the peripheral grid to the controller, the 24V power supply of N5 needs to be equipped with a separate switching power supply, and the recommended model is: Meanwell RS-150-24.

4. Controller Installation Instructions

4.1 Preparation before installation

Required tools for installation:

- Slotted screwdriver (M2)
- Phillips screwdriver (M5)
- Hex wrench
- Socket spanner
- Multimeter, etc.

4.2 fixed installation

Attention

- Please leave enough space on the right side and lower end of the controller for wiring; try to keep the controller away from servo amplifiers, inverters and other high-power or heat-generating electrical units.
- To improve the heat dissipation performance of the controller, make sure that the air on both sides is unobstructed; and that the heat dissipation airflow reaches the exhaust fan quickly.
- Because of the large size and heavy weight of the controller, side mounting is generally not recommended. If side mounting must be done, a mounting bracket needs to be added, and the controller is secured to the mounting bracket by means of flush mounting, and then the mounting bracket is mounted sideways.

4.2.1 N5 Monoblock Controller Mounting Hole Dimensions

The outer dimensions and mounting holes are shown below:

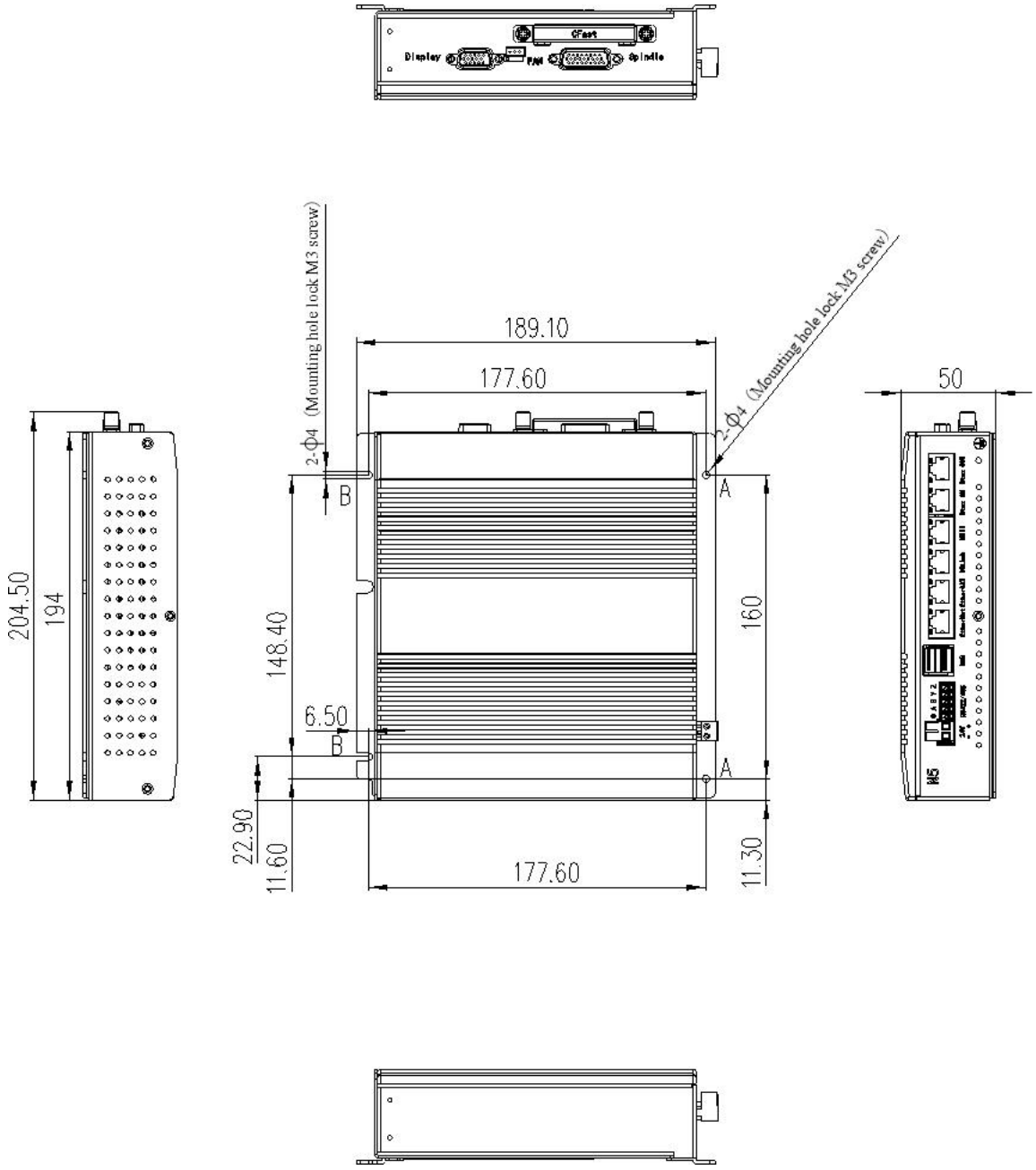


Figure 4- 1 N5 Monoblock Controller Mounting Hole Dimensions

4.2.2 N5 All-in-One Controller Mounting Hole Dimensions

The N5 all-in-one controller upper panel mounting hole locations and external dimensions are shown below:

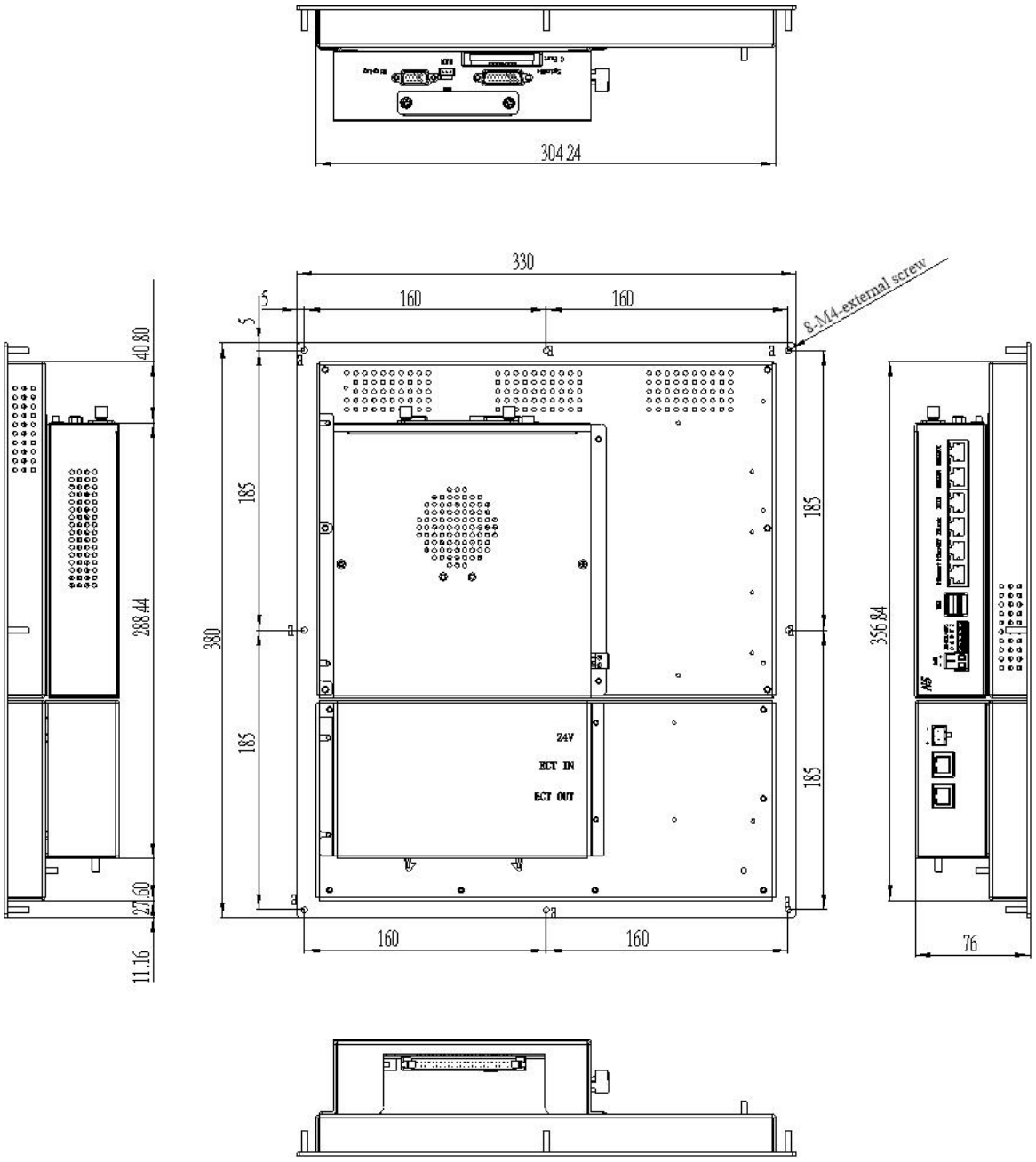


Figure 4- 2 N5 All-in-One Controller Upper Panel Mounting Hole Locations and External Dimensions

Attention

- The recommended mounting holes for sheet metal cabinets are 5mm, and the position refers to the position marked by a screw in [Figure 4- 2 N5 All-in-One Controller

Upper Panel Mounting Hole Locations and External Dimensions];

- The recommended opening size for the sheet metal upper panel is 360(H)*310mm(W) as shown below:

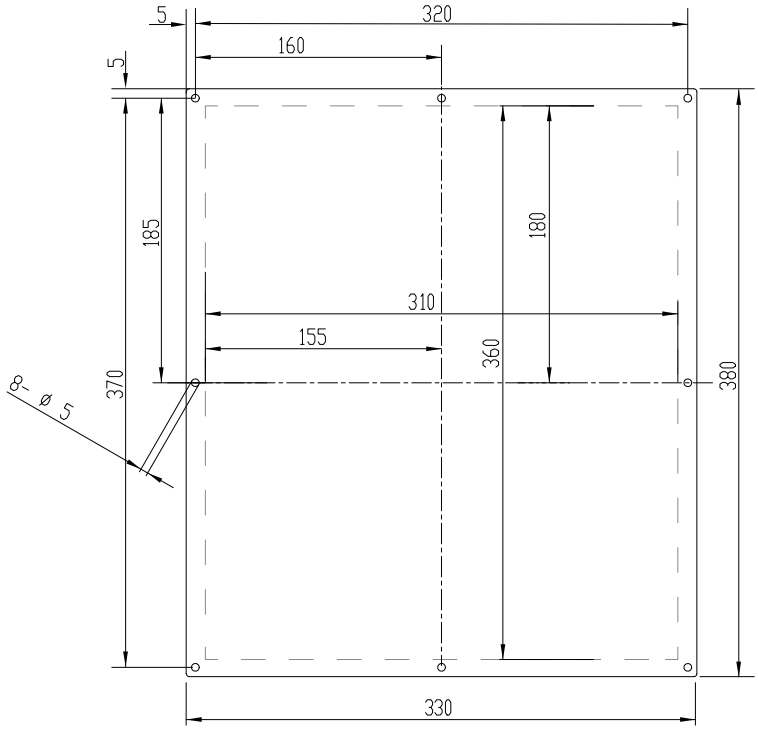


Figure 4- 3 Sheet Metal Cabinet Suggested Cutout Mounting Dimensions Drawing - N5 All-in-One Controller Upper Panel

- The recommended opening size for the sheet metal lower panel is 180(H)*310(W) as shown below:

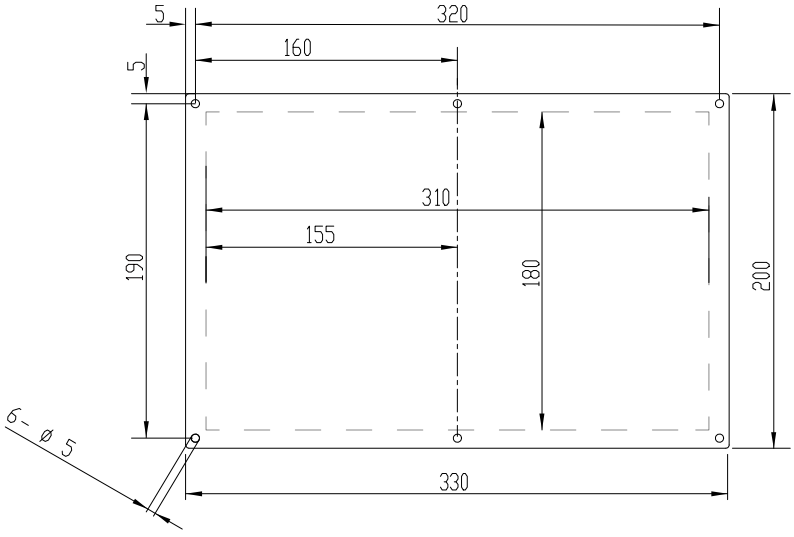


Figure 4- 4 Sheet Metal Cabinet Suggested Cutout Mounting Dimensions Drawing - N5 All-in-One Controller Lower Panel

4.2.3 N5 Controller Accessory Installation

Please refer to the relevant instructions for installation details:

Table 4- 1 Accessory Installation Reference Table

Installation projects	References
Panel Installation	☞ “Panel Instruction Manual”
PRIO Installation	☞ “PRIO Input-Output Modules - Instruction Manual”
IOE Installation	☞ “IOE Input-Output Modules - Instruction Manual”

4.3 Earth wire connection method

summarize

Once the modules are secured, connect their ground terminals to the machine safety ground.

4.4 Test before power-on

summarize

In the maintenance of CNC machine tools, in order to ensure the safe and reliable operation of the machine tool, regardless of whether the failure is related to the following checks, usually should be the first to do the routine inspection and testing of the CNC system.

Testing items

- Component appearance inspection
- Installation check
- Connecting the power supply
- Confirmation of power supply voltage

4.4.1 Component Appearance Check

A visual inspection of the CNC and servo drive should include the following:

- Check the appearance of the components of the MDI/CRT unit, machine operation panel, and other units for damage;
- Check that the control unit, servo driver, power supply unit, I/O and other units are firmly mounted and that the modules are not loose or detached;
- Check each connecting cable for breakage, insulation damage, or poor plugging.

4.4.2 Installation check

Check items

- Check that the control unit, servo driver, power supply unit, I/O unit, and other units are securely mounted, and that the modules are not loose or detached;
- Check that the operating components on the panel and on the machine are securely mounted;
- Check that the connecting cable wires are arranged and fixed as required and that the cable plugs have been reliably stabilized;
- Check the wiring of each I/O connection terminal for looseness, firm installation, etc.

4.4.3 Connection check

Check items

- Check that the power connections to the system and drive are correct;
- Check that the grounding wires of the CNC, Servo Driver, and I/O Unit are connected correctly, that the wire diameter is large enough, that the connection location is reasonable, and that the protective earth is a single point ground;
- Check that the signals and cables have been reliable;
- Make sure that the cable wiring from the N5 controller to the YCP panel and the cable wiring from the YCP panel to the PRIO board is correct;
- Make sure the controller to drive wiring is correct;
- Make sure that the servo motor is properly wired to the servo motor driver;
- Make sure that all IOs are wired correctly and that the polarity of the IO levels is

correct;

- Make sure all grounded signal wires are properly and adequately grounded.

4.4.4 Confirmation of power supply voltage

Check items

- Please measure the resistance of the 24V input to confirm that there is no short circuit;
- Make sure that there is a normal input of DC24V power.

4.5 Installation Precautions

summarize

1) Control board card power supply power cord: 24V must be twisted.

2) All differential form signal cables must be twisted pair per group and the cables must be reliably shielded.

3) The high-voltage line of machine tool should avoid signal line and weak power line as much as possible, and it is forbidden to run the line at close distance between signal line, weak power supply and high-voltage.

5. Controller common faults and handling

5.1 Mainframe Fault diagnosis

summarize

The host of the CNC machine tool usually refers to the mechanical, lubrication, cooling, chip removal, hydraulic, pneumatic and protection parts of the composition of the CNC machine tool, the host of common faults are mainly:

① Mechanical transmission fault caused by improper installation, commissioning, operation and use of mechanical parts.

② Faults caused by interference of moving parts such as guideway spindles, excessive friction, etc.

③ Malfunctions caused by damage to mechanical parts, poor connections, etc., etc.

The main manifestation of the faults:

Transmission noise, poor machining accuracy, high operating resistance, non-operation of mechanical parts movements, damage to mechanical parts, etc.

Common causes of faults:

Poor lubrication, clogged management of hydraulic and pneumatic systems and poor sealing are common causes of mainframe faults.

Mainframe faults handling:

Regular maintenance of CNC machine tools, maintenance, control and eradication of "three leaks" phenomenon is to reduce the host part of the failure of important measures.

5.2 Faults of the electrical control system

summarize

Electrical control system failures are usually categorized into two main groups in terms of the type of components used and according to common usage.

- "Weak power" fault

- "Strong power" fault

Description

① The "weak power" part refers to the control part of the control system which is mainly composed of electronic components and integrated circuits. The weak power part of the CNC machine tool includes CNC, PLC, MDI/CRT and servo drive unit, input and output unit and so on. "Weak power" fault can be divided into hardware fault and software fault.

② "Strong power" part of the control system refers to the main circuit or high-pressure, high-power circuit of relays, contactors, switches, fuses, power transformers, motors, solenoids, travel switches and other electrical components and their control circuits. Although this part of the fault maintenance, diagnosis is more convenient, but because it is in high pressure, high current working condition, the chance of failure is higher than the "weak power" part. Must cause maintenance personnel enough attention.

5.2.1 Hardware fault

summarize

Hardware faults are faults of integrated circuit chips, discrete electronic components, connectors, and external connection assemblies for each of the above components (CNC, PLC, MDI/CRT, and servo drive units, input/output units).

Table 5- 1 Common Hardware faults and Handling

Fault diagnosis	Fault classification/cause	Fault handling
Monitor black screen	Controller not activated	The 24V power supply of the controller may not be supplied, the voltage may be low, and it may be reversed.
		Power supply power is low, not using the recommended type of switching power supply, please ensure that the

		power of 150W
Automatic reboot occurs during operation		24V switching power supply power is not enough, may use the power, model is not correct
		The same switching power supply that powers devices other than the controller causes unstable power supply.
		Terminals are not locked, wires or terminals have poor contact, or even fall off

5.2.2 Software faults

summarize

Software faults refers to the action of germanium, data loss and other faults that occur under normal circumstances in the hardware, common processing program errors, changes or loss of system programs and parameters, computer arithmetic errors.

Table 5- 2 Common Software Faults and Handling

fault diagnosis	Fault classification/cause	Fault handling
System crash occurs	a) No screen saver, display screen appears but display does not refresh	Please check if the IOlink light of the controller is blinking. If it stops blinking, it is generally a controller fault
	b) Enter the screensaver, the interface stays black and unresponsive	Check if the IOlink light of the controller is blinking; if it stops blinking, then the controller is faulty, otherwise, please look for the problem of the display section
The panel is inoperable	Unresponsive	First of all, please make sure that the CNC light on the panel goes out, or never lights up, indicating that the connection cable to CN24 of the controller is disconnected.
		If the cable is not abnormal, then check whether the LED behind the panel is blinking, if it does not blink, the YCP board where the LED is located may be damaged and need to be repaired.

Appendix A. Recommendations of analog wiring

summarize

Analog output function, usually used to control the speed of the inverter.

Since there have been several recent incidents of analog interface IC damage, this description has been designed to reduce the incidence of some analog interface damage.

Attention

1、 For analog wiring, use a separate multi-core wire, do not share a multi-core wire with other signals, and **especially do not share a multi-core wire with any 220V signals**.

2、 If non-multi-core cables are used, use twisted-pair connections.

3、 The analog wires should not be twisted with any 220V power wires or servo output wires.

Since there are many inverter models, two types of wiring are illustrated here:

Appendix A.1 First wiring method

First inverter: analog input, analog ground

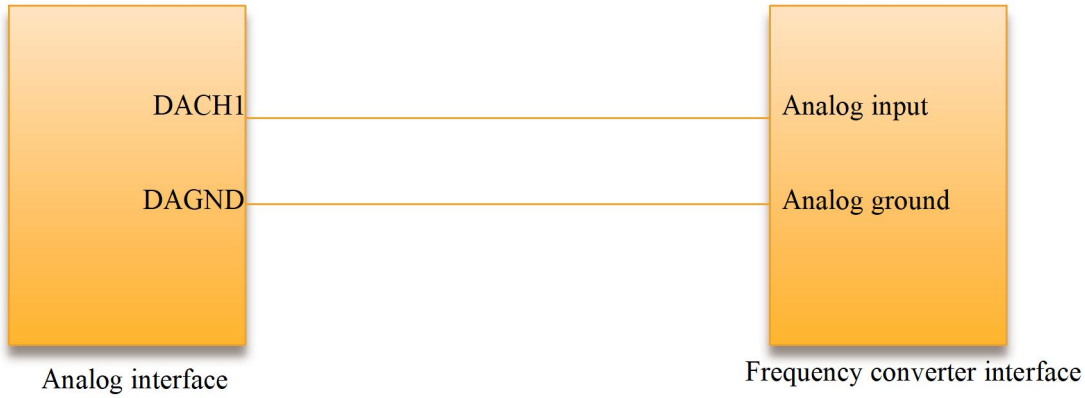


Figure A.1 First wiring method

Attention

1、 If the wiring in the above diagram can meet the requirements, please wire according to the first wiring method in Figure A.1.

2、 In some cases, if 0 needs to be connected with "other 0V of the inverter", it is necessary to

connect "analog ground" **separately to** 0V of the external power supply, and then connect "other 0V of the inverter" to 0V of the external power supply. "The wiring diagram is shown in Figure A.1-1 (for connection to CT driver HS30).

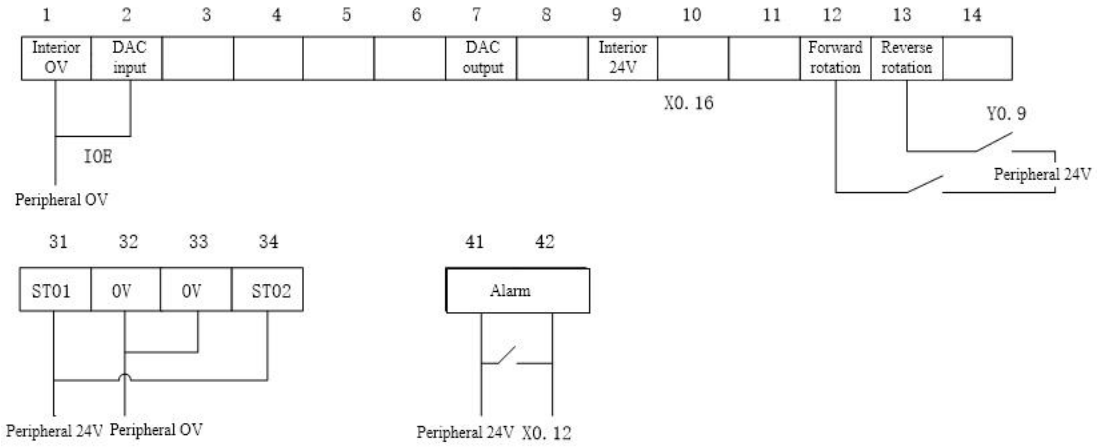


Figure A.1-1 Connection method

Appendix A.2 Second wiring method

The second type of inverter: analog input +, analog input -. Because this kind of inverter does not have "analog ground", so connect the analog "DAGND" to the "analog input -" of the inverter, the connection method is shown in the following figure A.2.

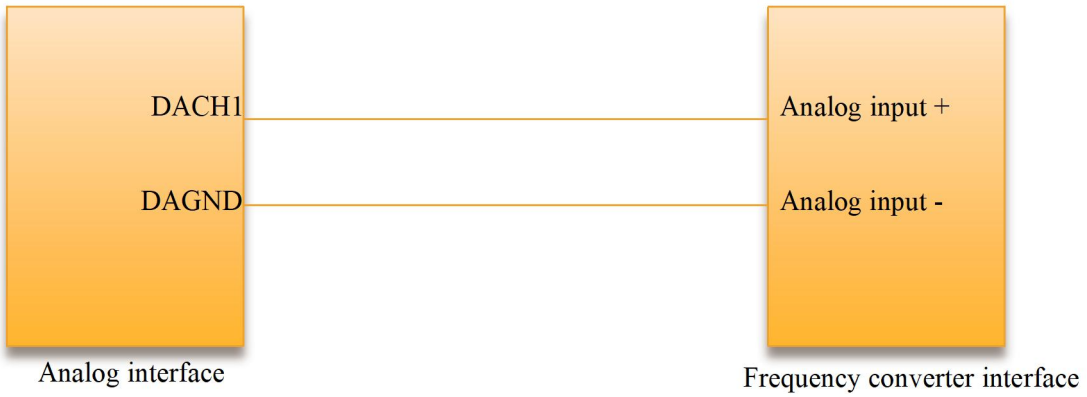


Figure A.2 Second wiring method

Attention

1、 Do not connect DAGND to any "0V" on the inverter interface.

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