Monarch
by INOVANCE

FORWARD, ALWAYS PROGRESSING



NICE3000^{new} Series
Integrated Elevator Controller
Installation and Commissioning Guide

Industrial Automation | Intelligent Elevator | New Energy Vehicle | Industrial Robot | Rail Transit

Data code 19011978 B00

Preface

Thank you for purchasing the NICE3000^{new} integrated elevator controller.

The controller is a world-leading intelligent control system that integrates computer, automatic control, network communication, and motor vector drive technologies. Monarch is a proprietary elevator product brand of Inovance.

It has the following major features:

Advanced Technology

- Distance-based direct travel ride, curves generated automatically
- Group control of up to 8 elevators based on the fuzzy control theory
- Multi-CPU redundancy control and integration of advanced CANbus, Modbus, and IoT communication technologies
- Built-in real-time clock, which provides time-based services for intelligent management
- Flexible emergency rescue schemes
- Automatic identification of short floor
- UCMP and braking force detection

Ease of Use

- Compact structure for small machine room or machine-room-less design
- Easy functional parameter setting for convenient commissioning
- Keypad equipped for easy inspection, maintenance and commissioning
- Load cell auto-tuning with any weight
- Multiple commissioning tools, including PC host computer software, operating panel, and Monarch app
- Automatic balance coefficient detection and slip amount test

Greater Safety and Reliability

- Multiple safety protections in line with the GB/T7588.1/2-2020 standard
- Fault-tolerant design
- Fault troubleshooting to minimize accidents (including elevator bottom-clashing or top-hitting) to ensure safe running
- Advanced drive system, high adaptability to varied environmental conditions and great resistance to power grid fluctuation, dust, heat and thunder impacts
- Dual-chip control of running and brake functions

Riding Comfort

- No-load-cell technology or special load cell compensation device for startup compensation
- High-performance vector control for excellent motor performance and riding comfort

Cost-efficiency

- High integration into the compact structure for reduced peripheral wiring, great cost-efficiency and reliability
- Use of CANbus and Modbus communication for fewer traveling cables
- Flexible modular optional parts
- Parallel connection easily implemented using two wires (no need for extra group control board)

It covers the installation (pre-installation preparation and mechanical and electrical installation) and system commissioning (tools and fault handling). Read this guide carefully before using the product, and keep it properly for future maintenance reference.

More Information

Document name	Data code	Description
NICE3000^{new} Integrated Elevator Controller System Design and Selection Guide	19011544	It covers the system components, technical specifications, dimensions, options selection, common EMC problems handling and certifications and standards.
NICE3000^{new} Integrated Elevator Controller Installation and Commissioning Guide	19011457	It covers the installation (pre-installation preparation and mechanical and electrical installation) and system commissioning (tools and fault handling).
NICE3000^{new} Integrated Elevator Controller Function Guide	19011449	It covers the functional parameters, including parameter list, parameter description, application, typical functions and schemes.
NICE3000^{new} Integrated Elevator Controller Troubleshooting Guide	19011576	It covers maintenance, part replacement , troubleshooting and so on.

Revision History

Date	Version	Change description
June 2022	B00	• Upgrade the product to meet new national standard • Upgrade the front and back covers.
August 2021	A00	First issue

Acquisition

This guide is not in the scope of delivery. If necessary, you can download the PDF file in the following way:

Visit *www.inovance.com*, click Download under Support and enter a keyword to search.

Table of Contents

Preface 1
Safety Instructions 5
1 Unpacking Inspection 11
1.1 Inspection upon Unpacking 11
1.2 Transportation 11
1.2.1 Transportation Before Unpacking 11
1.2.2 Transportation After Unpacking 13
2 Preparations for Installation 14
2.1 Installation Environment 14
2.2 Installation Direction 15
2.3 Installation Space 15
3 Mechanical installation 17
4 Electrical Installation 19
4.1 Wiring Flowchart 19
4.2 Electrical Wiring 19
4.3 Checks Before Wiring 20
4.4 Terminal Cover Removal 21
4.5 Wiring of the Main Circuit 22
4.5.1 Terminal Description 22
4.5.2 Wiring Connection 24
4.5.3 Wiring Requirements 25
4.6 Terminal Cover Installation 30
4.7 Main Control Board (MCB) Wiring 32
4.7.1 Terminal Description 32
4.7.2 Wiring Description 36
4.7.3 Wiring Requirements 37
4.8 Car Top Board (CTB) Wiring 38
4.8.1 Terminal Description 40
4.8.2 Wiring Connection 43
4.8.3 Wiring Requirements 44
4.9 PG Card Connection 45
4.9.1 Terminal Description 47
4.9.2 Wiring Connection 47
4.10 Car Call Board (CCB) Wiring 49
4.10.1 Terminal Description 50
4.10.2 Wiring Connection 52

4.11 Wiring of HCB/Car Display Board 52
4.11.1 Terminal Description 53
4.11.2 Wiring Connection 54
4.12 Installation of Shaft Switches 54
4.12.1 Leveling Signals 55
4.12.2 Slow-down Switches 57
4.12.3 Limit Switches 58
4.12.4 Final Limit Switches 58
4.13 Checks After Wiring 58
4.13.1 Mechanical Safety Checks 59
4.13.2 Electrical Safety Checks 59
5 Commissioning Tool 61
5.1 Overview 61
5.2 Keypad 61
5.3 LED Operating Panel 63
5.3.1 Components 63
5.3.2 Parameter Modification 66
5.3.3 Parameter Viewing 67
5.3.4 State Parameter Display 68
5.3.5 Fault and Alarm Display 68
5.4 Commissioning Using Mobile Phone 69
6 System Commissioning 71
6.1 Commissioning Flowchart 71
6.2 Commissioning Steps 71
6.2.1 Inspection Before Power-on 71
6.2.2 Power-on 71
6.2.3 Operating Panel Connection 72
6.2.4 Parameter Setting 73
6.2.5 Motor Auto-tuning 78
6.2.6 Trial Run at Inspection Speed 80
6.2.7 Car Top Commissioning 80
6.2.8 Shaft Auto-tuning 84
6.2.9 Trial Run at Normal Speed 86
6.2.10 HCB Commissioning (Optional) 87
7 Commissioning Fault Handling 90
7.1 Fault Handling at Power-on 90
7.2 Motor Auto-tuning Fault Handling 93
7.3 Handling of Common Door Control Problems 94
7.4 Adjustment to Abnormal Motor Startup 95
8 Electrical Wiring Diagram 97

Safety Instructions

Safety Precautions

- Before installing, using, and maintaining this equipment, read the safety information and precautions thoroughly, and comply with them during operations. To ensure the safety of humans and equipment, follow the signs on the equipment and all the safety instructions in this user guide. Failure to comply may result in severe personal injuries or even death or equipment damage.
- "DANGER", "WARNING", and "DANGER" items in the user guide do not indicate all safety precautions that need to be followed; instead, they just supplement the safety precautions.
- Use this equipment according to the designated environment requirements. Damage caused by improper usage is not covered by warranty.
- Inovance shall take no responsibility for any personal injuries or property damage caused by improper usage.

Safety Levels and Definitions

DANGER	Indicates that failure to comply with the notice will result in severe personal injuries or even death.
WARNING	Indicates that failure to comply with the notice may result in severe personal injuries or even death.
CAUTION	Indicates that failure to comply with the notice may result in minor or moderate personal injuries or equipment damage.

Safety Instructions

- Drawings in the user guide are sometimes shown without covers or protective guards. Remember to install the without covers or protective guards as specified before using the product, and perform operations following the instructions.
- The drawings in the user guide are shown for illustration only and may be different from the product you purchased.

Unpacking
WARNING • Do not install the equipment if you find damage, rust, or indications of use on the equipment or accessories. • Do not install the equipment if you find water seepage, component missing or damage upon unpacking. • Do not install the equipment if you find the packing list does not conform to the equipment you received.



- Check whether the packing is intact and whether there is damage, water seepage, damp, and deformation.
- Unpack the package by following the unpacking sequence. Do not hit the package with force.
- Check whether there is damage, rust, or injuries on the surface of the equipment or equipment accessories.
- Check whether the number of packing materials is consistent with the packing list.

Storage and Transportation



- Use professional loading and unloading equipment to carry large-scale or heavy equipment. Failure to comply may result in personal injuries or equipment damage.
- Before hoisting the equipment, ensure the equipment components such as the front cover and terminal blocks are secured firmly with screws. Loosely-connected components may fall off and result in personal injuries or equipment damage.
- Never stand or stay below the equipment when the equipment is lifted by hoisting equipment.
- When hoisting the equipment with a steel rope, ensure the equipment is hoisted at a constant speed without suffering from vibration or shock. Do not turn the equipment over or let the equipment stay hanging in the air. Failure to comply may result in personal injuries or equipment damage.



- Handle the equipment with care during transportation and mind your step to prevent personal injuries or equipment damage.
- When carrying the equipment with bare hands, hold the equipment casing firmly with care to prevent parts from falling. Failure to comply may result in personal injuries.
- Store and transport the equipment based on the storage and transportation requirements. Failure to comply will result in equipment damage.
- Avoid transporting the equipment in environments such as water splashing, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- Avoid storing this equipment for more than three months. Long-term storage requires stricter protection and necessary inspections.
- Pack the equipment strictly before transportation. Use a sealed box for long-distance transportation.
- Never transport this equipment with other equipment or materials that may harm or have negative impacts on this equipment.

Installation



- Installation must be performed by only experienced personnel who have been trained with necessary electrical information.



- Thoroughly read the safety instructions and user guide before installation.
- Do not install this equipment in places with strong electric or magnetic fields.
- Before installation, check that the mechanical strength of the installation site can bear the weight of the equipment. Failure to comply will result in mechanical hazards.
- Do not wear loose clothes or accessories during installation. Failure to comply may result in an electric shock.
- When installing the equipment in a closed environment (such as a cabinet or casing), use a cooling device (such as a fan or air conditioner) to cool the environment down to the required temperature. Failure to comply may result in equipment over-temperature or a fire.
- Do not modify this equipment.
- Do not rotate the equipment components or loosen fixed bolts (especially those marked in red) on equipment components.
- When this equipment is installed in a cabinet or final equipment, protection measures such as a fireproof enclosure, electrical enclosure, or mechanical enclosure must be provided. The IP rating must meet IEC standards and local laws and regulations.
- Before installing equipment with strong electromagnetic interference, such as a transformer, install an electromagnetic shielding device for this equipment to prevent malfunctions.
- Install the equipment onto an incombustible object such as a metal. Keep the equipment away from combustible objects. Failure to comply will result in a fire.
- The inspection box should be installed vertically with the cover normally closed to avoid foreign bodies such as water, oil, dust and insects.



- Cover the top of the equipment with a piece of cloth or paper during installation. This is to prevent unwanted objects such as metal chippings, oil, and water from falling into the equipment and causing faults. After installation, remove the cloth or paper for effective ventilation and cooling.
- Resonance may occur when the equipment operating at a constant speed executes variable speed operations. In this case, install the vibration-proof rubber under the motor frame or use the vibration suppression function to reduce resonance.

Wiring



- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by only professionals.
- Before wiring, cut off all equipment power supplies. Wait as specified on the product warning sign before further operations because residual voltage exists after power-off. Measure the DC voltage of the main circuit and make sure it is below the safety voltage. Otherwise, electric shock may occur.
- Never perform wiring at power-on. Failure to comply will result in an electric shock.
- Make sure that the equipment is well grounded. Failure to comply will result in an electric shock.



- Never connect the power cable to output terminals of the equipment. Failure to comply may cause equipment damage or even a fire.
- When connecting a drive with the motor, make sure that the phase sequences of the drive and motor terminals are consistent to prevent reverse motor rotation.
- Wiring cables must meet diameter and shielding requirements. The shielding layer of the shielded cable must be reliably grounded at one end.
- Fasten screw terminals with the specified tightening torque. Insufficient or excessive torque may cause overheating, damage, and even a fire.
- After wiring, make sure that no screws are fallen and cables are exposed in the equipment. Failure to comply may result in an electric shock or equipment damage.



- During wiring, follow the proper electrostatic discharge (ESD) procedures, and wear an antistatic wrist strap. Failure to comply will result in damage to internal equipment circuits.
- In wiring the control circuit, use shielded twisted pair cable and connect the shield to the PE terminal. Otherwise, the equipment may not function properly.

Power-on



- Before power-on, make sure that the equipment is installed properly with reliable wiring and the motor can be restarted.
- Before power-on, make sure that the power supply meets equipment requirements to prevent equipment damage or even a fire.
- After power-on, do not open the cabinet door or protective cover of the equipment. Never touch any terminals, or remove any unit or part of the equipment. Failure to comply will result in an electric shock.



- Perform a trial run after wiring and parameter setting to ensure the equipment operates safely. Failure to comply may result in personal injuries or equipment damage.
- Before power-on, check that the rated voltage of the equipment is consistent with that of the power supply. Failure to comply may result in a fire.
- Before power-on, check that no one is near the equipment, motor, or other mechanical parts. Failure to comply may result in personal injuries or even death.

Operation



- The equipment must be operated only by professionals. Failure to comply will result in personal injuries or even death.
- Do not touch any wiring terminals or remove any part of the equipment during operation. Failure to comply will result in an electric shock.



- Do not touch the equipment shell, fan, or resistor for temperature detection. Failure to comply will result in heat injuries.
- Prevent metal or other objects from falling into the device during operation. Failure to comply may result in fire or equipment damage.

Maintenance



- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by only professionals. Do not maintain the equipment at power-on. Failure to comply will result in an electric shock.
-
- Before maintenance, cut off all equipment power supplies and wait as specified on the product warning sign.
- In case of a permanent magnet motor, do not touch the motor terminals even after power-off because there is still induced voltage generated during rotation. Failure to comply will result in an electric shock.



- Perform daily and periodic inspection and maintenance for the equipment according to maintenance requirements and keep a maintenance record.

Repair



- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by only professionals.
- Do not repair the equipment at power-on. Failure to comply will result in an electric shock.
- Before inspection and repair, cut off all equipment power supplies and wait as specified on the product warning sign.

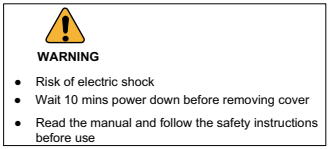


- Require for repair services according to the product warranty agreement.
- When the fuse is blown or the circuit breaker or earth leakage circuit breaker (ELCB) trips, wait as specified on the product warning sign before power-on or further operations. Failure to comply may result in personal injuries, equipment damage or even death.
- When the equipment is faulty or damaged, require professionals to perform troubleshooting and repair by following repair instructions and keep a repair record.
- Replace quick-wear parts of the equipment according to the replacement guide.
- Do not operate damaged equipment. Failure to comply may result in worse damage.
- After the equipment is replaced, perform wiring inspection and parameter settings again.

Disposal
 • Dispose of retired equipment by following local regulations or standards. Failure to comply may result in property damage, personal injuries, or even death. • Recycle retired equipment by following industry waste disposal standards to avoid environmental pollution.

Safety Signs

For safe equipment operation and maintenance, comply with safety signs on the equipment, and do not damage or remove the safety labels. The following table describes the safety signs.

Safety Signs	Description
	• Read the user guide before installation and operation. Failure to comply will result in an electric shock. • Do not remove the cover at power-on or within 10 minutes after power-off. • Before maintenance, inspection, and wiring, cut off input and output power, and wait at least 10 minutes until the power indicator is off.

1 Unpacking Inspection

1.1 Inspection upon Unpacking

Upon unpacking, check the following items:.

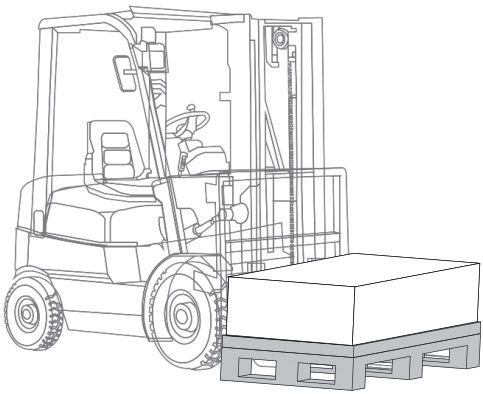
Item	Description
Whether the delivered product is consistent with your order	Check whether the product model on the nameplate is consistent with that on your order.
Whether the product is damaged	Check whether the product enclosure is damaged during transportation. If there is any omission or damage, contact Inovance or your supplier immediately.

1.2 Transportation

1.2.1 Transportation Before Unpacking

- Transport controller models of NICE-L-C-4003 to NICE-L-C-4037 (F) manually due to their small size and light weight.
- Transport controller models of NICE-L-C-4045 (F) to NICE-L-C-4280 (F) with appropriate lifting tools.

The unit must be carried on a wooden pallet when transported with a fork-lift truck or lifted with a crane.



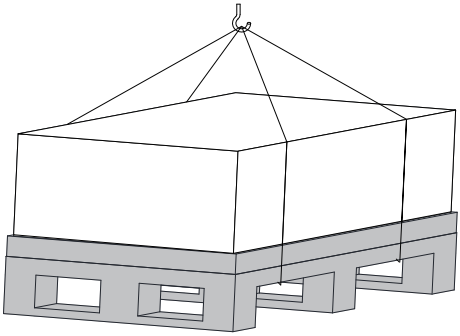


Figure 1-1 Transporting before unpacking

The unit must be placed on a flat and firm ground that can bear its weight.

For controller models of NICE-L-C-4045 (F) to NICE-L-C-4160 (F), they overturn easily because they are heavy and have a high center of gravity. Never place them on the inclined plane with a tilt of over 5°.

The equipment must always be transported in the upright position indicated. Never transport it upside down or in a horizontal position.

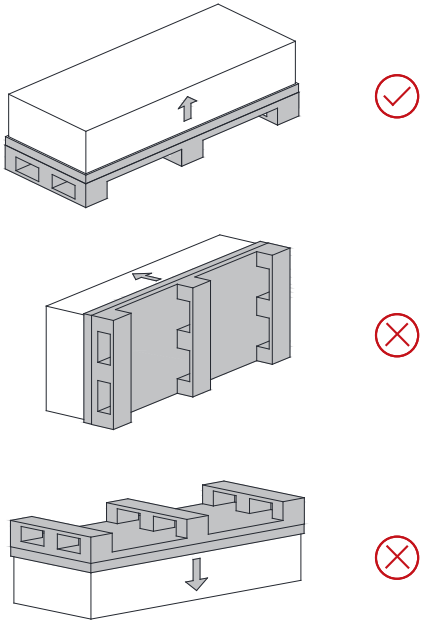


Figure 1-2 Equipment placement

1.2.2 Transportation After Unpacking

- Transport controller models of NICE-L-C-4003 to NICE-L-C-4037 (F) manually due to their small size and light weight.
- Transport controller models of NICE-L-C-4045 (F) to NICE-L-C-4280 (F) with a hoist with the load capacity larger than the combined weight of the equipment.

Use eyelets on the top of the load for lifting and handling, with the relief height not larger than 0.3 m.

Straighten the flat-lying equipment before further handling.

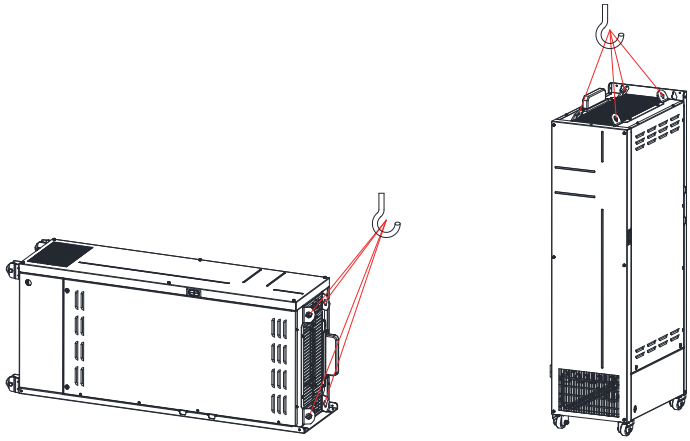


Figure 1-3 Models of NICE-L-C-4045 (F) to NICE-L-C-4280 (F) handling

2 Preparations for Installation

2.1 Installation Environment

Table 2–1 Environment requirement

Item	Requirement
Altitude	1000 m or below (de-rated by 1% for each 100 m higher if the altitude is above 1000 m) Maximum height: 3000 m
Ambient temperature	-10°C to +50°C, with the air temperature change less than 0.5°C/min. The rated current is de-rated by 1.5% for each 1°C higher if the ambient temperature is above 40°C. Maximum temperature: 50°C
Storage temperature	-40°C to +60°C
Ambient humidity	Less than 95%RH, non-condensing.
Storage humidity	Less than 95%RH, non-condensing.
Vibration and shock	Sinusoidal vibration: 5.9 m/s^2 (0.6 g) at 2 Hz to 200 Hz
Degree of protection	IP20
Heat dissipation and ventilation	Install on the backplate, and ensure that there is sufficient space around for heat dissipation.
Installation site	• Avoid direct sunlight. • Avoid places with humidity above 95% and where condensation forms. • Avoid corrosive, explosive and combustible gas. • Avoid places with greasy dirt and dust. • Avoid excessive vibration (Vibration ⩽ 0.6 g).
Protective enclosure	The product is intended for cabinet assembly for systems operating in the end-user environment. The end-user system shall provide enclosures for fireproof and electrical and mechanical protection in line with local laws and regulations and relevant IEC standards.

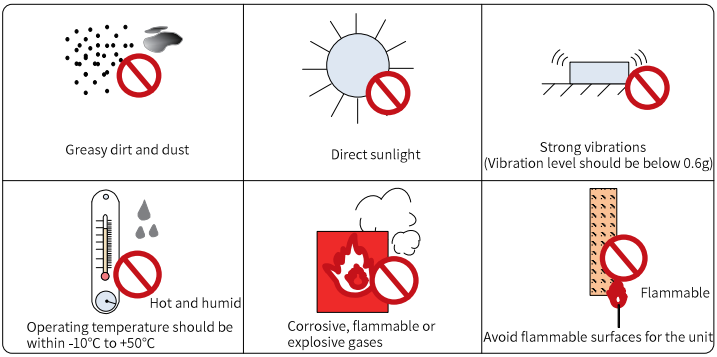


Figure 2-1 Environmental limits

2.2 Installation Direction

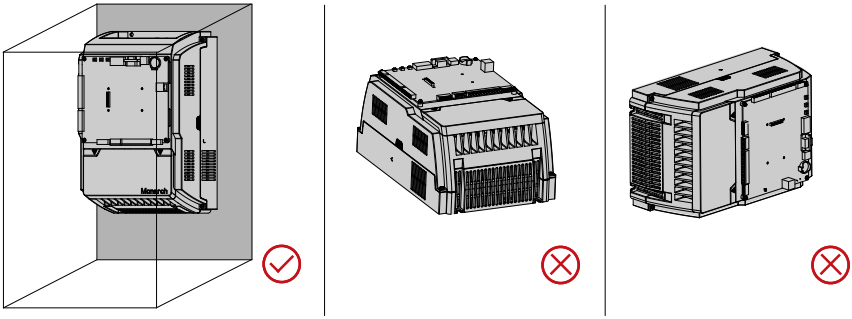


Figure 2-2 Installation direction

2.3 Installation Space

The installation space is different based on the power ratings. The following figure shows details.

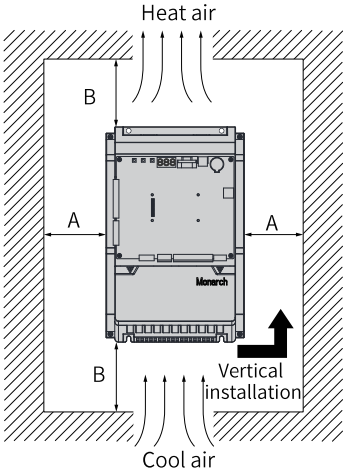


Figure 2-3 Installation space

Power rating	Space
3.7 kW to 15 kW	A ⩾ 10 mm, B ⩾ 100 mm
18.5 kW to 55 kW	A ⩾ 50 mm, B ⩾ 100 mm

The heat is dissipated upward from bottom to top, as shown in the following figure.

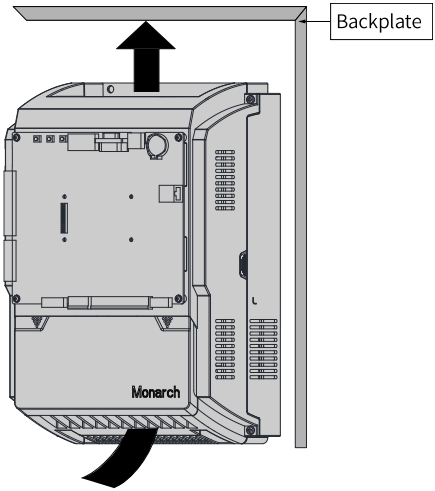


Figure 2-4 Heat dissipation

3 Mechanical installation

Controller models below 160kW (both plastic and sheet metal structure) are installed on a backplate in the control cabinet.

The following figure shows the installation details.

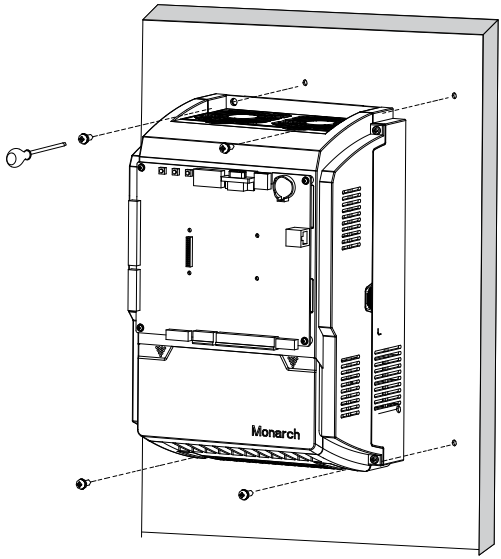


Figure 3-1 Backplate mounting

Caution

Note: Never fasten only the upper two screws, because the controller may fall and be damaged with long-term running. So ensure that all the four screws are fastened.

Pay attention to the following points when designing the control cabinet:

- The temperature difference inside and outside the cabinet shall not be over 10°C with temperature rise of the controller.
- A confined control cabinet must be configured with a fan (or other air cooling device such as air conditioner) to ensure air circulation.
- The air from the fan must not blow directly to the drive unit because this easily causes dust adhesion and further a fault on the drive unit.
- A vent must be available at the bottom of the control cabinet to form bottom-up air flow for effective heat transfer.

- If the fan cannot meet the cooling requirements, install an air conditioner in the cabinet or in the equipment room. Note that the temperature inside the cabinet must not be too low. Otherwise, condensation may occur, causing short circuit of components.
- For special environment where the temperature is high but cannot be reduced effectively, de-rate the controller during use.

4 Electrical Installation

4.1 Wiring Flowchart

The wiring flowchart is shown below:

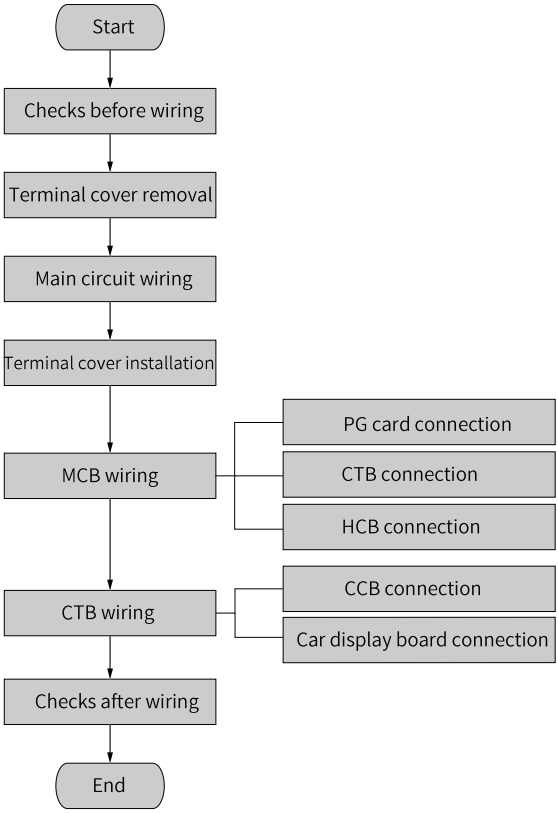


Figure 4-1 Wiring flowchart

Note

The wiring sequence described above is recommended but not mandatory.

4.2 Electrical Wiring

Refer to *"Figure 8–1 " on page 97* .

4.3 Checks Before Wiring

Work on a disconnected device must be carried out with extreme caution because external supply voltages may be present. The main circuit and control circuit terminals may be live even when the motor is in the stop state.

Do cut off input and output power, and wait at least 10 minutes until the power indicator is off before the checks.

The operator is responsible for performing checks including but not limited to those listed in the following table in accordance with the recognized technical rules in the country of installation and with applicable regional guidelines. Tick after each check of the item.

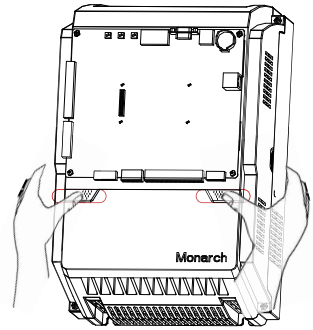
If a protective device trips in a branch circuit, a fault current may have been interrupted. To reduce the risk of fire or electric shock, the conductive parts and other components in the unit should be inspected and damaged parts replaced. When a protective device trips, the cause of the trip must be identified and rectified.

☑	No.	Item
☐	1	Ensure that no abnormal motor sound or vibration, abnormal mechanical connection, phase loss, or loose retaining screws exist.
☐	2	Ensure that cabinet units are in good condition.
☐	3	Ensure that accessories are complete.
☐	4	Ensure that the cable size is right for the controller model.
☐	5	Ensure that all safety devices are effective.
☐	6	Ensure that the controller and motor are grounded correctly.
☐	7	Ensure that there is no inter-phase or phase to ground short circuit in input power supply terminals (R/S/T). Ensure that there is no short circuit to ground on the output side of the transformer. Ensure that there is no inter-phase or phase to ground short circuit in the 220 V power supply.
☐	8	Ensure that devices are installed on the power input side to offer electrical isolation and protection against overcurrent and short circuit.

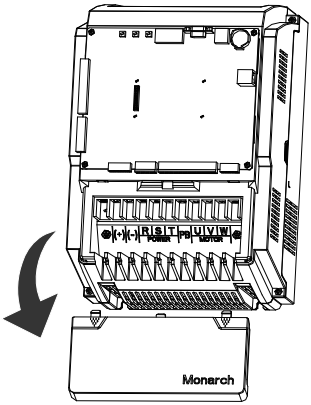
4.4 Terminal Cover Removal

- Removing the terminal cover of the plastic structure

1. Put the thumbs on the positions shown in the figure, and press downward so that the cover is detached.

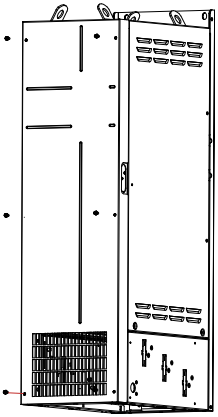


2. Push the cover in the arrow direction. Removal is completed.

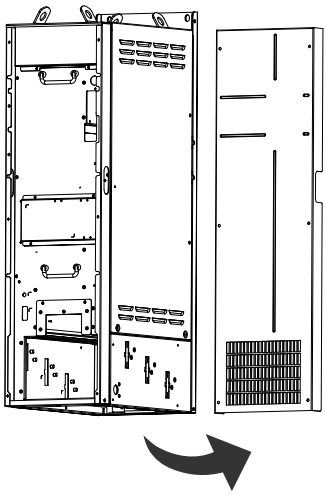


- Removing the terminal cover of the sheet metal structure

1. Remove the 4 to 6 screws and lift the cover to detach it from the positioning holes.



2. Take out the cover.



4.5 Wiring of the Main Circuit

4.5.1 Terminal Description

The terminal layout of the main circuit is shown in the following figure.

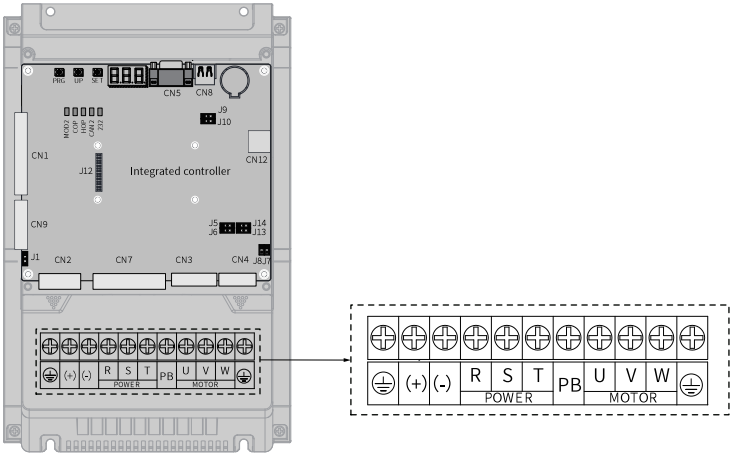
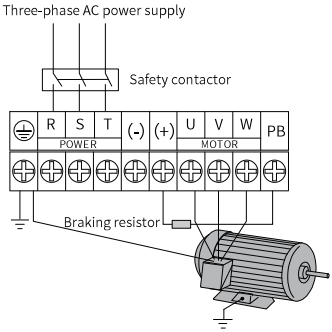


Figure 4-2 Terminal layout of the main circuit (models below 37 kW)

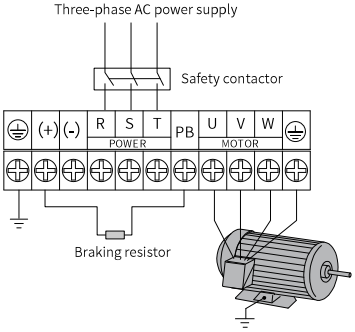
Table 4–1 Main circuit terminals layout

Terminal symbol	Terminal name	Description
R, S, T	Three-phase power input terminals	Three-phase AC power supply terminals
+ and -	Positive and negative terminals of DC bus	Terminals for connecting the external braking unit and regenerative unit for controller models of 75 kW and above
+, PB (P)	Terminals for connecting braking resistor	Terminals for connecting braking resistor for controller models of below 75 kW Terminals for connecting DC reactor for controller models of 75 kW and above (The two terminals are pre-assembled with the jumper bar. If you need not connect the DC reactor, do not remove the jumper bar).
U, V, W	Controller output terminals	Terminals for connecting the three-phase motor
⏚	Grounding terminal	Grounding terminal

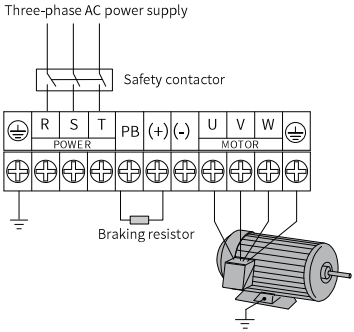
4.5.2 Wiring Connection



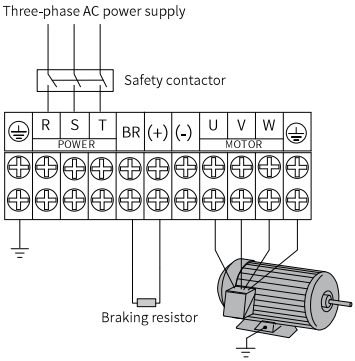
Main circuit wiring for models of 2.5 kW to 5.5 kW



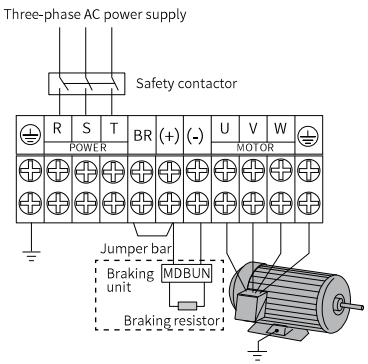
Main circuit wiring for models below 7.5 kW to 15 kW



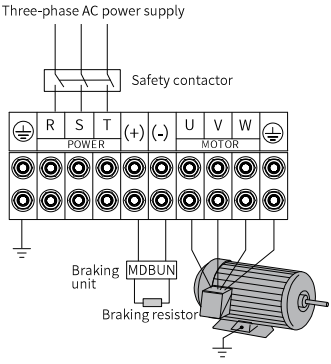
Main circuit wiring for models of 18 kW to 37 kW



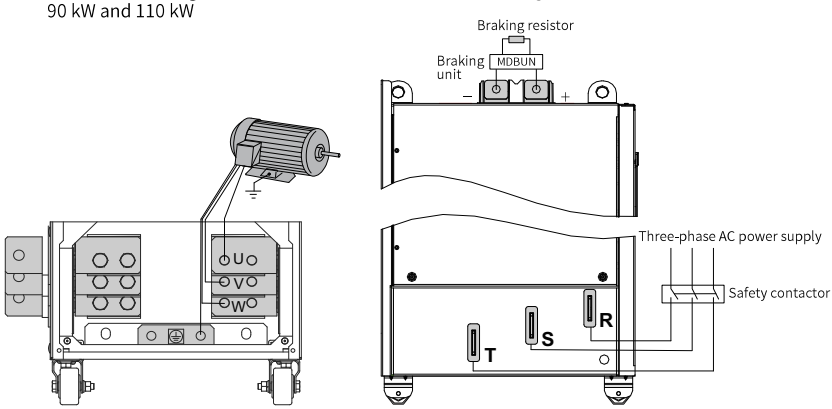
Main circuit wiring for models of 45 kW to 75 kW



Main circuit wiring for models of 90 kW and 110 kW



Main circuit wiring for models of 132 kW to 160 kW



Main circuit wiring for models of 200 kW and above

Figure 4-3 Wiring of the main circuit

4.5.3 Wiring Requirements

Cable Selection

Table 4–2 Input specification

Controller model	Rated input current (A)	I/O power cable (mm^2)	Torque of torque screwdriver (N·m)	Cable lug model
NICE-L-C-4003	10.5	2.5	1.2	GTNR2.5-4
NICE-L-C-4005	14.8	2.5	1.2	GTNR2.5-4
NICE-L-C-4007	20.5	4	2.5	GTNR4-5
NICE-L-C-4011	29.0	6	2.5	GTNR6-5

Controller model	Rated input current (A)	I/O power cable (mm^2)	Torque of torque screwdriver (N·m)	Cable lug model
NICE-L-C-4015	36.0	6	2.5	GTNR6-5
NICE-L-C-4018F	41	10	4.0	GTNR16-6
NICE-L-C-4022F	49.5	16	4.0	GTNR16-6
NICE-L-C-4030F	62	16	4.0	GTNR16-6
NICE-L-C-4037F	62	25	4.0	GTNR16-6
NICE-L-C-4045F	93	35	10.5	TNR1.25-4
NICE-L-C-4055F	113	50	10.5	GTNR2.5-4
NICE-L-C-4075F	157.5	70	20	GTNR70-10
NICE-L-C-4090F	180	95	20	GTNR95-10
NICE-L-C-4110F	214	120	35.0	GTNR120-12
NICE-L-C-4132F	256	120	35.0	GTNR120-12
NICE-L-C-4160F	307	150	35.0	GTNR150-12
NICE-L-C-4200F	365.0	95 × 2	20.0	GTNR95-10
NICE-L-C-4220F	410.0	120 × 2	35.0	GTNR120-12
NICE-L-C-4250F	441.0	120 × 2	35.0	GTNR120-12
NICE-L-C-4280F	495.0	120 × 2	35.0	GTNR120-12
NICE-L-C-5003	10.5	2.5	1.2	GTNR2.5-4
NICE-L-C-5005	14.8	2.5	1.2	GTNR2.5-4
NICE-L-C-5007	20.5	4	2.5	GTNR4-5
NICE-L-C-5011	29.0	6	2.5	GTNR6-5
NICE-L-C-5015	36.0	6	2.5	GTNR6-5
NICE-L-C-5018F	41.0	10	4.0	GTNR16-6
NICE-L-C-5022F	49.5	16	4.0	GTNR16-6
NICE-L-C-5030F	62.0	16	4.0	GTNR16-6
NICE-L-C-5037F	77.0	25	4.0	GTNR16-6

Notes

- Power input terminals R, S, T
  - The cable connection on the input side of the controller has no phase sequence requirement.
  - The specification and installation method of external power cables must comply with the local regulations and related IEC standards.
  - Refer to contents about peripheral device selection in the *NICE3000new Integrated Elevator Controller System Design and Selection Guide* for proper copper cables.
  - The filter must be installed close to the input terminal of the controller. The cable between the filter and the input terminals must be shorter than 30 cm. Ensure that the grounding terminals of the filter and the controller are

connected together, and that both the filter and controller are installed on the same conductive plane that are connected to main grounding of the cabinet.

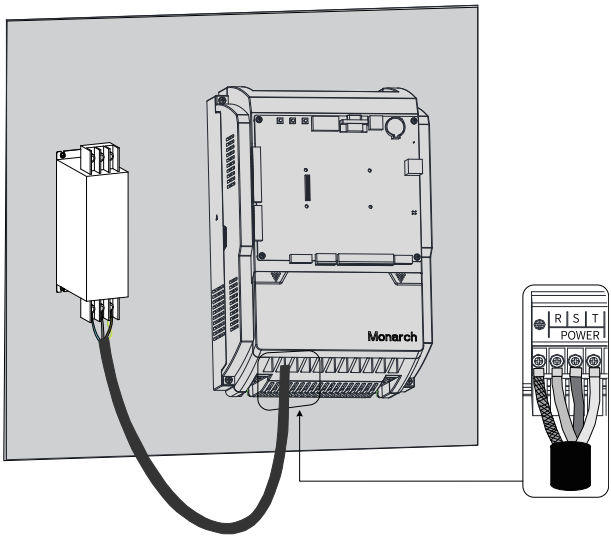
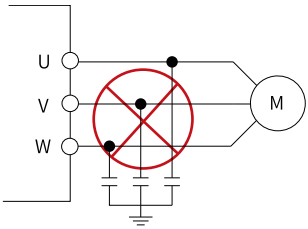


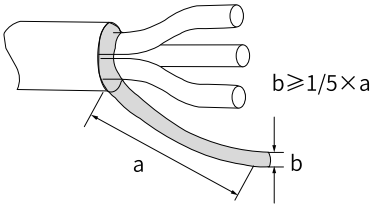
Figure 4-4 Installation on the conductive plane

- DC bus terminals (+) and (-)
  - Terminals (+) and (-) of the DC bus have residual voltage after the controller is switched off. Wait at least 10 minutes and ensure that the voltage is lower than 36 VDC before performing wiring. Failure to comply may result in electric shock.
  - When connecting external braking components for the controller of 75 kW and above, never reverse (+) and (-). Failure to comply may result in damage to the controller and even cause a fire.
  - The cable length of the braking unit must not exceed 10 m. Use twisted pair wires or closely routed pair wires for parallel connection.
  - Do not connect the braking resistor directly to the DC bus. Otherwise, it may damage the controller and even cause a fire.
- Terminals (+) and PB for braking resistor connection
  - These terminals are valid only for the models below 75 kW that have the built-in braking unit.
  - Connect a braking resistor of the recommended model, and ensure that the cable length is shorter than 5 m. Otherwise, it may damage the controller.
- Terminals U, V, W
  - The specification and installation method of external power cables must comply with the local regulations and related IEC standards.

- Refer to contents about peripheral device selection in the *NICE3000new Integrated Elevator Controller System Design and Selection Guide* for proper copper cables.
- Do not connect a capacitor or surge protection device on the output side of the controller. Otherwise, it may cause overheating or even damage to the controller due to harmonics.



- If the motor cable is too long, electrical resonance will be generated due to the impact of distributed capacitance. This will damage the motor insulation or generate higher leakage current, causing the controller to trip in overcurrent protection. If the motor cable is greater than 100 m long, an AC output reactor must be installed close to the controller.
- Use the shielded cable as the output power cable connecting the motor. The shield is connected to the grounding cable.



- Grounding terminal (PE)
  - The grounding terminal must be grounded reliably, and the resistance of the grounding cable must be smaller than 10 Ω. Otherwise, the controller may work abnormally or be damaged.
  - The grounding (PE) wire and neutral wire don't share a terminal in the power system.
  - Impedance of the PE conductor must be able to withstand the large short circuit current that may arise when a fault occurs.
  - Select the size of the PE conductor according to the following table.

Table 4–3 Size of PE conductor

Cross-sectional area of a phase conductor (S)	Min. cross-sectional area of protective conductor (Sp)
$S \leqslant 16\ mm^2$	S
$16mm^2 < S \leqslant 35mm^2$	$16\ mm^2$
$S > 35\ mm^2$	S/2

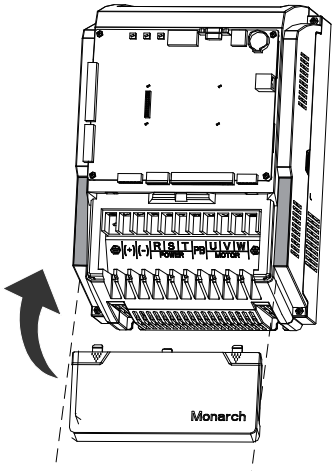
- Use a yellow-green cable to connect the grounding conductor.
- It is recommended that the controller be installed on the conductive metal plane. Ensure that the entire conductive bottom of the controller is in good contact with the metal plane. Install the filter and controller on the same plane to ensure the desired filtering performance.

- Upstream protective device
  - Install proper devices on the power input side to offer electrical isolation and protection against overcurrent and short circuit.
  - For selection of protective devices, consideration should be given to such factors as the current capacity of power cables, the overload capacity requirement of the system, and the short circuit capacity of the upstream components.
- Cable shield requirements
  Refer to contents about cable shield requirements in *NICE3000^{new} Integrated Elevator Controller System Design and Selection Guide*.
- Cabling requirements
  Refer to contents about cable shield requirements in *NICE3000^{new} Integrated Elevator Controller System Design and Selection Guide*.

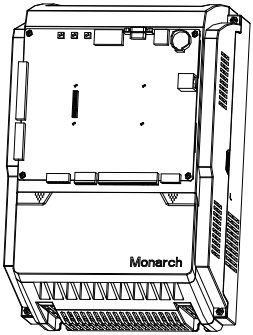
4.6 Terminal Cover Installation

- Installing the terminal cover of the plastic structure

1. Align the cover with the edges of the controller and push in the arrow direction.

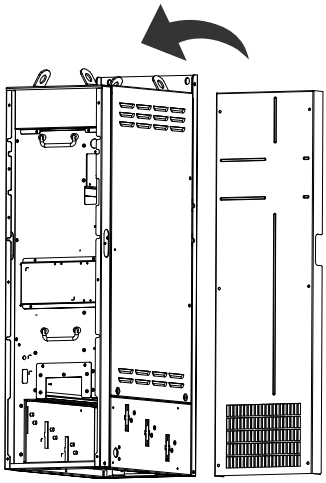


2. Hold the cover and insert the snap-fit joints on the cover into fixed holes.

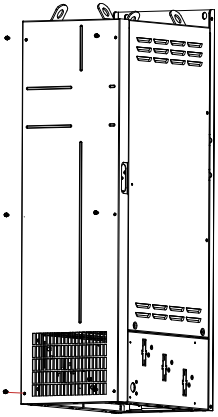


- Installing the terminal cover of the sheet metal structure

1. Hold the cover and latch the pins into fixed holes.



2. Tighten the 4 to 6 screws on the terminal cover with a screwdriver.



4.7 Main Control Board (MCB) Wiring

4.7.1 Terminal Description

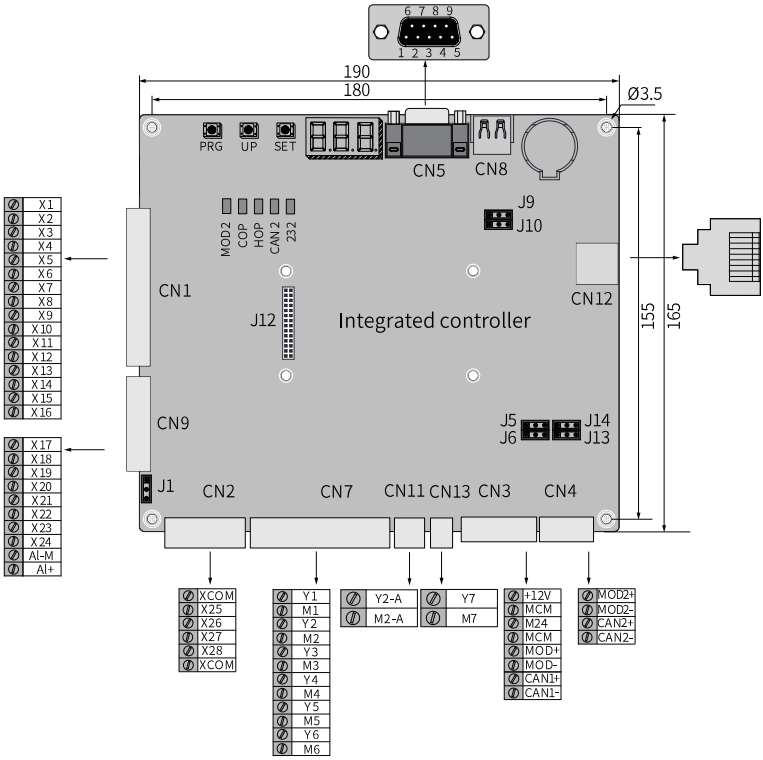
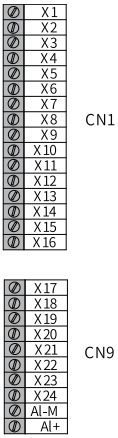
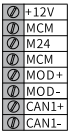
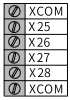
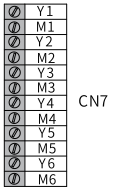
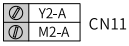
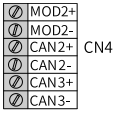
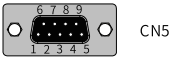
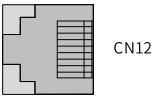


Figure 4-5 Control circuit terminal layout (unit: mm)

Table 4–4 Control circuit terminal description

Terminal symbol		Terminal name	Description	Layout
CN1	X1 to X16	Digital input	Input voltage range of 10 VDC to 30 VDC. Input impedance of 4.7 kΩ, photocoupler isolation. Input current limit of 5 mA. DI terminal function is set by F5-01 to F5-24.	
CN9	X17 to X24	Digital input		
	AI-M	/	/	
	AI +	Analog differential input	It is for the analog load cell.	
CN3	+12V/MCM	External 12 VDC input	It supplies 12 V power supply for the MCB.	
	M24V/MCM	External 24 VDC input	It supplies 24 V power supply for the MCB.	
	MOD+/ MOD-	RS485 differential signals	They are the standard isolated RS485 communication interface for hall call and display.	
	CAN1+/ CAN1-	CANbus differential signals	They are the CAN communication interface with the CTB, and for MRL monitoring board and DI/ DO expansion board connection.	
CN2	X25 to X28/ XCOM	High-voltage detection terminal	They are for the safety circuit and door lock circuit feedback loop (input from left XCOM of X25 and output from right XCOM of X28) with input voltage of 110 VAC ± 15%. The functions are set by F5-37 to F5-40.	

Terminal symbol		Terminal name	Description	Layout
CN7	Y1/M1 to Y6/M6	Relay output	Relay NO output of 5 A/ 250 VAC with functions set by F5-26 to F5-31.	
CN11	Y2-A/M2-A	Relay output	Relay NO output of 5 A/ 250 VAC with functions set by F5-45.	
CN13	Y7/M7	Relay output	Relay NO output of 5 A/ 250 VAC with functions set by F5-46.	
CN8	USB port	RS232 communication interface	It is for mobile phone Bluetooth commissioning.	
CN4	MOD2+/ MOD2-	RS485 differential signals	MOD2 communication interface is for MIB and IoT connection.	
	CAN2+/ CAN2-	CAN2 differential signals	They are for parallel/ group control.	
	MOD3+/ MOD3-	Reserved	/	
CN5	DB9 interface	RS232 communication interface	It is the interface for site commissioning software, MIB, RS232/ RS485 parallel/group control and MCB and DSP board software download.	
CN12	RJ45 interface	Operating panel interface	It is for connecting the operation panel.	

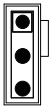
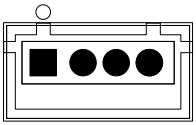
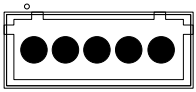
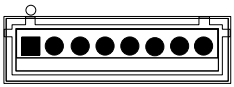
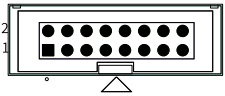
Terminal symbol		Terminal name	Description	Layout
J12	PG card connection			 J12
J1	Used by the manufacturer only, optional grounding terminal for AI, and COM not shorted by default.			 COM CN12
J5	Used by the manufacturer only, MOD2 termination resistor, and ON shorted by default.			 ON J5/J6
J6				
J13	Used by the manufacturer only, CAN2 termination resistor, and ON shorted by default.			 ON J13/J14
J14				
J2	They are for drive board connection.			 J2
J3				 J3
J4				 J4
J11				 2 1 16 15 J11
J9/J10	For use by the manufacturer only and short these terminals with extreme caution for normal use.			/

Table 4–5 Description of indicators on the MCB

Terminal symbol	Terminal name	Description
MOD2	Modbus2 indicator	Flashing (green) for normal communication with IoT and MIB/remote monitoring board
COP	CAN1 indicator	Flashing (green) for normal communication between the MCB and CTB
HOP	Modbus1 indicator	Flashing (green) for normal communication between the MCB and HCB
CAN2	Group control indicator	Steady ON (green) for parallel/group control communication and flashing for normal running in parallel/group control mode
232	Serial communication indicator	Flashing (green) for normal communication with the host controller and MIB/remote monitoring board
X1 to X28	Input signal indicator	ON for active external input signals
Y1 to Y7/ Y2-A	Output signal indicator	ON for system output

4.7.2 Wiring Description

- Connection with PG card
  J1 terminal of MCTC-PG card is inserted into the J12 terminal on the MCB.
- Connection with CTB
  Connect the CN3 port of the MCB with the CN2 port of the CTB.

Table 4–6 MCB CN3 terminals

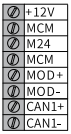
Terminal symbol		Terminal name	Description	Layout
CN3	+12V/MCM	External 12 VDC input	It supplies 12 V power supply for the MCB.	
	M24V/MCM	External 24 VDC input	It supplies 24 V power supply for the MCB.	
	MOD+/ MOD-	RS485 differential signals	They are the standard isolated RS485 communication interface for hall call and display.	
	CAN1+/ CAN1-	CANbus differential signals	They are the CAN communication interface with the CTB, and for MRL monitoring board and DI/ DO expansion board connection.	

Table 4–7 CTB CN2 terminals

Terminal symbol		Terminal name	Description	Layout
CN2	+24V/COM	External 24 VDC power supply	Terminals for connection with external 24 V power supply for the CTB	
	CAN+/CAN-	CAN communication interface with the MCB	Terminals for CAN communication between the CTB and MCB	

See *"CTB Wiring" on page 38* for details.

- Connection with HCB
  Terminals for connection of the CN3 port of the MCB with the CN1 port of the HCB

Table 4–8 MCB CN3 terminals

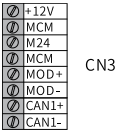
Terminal symbol		Terminal name	Description	Layout
CN3	+12V/MCM	External 12 VDC input	It supplies 12 V power supply for the MCB.	
	M24V/MCM	External 24 VDC input	It supplies 24 V power supply for the MCB.	
	MOD+/ MOD-	RS485 differential signals	They are the standard isolated RS485 communication interface for hall call and display.	
	CAN1+/ CAN1-	CANbus differential signals	They are the CAN communication interface with the CTB, and for MRL monitoring board and DI/ DO expansion board connection.	

Table 4–9 HCB CN1 terminals

Terminal symbol		Terminal name	Description	Layout
CN1	+24V/COM	External 24 VDC input	It supplies 24 V power supply for the MCB.	
	MOD+/ MOD-	RS485 differential signals	Modbus communication port for connection with the MCB.	

4.7.3 Wiring Requirements

Cable Selection

Use the tubular terminal with the insulation sleeve. When the single-wire or twisted-pair cable is used, it must have stripped wire ends of 6 mm.

Refer to contents about peripheral device selection in *NICE3000new Integrated Elevator Controller System Design and Selection Guide* for proper copper cables.

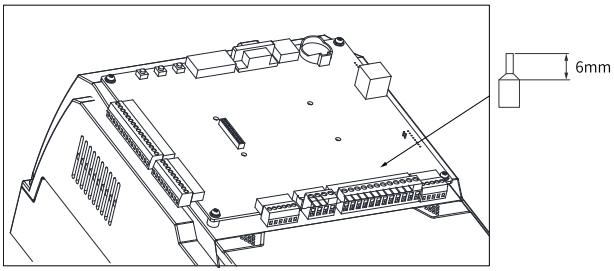


Figure 4-6 Control cable tubular terminal requirement

Table 4–10 Control cable specifications

Terminal name	Tightening torque (N·m)
Control circuit terminal block	0.565

Notes

For wiring requirements, refer to contents about I/O interfaces and communication and system wiring requirements in *NICE3000new Integrated Elevator Controller System Design and Selection Guide*.

4.8 Car Top Board (CTB) Wiring

The car top board (MCTC-CTB) is for car control. It has 8 DIs, 1 AI and 7 standard relay outputs (9 for non-standard customization).

Outline Dimensions and Installation Method

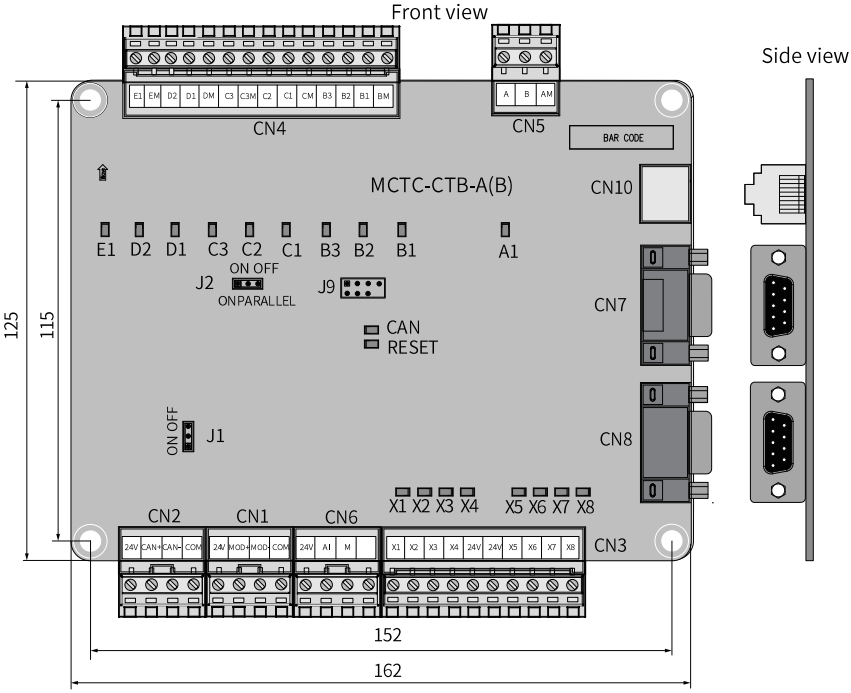


Figure 4-7 CTB outline dimensions (unit: mm)

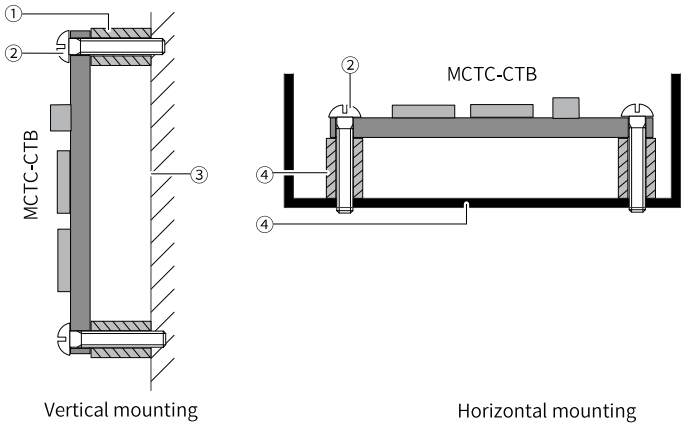
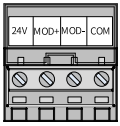
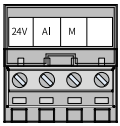


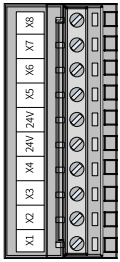
Figure 4-8 CTB installation method (unit: mm)

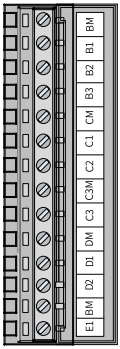
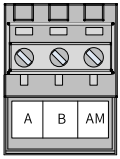
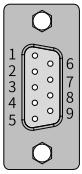
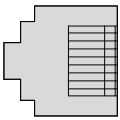
No.	Name	No.	Name
①	Plastic fitting (height no less than 1 cm)	③	Backplate
②	Self-taping screw (4-Ø4.9 × 30)	④	Control box

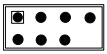
4.8.1 Terminal Description

Table 4–11 Description of CTB terminals

Terminal symbol		Terminal name	Function description	Layout
CN2	+24V/ COM	External 24 VDC power supply	Terminals for connection with external 24 V power supply for the CTB **Warning:** Do not connect safety circuit to the terminals here and avoid high voltage contact. Otherwise, burnout will happen.	
	CAN+/ CAN-	CAN communication interface with the MCB	Terminals for CAN communication between the CTB and MCB	
CN1	+24V/ COM	24 VDC voltage output	Terminals for 24 V power supply for the car display board of MCTC-HCB	
	MOD+/ MOD-	Modbus communication interface with the car display board	Terminals for connecting the car display board of MCTC-HCB for Modbus communication	
CN6	AI-M	Analog load cell signal input	Input voltage range: 0 VDC to 10 VDC	

Terminal symbol		Terminal name	Function description	Layout
CN3	24 V	+24 V power supply	DI common terminal	
	X1	Light curtain 1 input	DI terminal • Photocoupler isolation, unipolarity input • Input impedance: 3.3 kΩ The MCTC-CTB signal is active with 24 VDC input	
	X2	Light curtain 2 input		
	X3	Door open limit 1 input		
	X4	Door open limit 2 input		
	X5	Door close limit 1 input		
	X6	Door close limit 2 input		
	X7	Full-load signal (100%) input		
	X8	Overload signal (110%) input		

Terminal symbol		Terminal name	Function description	Layout
CN4	B1-BM	Door open signal 1 output	Relay output terminal, contact drive capacity: 30 VDC, 1A	
	B2-BM	Door close signal 1 output		
	B3-BM	Forced door close 1 output		
	C1-CM	Door open signal 2 output		
	C2-CM	Door close signal 2 output		
	C3-C3M	Forced door close 2 output		
	D1-DM	Up arrival signal output		
	D2-DM	Down arrival signal output		
	E1-BM	Sound and light alarm output		
CN5	A-AM (NC contact) B-AM (NO contact)	Car fan/ lighting control output	Relay output terminal, drive capacity: 250 VAC, 3 A or 30 VDC, 1 A **Warning:** Do not connect safety circuit to the terminals here and avoid high voltage contact. Otherwise, burnout will happen.	
CN7/CN8		DB9 connector for communication with the CCB	Terminals for connection with MCTC-CCB CN7 mainly used for front door and ordinary calls CN8 mainly used for rear door and disability calls	
CN10		RJ45 connector for external operating panel	Terminal for connection with the external LED keypad or LCD operation panel	

Terminal symbol	Terminal name	Function description	Layout
J2	CTB address jumper in parallel control	Terminal for CTB address setting in parallel control. You can choose to (or not to) short OFF for a single elevator.	
CAN	CAN indicator	Communication indicator between the CTB and MCB (flashing for normal communication and steady ON for faulty communication)	
RESET	CAN fault indicator	Fault indicator flashing and CAN indicator steady ON for faulty communication between the CTB and MCB	
X1 to X8	DI indicator	ON (green) when corresponding external input signal is active	
A1 to E1	Relay output indicator	ON (green) when corresponding system output is active	
J9	Reserved	For use by the manufacturer only and short these terminals with extreme caution for normal use	

4.8.2 Wiring Connection

Connection with the MCB

See the connection with CTB in *"4.7.2 Wiring Description" on page 36*.

Connection with the CCB

Table 4–12 CTB CN7/ CN8 terminals

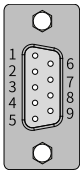
Terminal symbol	Terminal name	Description	Layout
CN7/CN8	DB9 connector for communication with the CCB	Terminals for connection with MCTC-CCB CN7 mainly used for front door and ordinary calls CN8 mainly used for rear door and disability calls	

Table 4–13 CCB CN2 terminals

Terminal symbol	Terminal name	Description	Layout
CN2	Terminals for CAN and power input	Terminals for connection with the CTB as the input ports of CAN and power supply	

Caution

- Perform correct and tight terminal wiring.
- The MCTC-CCB has the same interfaces on both ends, and do not make wrong connection when connecting multiple boards in series.

Connection with the Car Display Board

Table 4–14 CTB CN1 terminals

Terminal symbol		Terminal name	Description
CN1	+24V/ COM	24 VDC voltage output	Terminals for 24 V power supply for the car display board of MCTC-HCB
	MOD+/ MOD-	Modbus communication interface with the car display board	Terminals for connecting the car display board of MCTC-HCB for Modbus communication

Table 4–15 Car display board CN1 terminals

Terminal symbol		Terminal name	Description
CN1	+24V/ COM	24 VDC voltage output	Terminals for 24 V power supply for the car display board of MCTC-HCB
	MOD+/ MOD-	Modbus communication interface with the car display board	Terminals for connecting the CTB for Modbus communication

4.8.3 Wiring Requirements

For wiring requirements, refer to contents about I/O interfaces and communication and system wiring requirements in *NICE3000^{new} Integrated Elevator Controller System Design and Selection Guide*.

4.9 PG Card Connection

The controller can perform feedback vector control (FVC) only with use of the MCTC-PG card. J1 terminal is directly inserted into the J12 on the MCB.

Installation is shown in the following figure.

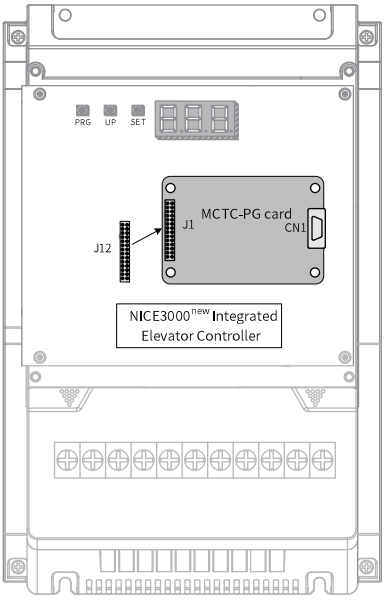
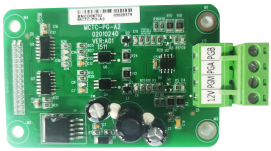
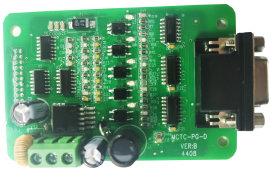
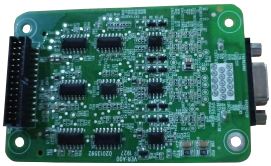
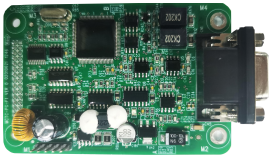
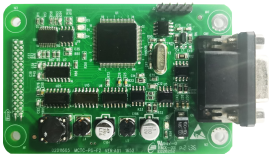


Figure 4-9 MCTC-PG card and its installation

PG card model

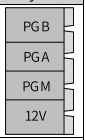
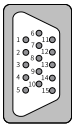
We provide five PG card models of MCTC-PG-A2, MCTC-PG-D, MCTC-PG-E, MCTC-PG-F1 and MCTC-PG-F2 for different encoder types, as described in the following table.

Table 4–16 MCTC-PG card selection

Encoder type	PG card	Appearance
Incremental encoder with push-pull/open-collector encoder output	MCTC-PG-A2	
UVW encoder	MCTC-PG-D	
Sin/Cos encoder	MCTC-PG-E	
Absolute encoder (ERN413/1313)	MCTC-PG-F1	
Absolute encoder	MCTC-PG-F2	

4.9.1 Terminal Description

Table 4–17 Definitions of the CN1 terminals of different PG card models

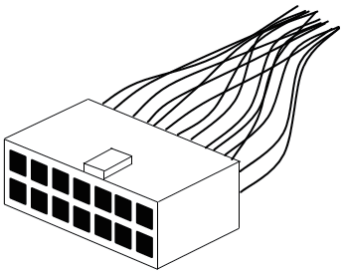
PG card model	Pins															CN1 terminals layout
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
MCTC-PG-A2	12 V	PGM	PGA	PGB	/	/	/	/	/	/	/	/	/	/	/	
MCTC-PG-D	A+	A-	B+	B-	Null	Null	U+	U-	V+	V-	W+	W-	VCC	COM	Null	
MCTC-PG-E	B-	Null	Z+	Z-	A+	A-	COM	B+	VCC	C+	C-	D+	D-	Null	Null	
MCTC-PG-F1	B-	Null	Null	Null	A+	A-	GND	B+	5 V (UP)	CLK+	CLK-	DATA+	DATA-	Null	5 V (Sensor)	
MCTC-PG-F2	B-	/	MOD+	MOD-	A+	A-	GND	B+	M5V	/	/	/	/	/	/	

4.9.2 Wiring Connection

PG Card Connection with the MCB

J1 terminal of MCTC-PG card is inserted into the J12 terminal on the MCB.

PG Card Connection with the Motor Encoder



- Connection between MCTC-PG-E and encoder ERN1387
  An FVC system is formed by connecting the J1 terminal of the MCTC-PG card to the J12 terminal on the MCB and by connecting the CN1 terminal with the traction machine encoder. The connection between different MCTC-PG cards and the MCB is the same, but the connection between the MCTC-PG cards and the encoder varies with the CN1 terminal type.

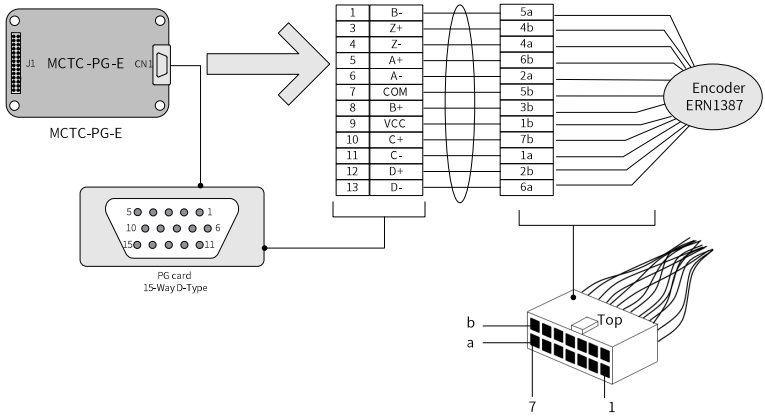


Figure 4-10 Connection between the PG card and encoder ERN1387

Table 4–18 Terminal definition of encoder ERN1387

Signal	C-	A-	0 V Thermistor	R-	B-	D-	Up Thermistor	VCC	D+	B+	R+	0 V	A+	C+
Encoder terminal	1a	2a	3a	4a	5a	6a	7a	1b	2b	3b	4b	5b	6b	7b

- Connection between MCTC-PG-F1 and encoder ERN1313

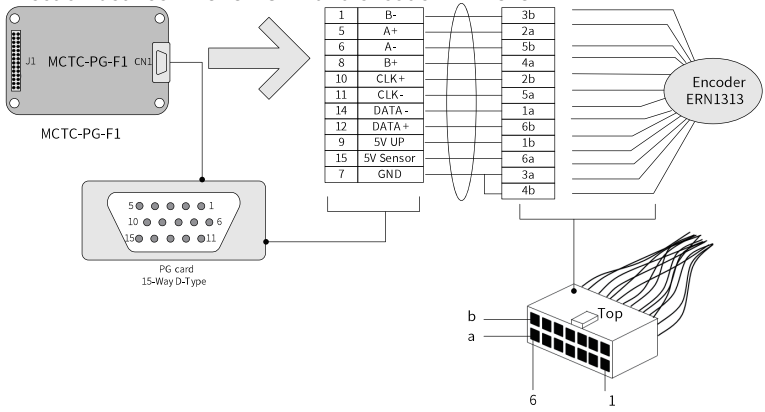


Figure 4-11 Connection between the PG card and encoder ERN1313

Table 4–19 Terminal definition of ERN1313

Signal	DATA-	A+	GND	B+	CLK-	5 V (Sensor)	5 V (UP)	CLK+	B-	GND	A-	DATA+
Encoder terminal	1a	2a	3a	4a	5a	6a	1b	2b	3b	4b	5b	6b

Note

- Cables from the PG card to the encoder must be separated from those of the control circuit and the main circuit. Parallel cabling with close distance is forbidden.
- Shielded cables are required for PG card connection with the encoder. The shield must be connected to the PE on the controller side. To minimize interference, grounding at one end is suggested.
- Ensure cables run through a separate duct and that the metal enclosure is reliably grounded.

4.10 Car Call Board (CCB) Wiring

The car call board (MCTC-CCB) is another interface between users and the control system. Each CCB comprises 24 inputs and 22 outputs, including 16 floor buttons and 8 functional signals. The CCB mainly collects button calls and outputs signals of the button call indicators. The need for 40-floor use can be met through cascaded connection. CN2 is an input connector and CN1 is a cascaded output connector.

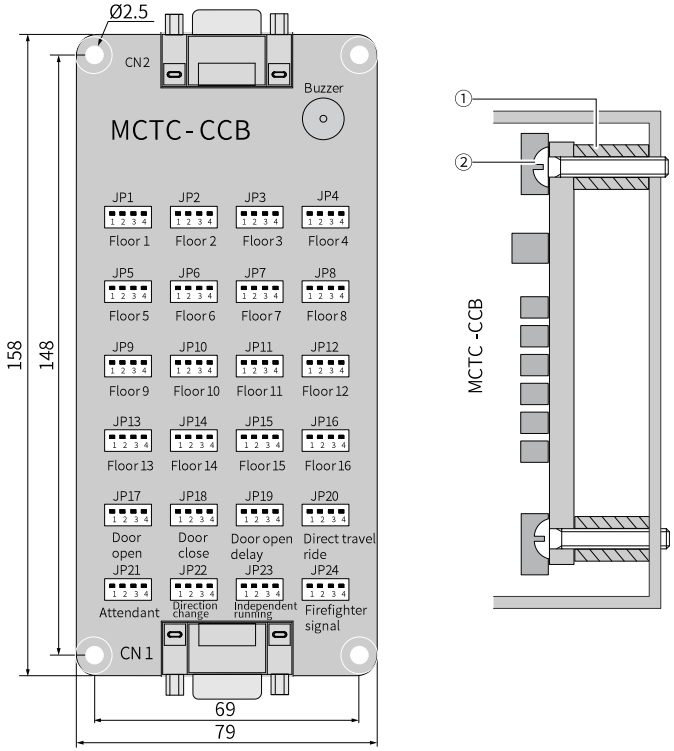


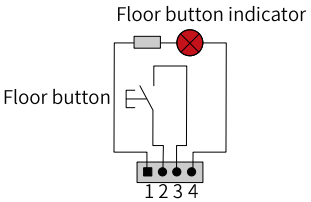
Figure 4-12 Appearance, structure and installation method of the CCB

No.	Name	No.	Name
①	Plastic fitting (height below 1 cm)	②	Self-taping screw (4-Ø4.9 × 30)

4.10.1Terminal Description

Table 4–20 CCB terminals

Terminal symbol	Terminal name	Description
CN1	Cascaded output connector	Through connection with the next CCB, it can meet the needs of controller use for 40 floors.
CN2	CTB input connector	Connection with the CTB for signal input

Interface	Pins 2 and 3	Pins 1 and 4	Wiring description
JP1	Floor 1 button input	Floor 1 display output	 When the CCB is used for cascaded connection, the input signal of JPn corresponds to floor (16 + n) button input.
JP2	Floor 2 button input	Floor 2 display output	
JP3	Floor 3 button input	Floor 3 display output	
JP4	Floor 4 button input	Floor 4 display output	
JP5	Floor 5 button input	Floor 5 display output	
JP6	Floor 6 button input	Floor 6 display output	
JP7	Floor 7 button input	Floor 7 display output	
JP8	Floor 8 button input	Floor 8 display output	
JP9	Floor 9 button input	Floor 9 display output	
JP10	Floor 10 button input	Floor 10 display output	
JP11	Floor 11 button input	Floor 11 display output	
JP12	Floor 12 button input	Floor 12 display output	
JP13	Floor 13 button input	Floor 13 display output	
JP14	Floor 14 button input	Floor 14 display output	
JP15	Floor 15 button input	Floor 15 display output	
JP16	Floor 16 button input	Floor 16 display output	

Interface	Pins 2 and 3	Pins 1 and 4	Wiring description
JP17	Door open button input	Door open display output	When the CCB is used for cascaded connection, the terminals are invalid. When the cascaded CCB is used for rear door control, JP17 can be used for rear door open.
JP18	Door close button input	Door close display output	
JP19	Door open delay button input	Door open delay display output	
JP20	Direct travel ride input	Non-door zone stop output	
JP21	Attendant input	Reserved	
JP22	Direction change input	Reserved	
JP23	Independent running input	Reserved	
JP24	Firefighter operation input	Reserved	

Note

Note: Pins 1 and 2 are positive of power supply. The pin with white dot mark or that is rectangular is pin 1.

4.10.2Wiring Connection

For connection with the CTB, see the information about connection with the CCB in *" CTB Wiring" on page 38*.

4.11 Wiring of HCB/Car Display Board

MCTC-HCB receives the passenger calls and displays the floor where the elevator is located and the running direction. It can also be used as car display board.

Take MCTC-HCB-R600 as an example. If the types available cannot meet your requirements, you can use a parallel-serial conversion board (HCB-B) to make the board provided match your own. For more information, don't hesitate to contact Inovance.

Table 4–21 Common MCTC-HCB types

Name	Feature	Dimensions (mm)
MCTC-HCB-R600	Dot-matrix display board (red)	130 × 72 × 4.6

4.11.1Terminal Description

MCTC-HCB-R600: Dot-matrix display board

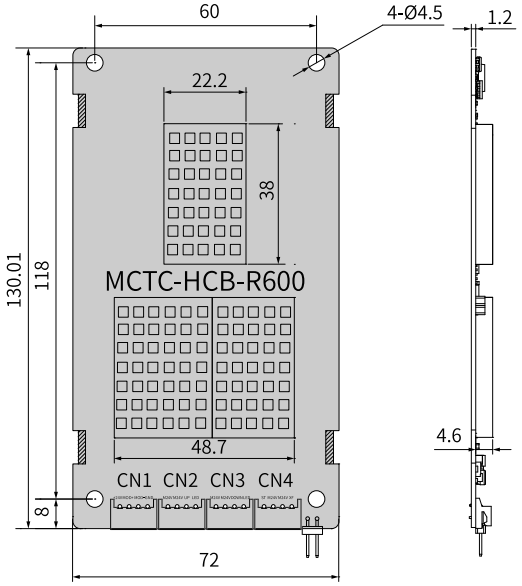


Figure 4-13 Appearance, structure and installation of MCTC-HCB-R600 (unit: mm)

Terminal description:

Table 4–22 Functions of I/O terminals

Terminal symbol		CN1		CN2		CN3		CN4		CN5
Function		Modbus and power supply		Up call button		Down call button		Fire emergency elevator lock input		Jumper for address setting
Pins	1	+24V	24 V power supply	MP24	24 V power supply	MP24	24 V power supply	ST	Elevator lock button input	ON: Floor address setting with up and down call buttons pressed simultaneously after two pins of the jumper are shorted. OFF: No jumper.
	2	MOD+	Modbus communication cable	MP24	24 V power supply	MP24	24 V power supply	MP24	24 V power supply	
	3	MOD-	Modbus communication cable	U-IN	Up call button input	D-IN	Down call button input	MP24	24 V power supply	
	4	GND	Power ground	LED-UP	Up call button output	LED-DOWN	Down call button output	XF	Fire emergency button input	

Note

- 24 V power supply of voltage between 18 V and 26 V
- RS485 communication with default baud rate of 38400 bps
- Load current of the button indicator (⩽ 25 mA) without jumpers by default.

4.11.2Wiring Connection

Connection between the HCB and MCB

See the connection with the HCB in *"4.7.2 Wiring Description" on page 36*.

Connection between Car Display Board and CTB

See the connection with the car display board in *"4.8.2 Wiring Connection" on page 43*.

4.12 Installation of Shaft Switches

In elevator control, to implement accurate landing and safe running, the car position needs to be identified based on shaft position signals. These shaft position signals include the leveling switches, up/down slow-down switches, up/down limit switches, and up/down final limit switches. These shaft position signals are directly transmitted by the shaft cables to the MCB of the controller.

The following figure shows the arrangement of shaft position signals in the shaft.

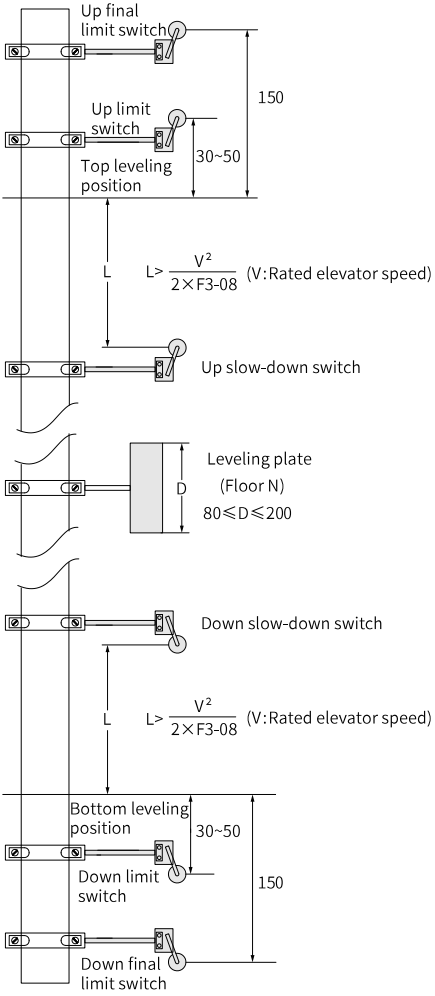


Figure 4-14 Arrangement of shaft position signals (unit: mm)

4.12.1Leveling Signals

Leveling signal devices, including the leveling switches and leveling plates, are connected to the input terminals of the controller. They enable the car to land at each floor accurately.

The leveling switches are installed on the top of the car. This controller supports the installation of four leveling switches. The leveling plate is installed on the guide rail in the shaft. One leveling plate needs to be installed on each floor. Ensure that leveling plates at all floors are mounted with the same depth and verticality.

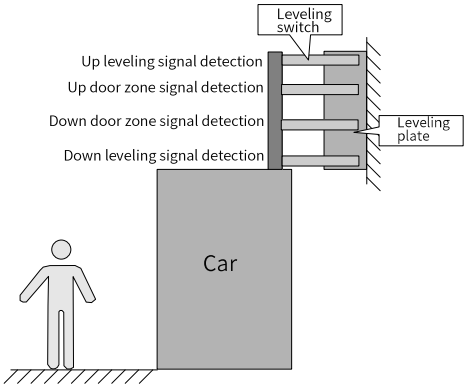
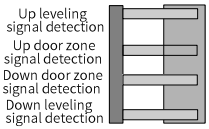
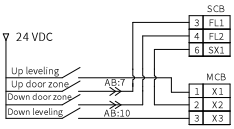
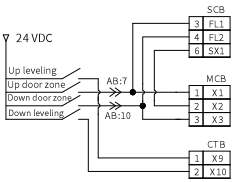


Figure 4-15 Installation of leveling signals

Table 4–23 Installation requirements of leveling switches

Number of leveling switches	Installation method	Connecting to controller input terminals	Parameter setting	State monitoring
4			F5-01 = 1 F5-02 = 3 F5-03 = 2 F6-52 bit6 = 0 (disable)	FA-26 bit1: up leveling state monitoring FA-26 bit2: down leveling state monitoring FA-26 bit3: door zone signal monitoring
			F5-01 = 1 F5-02 = 3 F5-03 = 2 F6-52 bit6 = 1 (enable) F5-25 bit9 = 1 (NO) F5-25 bit10 = 1 (NO)	FA-33 bit10: up leveling state monitoring FA-33 bit11: down leveling state monitoring FA-26 bit3: door zone signal monitoring FA-26 bit1: up door zone signal monitoring FA-26 bit2: down door zone signal monitoring

4.12.2Slow-down Switches

The slow-down switches are one of the key protective means of the elevator, protecting against top-hitting and bottom-clashing even at maximum speed when the elevator position is abnormal. This controller supports a maximum of three pairs of slow-down switches. The slow-down switch 1, slow-down switch 2 and slow-down switch 3 are installed from the two ends of the shaft to the middle floor one by one. Generally, only one pair of slow-down switches is required for the low-speed elevator. Two or three pairs of slow-down switches are required for the high-speed elevator.

The slow-down distance L indicates the distance from the slow-down switch to the leveling plate at the terminal floor. The calculating formula is as follows:

$$L > \frac{V^2}{2 \times F3\text{-}08}$$

L: Slow-down distance; V: Rated elevator speed (F0-04); F3-08: Special deceleration rate.

The default value of F3-08 is 0.9 m/s^2. The following table lists the slow-down distances corresponding to different rated elevator speeds.

Table 4–24 Slow-down distances

Rated elevator speed (m/s)	0.25	0.4	0.5	0.63	0.75	1	1.5	1.6	1.75	2	2.5	3	3.5	4
Slow-down 1 distance (m)	0.4	0.4	0.4	0.4	0.4	0.7	1.5	1.7	2.0	2.0	2.0	2.0	2.0	2.0
Slow-down 2 distance (m)	/	/	/	/	/	/	/	/	/	2.5	4.0	4.0	4.0	4.0
Slow-down 3 distance (m)	/	/	/	/	/	/	/	/	/	/	/	6	8	11

- V < 1 m/s: Compared with the values recommended in this table, the actual installation distances of slow-down switches are allowed to have an error of ± 0.1 m.
- 1 m/s ≤ V ≤ 2 m/s: Compared with the values recommended in this table, the actual installation distances of slow-down switches are allowed to have an error of ± 0.2 m.
- 2 m/s ≤ V ≤ 4 m/s: Compared with the values recommended in this table, the actual installation distances of slow-down switches are allowed to have an error of ± 0.3 m.

Note

- The slow-down distances listed in the preceding table are calculated at the default special deceleration rate (0.9 m/s^2).
- A lower acceleration/deceleration rate or higher special deceleration rate does not affect safety performance. However, a lower special deceleration rate may cause safety hazards. If a rate change is required, calculate the slow-down distance again according to the preceding formula.

4.12.3Limit Switches

The up limit switch and down limit switch protect the elevator against top-hitting and bottom-clashing when the elevator does not stop at the leveling position of the terminal floor.

- The up limit switch needs to be installed 30 mm to 50 mm away from the top leveling position. The limit switch acts when the car continues to run upward for the distance from the top leveling position.
- The down limit switch needs to be installed 30 mm to 50 mm away from the bottom leveling position. The limit switch acts when the car continues to run downward for the distance from the bottom leveling position.

4.12.4Final Limit Switches

The final limit switch is to protect the elevator against top-hitting and bottom-clashing when the elevator does not stop completely upon triggering the up/down limit switch.

- The up final limit switch is mounted above the up limit switch. It is usually 150 mm away from the top leveling position.
- The down final limit switch is mounted below the down limit switch. It is usually 150 mm away from the bottom leveling position.

4.13 Checks After Wiring

The following figure shows the flowchart of wiring safety checks.

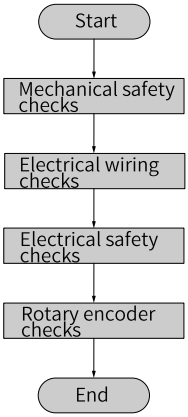


Figure 4-16 Flowchart of wiring safety checks before power-on

4.13.1Mechanical Safety Checks

Check for a totally clear shaft, car and car roof to create a safe operating environment for the elevator.

4.13.2Electrical Safety Checks

The operator is responsible for performing checks including but not limited to those listed in the following table in accordance with the recognized technical rules in the country of installation and with applicable regional guidelines. Tick after each check of the item.

☑	No.	Item
☐	1	Ensure that power input terminals (R/S/T) are connected correctly and securely.
☐	2	Ensure that motor terminals (U/VW) are wired with the controller correctly and securely.
☐	3	Ensure that the controller and motor are grounded correctly.
☐	4	Ensure that the safety circuit is energized and that the emergency stop button and switches in the controller and the machine room operate properly.
☐	5	Ensure that the door lock circuit is energized and that the door lock circuit is disconnected when the car door or any landing door opens.
☐	6	Ensure that the user power line voltage is within the range of 380 V to 440 V and that the phase unbalance degree does not exceed 3%.

☑	No.	Item
☐	7	Ensure that the total lead-in wire gauge and total switch capacity meet requirements.
☐	8	Ensure that there is no inter-phase or phase to ground short circuit in input power supply terminals (R/S/T).
☐	9	Ensure that there is no inter-phase or phase to ground short circuit in the controller or the motor (U/V/W).
☐	10	Ensure that there is no short circuit to ground on the output side of the transformer.
☐	11	Ensure that there is no inter-phase or phase to ground short circuit in the 220 V power supply.
☐	12	Ensure that the 24 V power supply has no short circuit to ground or between positive and negative output.
☐	13	Ensure that the CAN/Modbus communication cable has no short circuit to ground or with the 24 V power supply.

Rotary encoder checks:

☑	No.	Item
☐	1	Ensure that the encoder is installed reliably with correct wiring.
☐	2	Ensure that the encoder signal cables and high-voltage circuit are laid in different ducts to prevent interference.
☐	3	The encoder cables are preferably directly connected to the controller. If the cable is not long enough and an extension cable is required, the extension cable must be shielded and preferably welded to the encoder cables by using the soldering iron.
☐	4	Ensure that the shield of the encoder is reliably grounded on the controller side. To minimize interference, grounding at one end is suggested.

5 Commissioning Tool

5.1 Overview

Use the following tools for system commissioning.

Commissioning tools	Model	Function
Keypad	/	Used to input the shaft commissioning commands and view the floor information.
LED operating panel	MDKE	Used to view and modify parameters related to elevator drive and control.
LED operating panel	MDKE6	Used to upload, download, view or modify the parameters of the integrated controller.
Mobile phone software	Monarch app	Connect the external Wi-Fi module of the controller MCB with your mobile phone. The commissioning software allows parameter setting, function commissioning, real-time running status monitoring, parameter uploading and downloading, and firmware programming of the elevator control system.

5.2 Keypad

The keypad consists of three LEDs and three buttons. You can view information about the controller and enter simple commands on the keypad.

- Keys and display

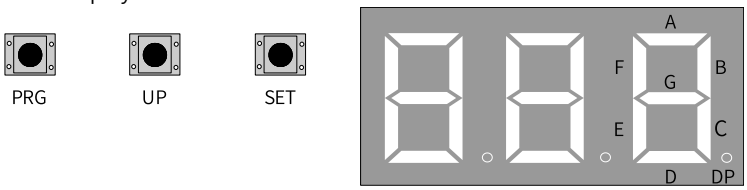


Figure 5-1 Layout of the keypad

The display area of the keypad includes three 7-segment LEDs and the three buttons that are defined as PRG, ADD, and SET.

Key	Function
PRG	It displays the current function menu No. in any state and exits the current operation.
UP	It increases the No. or value of the function menu. It is used as the door open command in F-6 menu.
SET	It enters the function menu editing mode as well as confirms and saves the current operation. It is used as the door close command in F-6 menu.

- Keypad operations
  Example: To call the elevator to floor 4 using the keypad, operate as follows:

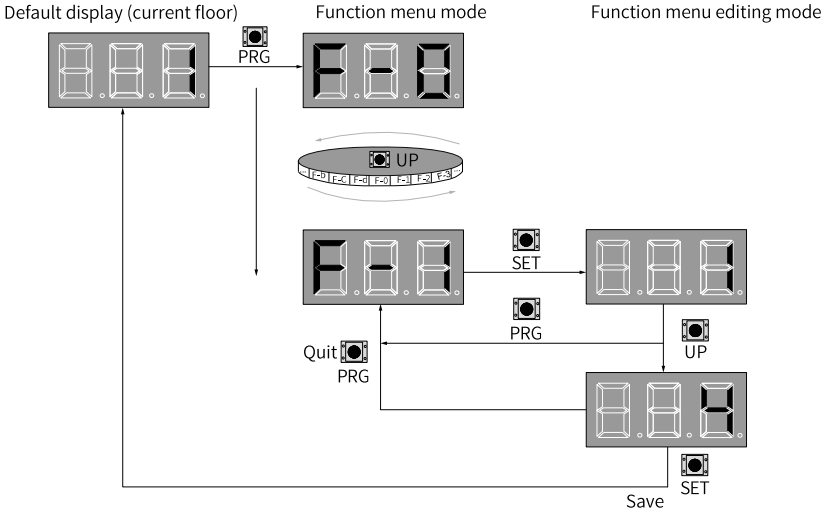


Figure 5-2 Setting the called floor

- Fault and alarm display
  When a fault occurs, the keypad displays the current fault code and subcode in scrolling mode, such as "E22-101" shown in the following figure.



Figure 5-3 Fault code and subcode display on the keypad

After F-2 is set to 2 on the keypad, the keypad will display the information about latest 10 faults, including fault code, subcode, and occurrence time.

After troubleshooting, reset the fault by setting F-2 to 1.

5.3 LED Operating Panel

5.3.1 Components

The following figure shows the operating panel.

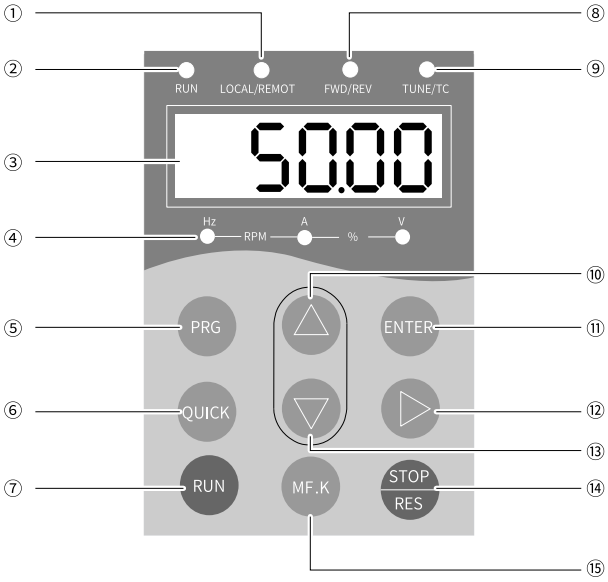


Figure 5-4 Operating panel

Table 5–1 Operating panel layout

No.	Name	No.	Name
①	Command source indicator	⑨	Auto-tuning/Torque control/Fault indicator
②	Running status indicator	⑩	Increment key
③	Data display area	⑪	Confirm key
④	Unit indicator	⑫	Shift key
⑤	Programming key	⑬	Decrement key
⑥	Quick menu key	⑭	Stop/Reset key
⑦	RUN	⑮	Multi-function key
⑧	Running direction indicator	/	/

Table 5–2 Key information

Key	Name	Function
PRG	Programming key	Return to the previous menu of level I.
ENTER	Confirm key	Enter the next screen, and confirm the mode, parameters and set values.
△	Increment key	Change (increase) parameter No. and settings.
▽	Decrement key	Change (decrease) parameter No. and settings.
▷	Shift key	Shift to the left option for parameter display, parameter No. and settings
RUN	RUN	Operate in the operating panel control mode.
STOP/RES	Stop/Reset	Stop the running state. Perform a reset operation when it is in the fault state.
MF.K	Multi-function key	Perform a function switchover according to the setting of F7-01.
QUICK	Quick menu key	Perform a menu mode switchover according to the setting of FP-03 (one menu mode by default).

In the following table, ☀ indicates ON, ● OFF, And ☾ flashing.

Table 5–3 Description of indicators

Status		Description
RUN Running status indicator	● RUN	OFF: Stop state
	☀ RUN	ON: Running state
FWD/REV Running direction indicator	● FWD/REV	OFF: Forward running
	☀ FWD/REV	ON: Reverse running

Status		Description
TUNE/TC Auto-tuning indicator	TUNE/TC	OFF: Not auto-tuning state
	TUNE/TC	ON: Auto-tuning state
Hz - RPM - A - % - V		Unit of frequency: Hz
Hz - RPM - A - % - V		Unit of current: A
Hz - RPM - A - % - V		Unit of voltage: V
Hz - RPM - A - % - V		Unit of motor speed: RPM
Hz - RPM - A - % - V		Percentage: %

The 5-digit LED on the operating panel can display the frequency reference, output frequency, various monitoring data, and fault codes.

Table 5–4 LED display and actual data

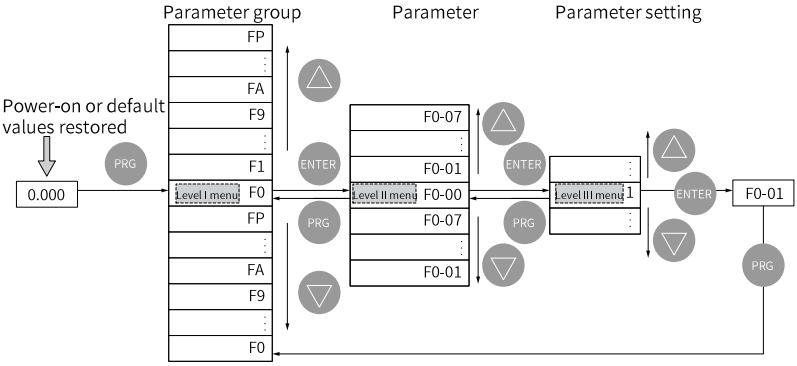
LED display	Actual data	LED display	Actual data	LED display	Actual data	LED display	Actual data
0	0	6	6	C	C	n	N
1	1	7	7	c	c	P	P
2	2	8	8	d	D	r	R
3	3	9	9	E	E	t	T

LED display	Actual data	LED display	Actual data	LED display	Actual data	LED display	Actual data
4	4	A	A	F	F	U	U
5	5, S	b	B	L	L	u	u

5.3.2 Parameter Modification

The LED operating panel adopts a three-level menu to perform operations such as parameter setting. It consists of:

- Level I: parameter groups
- Level II: parameters
- Level III: parameter setting



After entering each level of menu, you can modify the flashing digit by pressing , , and .

Example: Change F3-02 from 10.00 m/s^2 to 15.00 m/s^2.

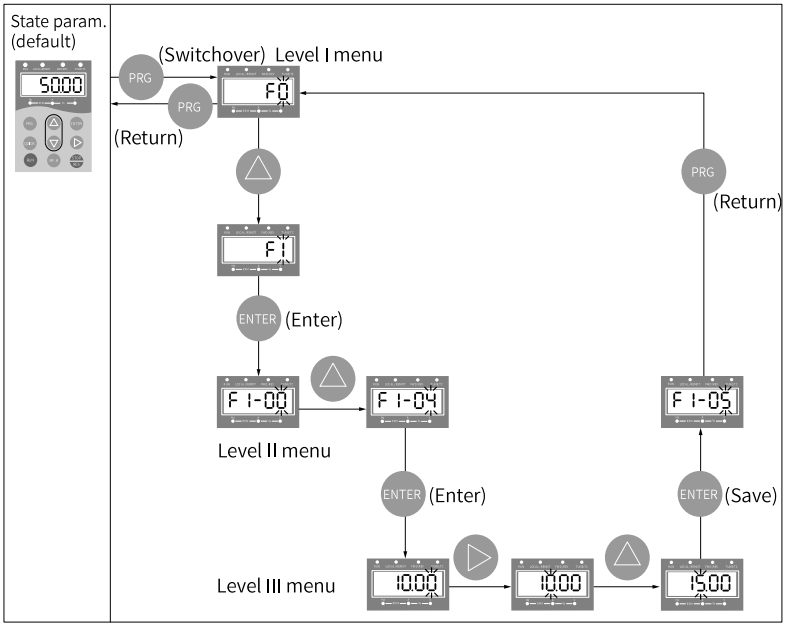


Figure 5-5 Parameter modification procedure

You can return to Level II menu from Level III menu by pressing PRG or ENTER. The differences between the two are:

- By pressing ENTER, you will return to Level II menu after saving the set parameter, and move to the next parameter automatically.
- After you press PRG, the system directly returns to Level II menu without saving the current parameter modification and remains at the current parameter.

In Level III menu, if a parameter does not include a flashing digit, it indicates that this parameter cannot be modified. This may be because:

- This parameter is only readable, such as AC drive type, detected parameter and running record parameter.
- It can only be modified after the motor is shut down.

5.3.3 Parameter Viewing

The following figure shows the operation procedure.

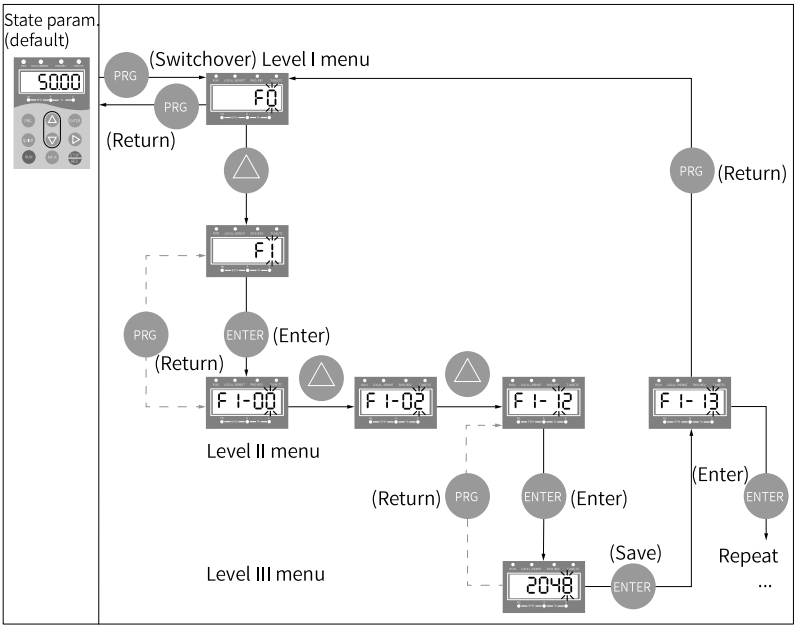


Figure 5-6 Parameter viewing procedure

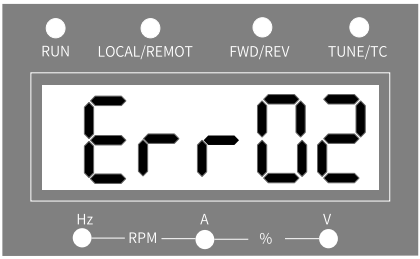
5.3.4 State Parameter Display

In the running state, press to view the running state parameters. The displayed parameters by default include the running speed, bus voltage, output voltage, output current, and output frequency. To view more running state parameters, see the description of FA-01 (Parameter display during running).

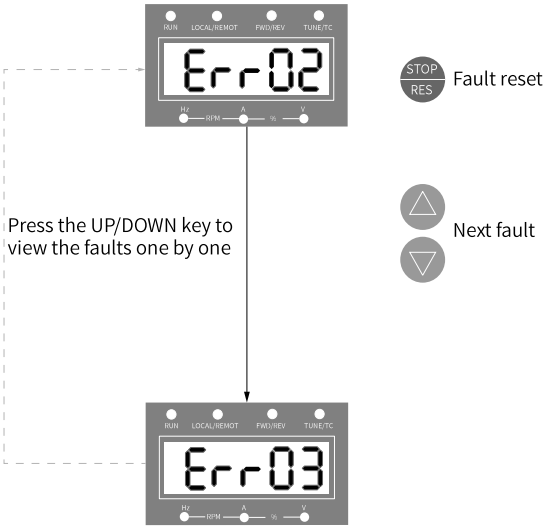
In the stop state, press to view the stop state parameters. The displayed parameters by default are rated speed and bus voltage. To view more stop state parameters, see the description of FA-02 (Parameter display at stop).

5.3.5 Fault and Alarm Display

When a fault occurs, the operating panel will display the fault code shown in the following figure.



The controller stops outputting immediately, and the fault relay contact is closed. Find out the fault cause and solution according to the fault code displayed.



5.4 Commissioning Using Mobile Phone

Monarch app is a software developed by Suzhou MONARCH, a subsidiary of Inovance for easy elevator debugging.

Operating System Supported

The app can be used on Android system. Users need to download the app for installation based on their own system version. Specifically, Android 4.4 or later and iOS 12 or later are supported.

Inovance engineers have actually tested Android brands (Huawei, Xiaomi and others) and iPhone. For any incompatibility with phone brands, contact the Monarch app system administrator.

Software Versions Supported

The app supports the debugging of NICE3000^{New} V20.00 or later, control cabinets (Tomorrow, Jiaolong, Honor and Mini series) and ARD, B6 (S), COB-B1 and other new product series developed in recent two years. From 2021, it can be used to debug the newly developed Inovance whole units and components.

Software Installation

Users can scan the QR code shown below through QQ, WeChat, browser and other code scanning softwares to get the installation package.



Figure 5-7 QR code for installation

When the app is successfully installed on the smartphone, the icon below will appear.



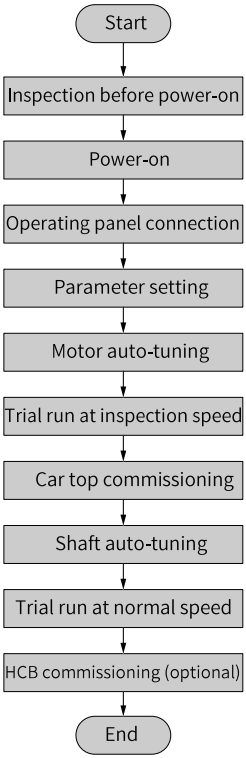
Figure 5-8 Icon after installation

Commissioning Using Mobile Phone

See *Monarch App for Elevator Debugging User Guide* for information about user signup and signin, Wi-Fi module, phone hotspot connection, remote assistance, programming and upgrade.

6 System Commissioning

6.1 Commissioning Flowchart



6.2 Commissioning Steps

6.2.1 Inspection Before Power-on

Before commissioning, check the mechanical and electrical parts to ensure that the conditions are ripe for field system commissioning.

During commissioning, at least two operators are working at the same time. Cut off the power supply immediately if any abnormality occurs.

6.2.2 Power-on

Procedure

1. Turn off the main switch in the power distribution box.
2. Check the display of the controller MCB. The power is on with some indicators on and LED display.

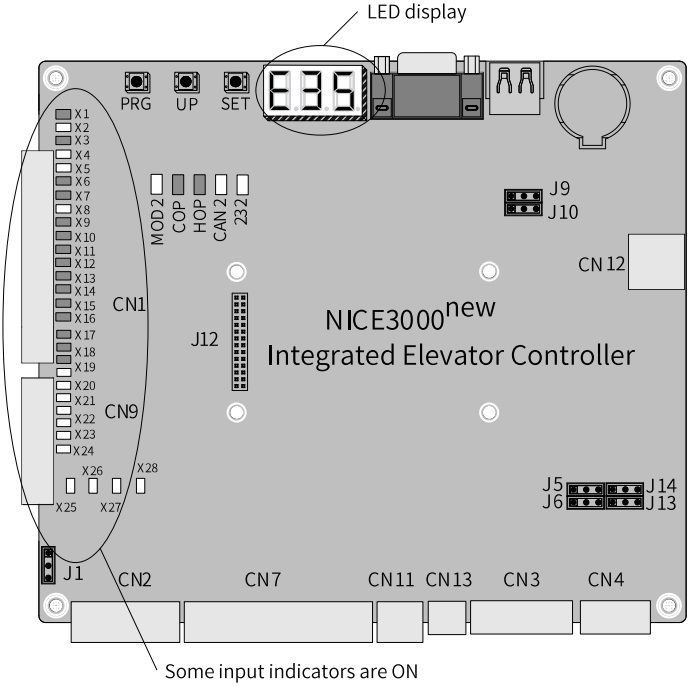


Figure 6-1 MCB display at normal power-on

Note: If E35, E51 or E52 are displayed at power-on, the system can remain unaffected and continue its operation. They will be reset automatically in the end or reset manually through setting F-2 to 1 on the keypad. For details about E35, E51 or E52, see *"Table 7–1 " on page 91*.

6.2.3 Operating Panel Connection

Connect the LED operating panel to the RJ45 port of the integrated controller using an 8-conductor flat cable. The connection is shown in the following figures.

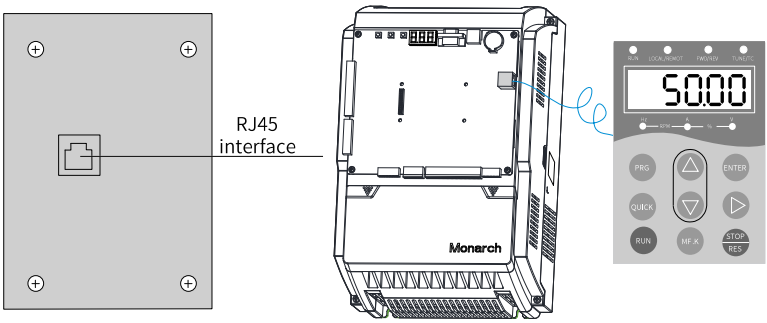


Figure 6-2 Operating panel connection

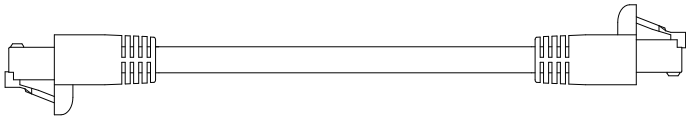


Figure 6-3 The 8-conductor flat cable

6.2.4 Parameter Setting

Procedure

1. **DI/ DO parameters Setting**

a. Low-voltage DI setting

Set parameters F5-01 to F5-24 based on the functions of DI X1 to X24. For example, when X1 is connected to the NO switch for up leveling signal input, set F5-01 to 01.

Parameter	Name	Range	Default
F5-01	X1 function selection	00: Invalid 01/33: Up leveling NO/NC 02/34: Down leveling NO/NC 03/35: Door zone NO/NC 04/36: Safety circuit feedback NO/NC 05/37: Door lock circuit feedback NO/NC 06/38: RUN contactor feedback NO/NC 07/39: Brake feedback NO/NC 08/40: Inspection signal NO/NC 09/41: Inspection/EEO up signal NO/NC 10/42: Inspection/EEO down signal NO/NC 11/43: Fire emergency signal NO/NC 12/44: Up limit signal NO/NC 13/45: Down limit signal NO/NC 14/46: Overload signal NO/NC 15/47: Full-load NO/NC	1
F5-02	X2 function selection		3
F5-03	X3 function selection		2
F5-04	X4 function selection		118
F5-05	X5 function selection		0
F5-06	X6 function selection		38
F5-07	X7 function selection		39
F5-08	X8 function selection		30
F5-09	X9 function selection		40

Parameter	Name	Range	Default
F5-09	X9 function selection	16/48: Up slow-down 1 signal NO/NC 17/49: Down slow-down 1 signal NO/NC 18/50: Up slow-down 2 signal NO/NC 19/51: Down slow-down 2 signal NO/NC 20/52: Up slow-down 3 signal NO/NC 21/53: Down slow-down 3 signal NO/NC 22/54: Shorting door lock circuit relay feedback NO/NC 23/55: Firefighter operation signal NO/NC 24/56: Door operator 1 light curtain signal NO/NC 25/57: Door operator 2 light curtain signal NO/NC 26/58: Brake travel switch 1 NO/NC 27/59: Emergency evacuation signal NO/NC 28/60: Elevator lock signal NO/NC 29/61: Safety circuit 2 NO/NC 30/62: Synchronous motor self-lock feedback NO/NC 31/63: Door lock circuit 2 feedback NO/NC 65/97: Door operator 1 safety edge NO/NC 66/98: Door operator 2 safety edge NO/NC 67/99: Motor overheat signal NO/NC 68/100: Earthquake signal NO/NC 69/101: Rear door forbidden signal NO/NC 70/102: Light-load signal NO/NC 71/103: Half-load signal NO/NC 72/104: Fire emergency floor switchover signal NO/NC 76/108: Door 1 open input 77/109: Door 2 open input 78/110: Brake travel switch 2 input NO/NC 79/111: External fault input 80/112: Terminal floor verification signal 81/113: Door lock 1 shorting signal NO/NC 82/114: Door lock 2 shorting signal NO/NC 84/116: EEO signal NO/NC 85/117: Main switch disconnection input signal NO/NC 86/118: Door lock bypass input NO/NC 87/119: Fire emergency one-key input NO/NC 88/120: Rope gripper feedback signal input NO/NC Note: For the same signal, NC parameter setting = NO parameter setting + 32	40
F5-10	X10 function selection		116
F5-11	X11 function selection		10
F5-12	X12 function selection		44
F5-13	X13 function selection		45
F5-14	X14 function selection		48
F5-15	X15 function selection		49
F5-16	X16 function selection		50
F5-17	X17 function selection		51
F5-18	X18 function selection		00
F5-19	X19 function selection		00
F5-20	X20 function selection		00
F5-21	X21 function selection		00
F5-22	X22 function selection		00
F5-23	X23 function selection		00
F5-24	X24 function selection		00

b. High-voltage DI input setting

Set parameters F5-37 to F5-40 based on the functions of DI X25 to X28.

Parameter	Name	Range	Default
F5-37	X25 function selection	0: Disabled 4: Safety circuit signal 5: Door lock circuit signal 1 (high-voltage input detection point, multiple selection allowed) 6: Door lock circuit signal 2 (high-voltage input detection point, multiple selection allowed) 7: Door lock 1 shorting 8: Door lock 2 shorting	0
F5-38	X26 function selection		0
F5-39	X27 function selection		0
F5-40	X28 function selection		0

c. DO setting

Set parameters F5-26 to F5-31 based on relay output Y1 to Y6.

Parameter	Name	Range	Default
F5-26	Y1 function selection	0: Disabled (output terminal not assigned) 1: RUN contactor output 2: Brake contactor output 3: Shorting door lock circuit contactor output 4: Fire emergency floor arrival signal feedback 5: Door operator 1 open 6: Door operator 1 close 7: Door operator 2 open 8: Door operator 2 close 9: Brake/RUN contactor normal 10: Fault state output 11: Running state output 12: Shorting PMSM stator contactor output 13: Emergency evacuation automatic switchover 14: System healthy 15: Evacuation buzzer control 16: High-voltage startup of brake 17: Up signal 18: Light/fan running 19: Medical sterilization control 20: Non-door zone stop output 21: Electromagnetic lock control output 22: Non-service state indication 23: Emergency evacuation completed 25: Rope gripper reset 26: Braking transistor short circuit output 27: Alarm filter output	1
F5-27	Y2 function selection		2
F5-28	Y3 function selection		12
F5-29	Y4 function selection		4
F5-30	Y5 function selection		3
F5-31	Y6 function selection		0

Note

The commissioning in this user guide are all based on the default settings as an example.

2. **Elevator Speed Setting**
   a. Set the rated elevator speed F0-04. Refer to the speed on the motor nameplate.
   b. F0-03 is used to set the actual maximum running speed of the elevator. The value must not be larger than the rated elevator speed (F0-04).

Parameter	Name	Range	Default
F0-03	Running speed	0.250 to F0-04	1.600 m/s
F0-04	Rated speed	0.250 to 4.000	1.600 m/s

3. **Top Floor Setting**

The parameters are to set the top floor of the elevator, determined by the number of leveling plates installed.

Parameter	Name	Range	Default
F6-00	Top floor of the elevator	F6-01 to 48	9
F6-01	Bottom floor of the elevator	1 to F6-00	1

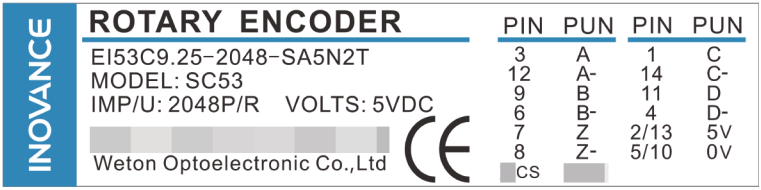
4. **Motor Parameters Setting**

Set motor parameters group F1 according to the motor nameplate.
For PMSM, set F1-25 to 1.

Parameter	Name	Range	Value
F1-25	Motor type	0: Asynchronous motor 1: Synchronous motor	1
F1-01	Rated power	0.7 to 75.0	5.0 kW
F1-02	Rated voltage	0 to 600	380 V
F1-03	Rated current	0.00 to 655.00	12.00 A
F1-04	Rated frequency	0.00 to max. frequency	19.00 Hz
F1-05	Rated speed	0 to 3000	95 r/min

5. **Encoder Parameters Setting**

Set the encoder type and PPR according to the encoder nameplate.



a. The preceding figure shows a Sin/Cos encoder. Set F1-00 to 0.
b. For the encoder with 2048 ppr, set F1-12 to 2048.

Parameter	Name	Range	Value
F1-00	Encoder type	0: Sin/Cos encoder 1: UVW encoder 2: ABZ encoder 3: Endat absolute encoder	0
F1-12	Encoder pulses per revolution	0 ppr to 10000 ppr	2048

6. **Command Source Setting**

   Set F0-01 to 1 to select the distance control mode.

Parameter	Name	Range	Value
F0-01	Command source selection	0: Operating panel control 1: Distance control	1

Note

During with-load auto-tuning, F0-01 (Command source selection) must be 1.

6.2.5 Motor Auto-tuning

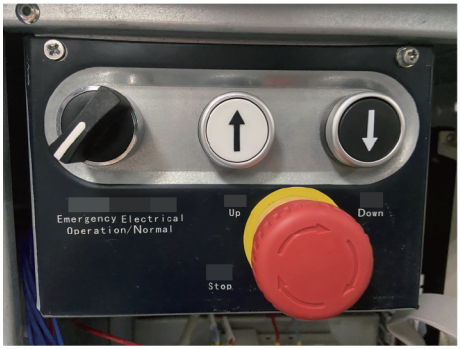


To guarantee safe elevator running:

- Never start the elevator when the safety circuit is shorted. Failure to comply will result in severe personal injuries or even death.
- Before emergency electrical operation, confirm that nobody is in the shaft. Failure to comply may result in safety accidents.

Procedure

1. Set the switch to Emergency Electric Operation. Check that the X9 indicator on the MCB becomes OFF and the elevator enters the EEO state.



2. Auto-tuning preparation
   a. Check the equation and motor parameters: N=60 × f/P, where f is F1-04 (rated frequency), N is F1-05 (rated speed), P is the number of pole pairs (number of poles/2, mostly a positive integer).
   b. Set F1-11 to 1 and select with-load auto-tuning. Press PRG and the operating panel displays "TUNE", indicating that the motor enters auto-tuning state.
3. Keep pressing the Up/Down button for the auto-tuning process. RUN contactor closes and the motor has vibration noise due to excitation. After 3s to 5s, the brake contactor closes and no fault is reported if the motor stops automatically with 2 or 3 rotations. With the encoder measured angle displayed by the LED for about 3s on the MCB, the auto-tuning is completed successfully and the controller automatically stops output. You can release the buttons now. If the fault code is displayed, it shows the auto-tuning fails. Clear the fault first before performing auto-tuning again.
4. Repeat step 3 (at least 3 times) and ensure that the encoder measured angles have a difference within ±5°.
5. Finally, reset Emergency Electric Operation to Normal.

Parameter	Name	Range	Value
F1-11	Auto-tuning mode	0: No operation 1: With-load auto-tuning 2: No-load auto-tuning 3: Shaft auto-tuning 1 4: Shaft auto-tuning 2 5: Synchronous motor static auto-tuning	1
F5-09	X9 function selection	0 to 127 116: EEO NC input	116

6.2.6 Trial Run at Inspection Speed

The trial run at inspection speed aims to make sure that the motor rotation direction is consistent with the elevator running direction.

The following table shows the related parameters.

Parameter	Name	Range	Default
F2-10	Elevator running direction	0: Running direction unchanged 1: Running direction reversed	0
F3-25	Elevator speed in the EEO state	0.100 to 0.300	0.250 m/s

Procedure

1. After the motor auto-tuning is completed, turn the switch to Emergency Electric Operation for EEO running test.
2. Press Up or Down button to check whether the running direction of the elevator is consistent with that of the motor. If not, change F2-10 to 1 to reverse the running direction of the elevator, and then repeat.

6.2.7 Car Top Commissioning



- During car top commissioning, ensure that car top inspection is enabled to guarantee safety.
- The MCTC-CTB is high level active by default.

You need to set the NO/NC features of the CTB input signals in F5-25 and ensure that they are consistent with those of the actual electrical parts (light curtain and door open/close limit switches). The control by the CTB can be implemented only after the

signal features are set correctly. If the signal features are inconsistent, the elevator doors cannot open or close or E53 is reported.

F5-25 bits	Name	CTB input signal setting
bit0	Door 1 light curtain	Used to set NO/NC feature of door 1 light curtain signal
bit2	Door 1 open limit	Used to set NO/NC feature of door 1 open limit signal
bit4	Door 1 close limit	Used to set NO/NC feature of door 1 close limit signal

This section takes the single-door elevator system as an example to describe the commissioning. The related signals include light curtain 1, door 1 open/close limit signal, and door 1 open/close output signal. And the light curtain and door open/close limit signals are of NC state. The following table shows the related signals.

Table 6–1 Car top commissioning-related signals

CTB terminals	Definition
P24	Common for X1 to X8 inputs
X1	Light curtain 1 input
X3	Door 1 open limit input
X5	Door 1 close limit input
BM	Common for door 1 output
B1	Door 1 open output
B2	Door 1 close output

1. **Light curtain commissioning**

   Light curtain commissioning is performed to check whether the inputs/outputs and NC/NO settings of light curtains are correct.

   a. Check whether light curtains are installed properly and securely.

   b. Check the status of X1 signals indicator on the CTB to ensure that light curtains work normally. See the following table for the light curtain judgment:

Table 6–2 Light curtain judgment

	Blocking state	X1 signal indicator
Light curtain signal set to NO	Unblocked	Steady OFF
	Blocked	Steady ON
Light curtain signal set to NC	Unblocked	Steady ON
	Blocked	Steady OFF

   c. Check bit0 of F5-25. If the light curtains is not blocked, LED segment A will be OFF (light curtain signal inactive). It indicates that the NO/NC settings are correct. If LED segment A is ON (light curtain signal active) shown in the following

figure, set bit0 of F5-25 to the opposite state. That is, if the original value of bit0 is 0, change it to 1 and 0 if the original value of bit0 is 1.

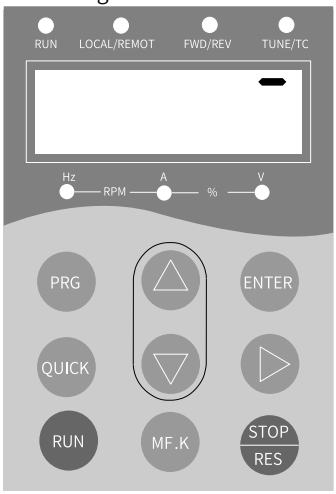


Figure 6-4 Light curtain signal valid display (segment A)

d. Light curtain commissioning is completed.

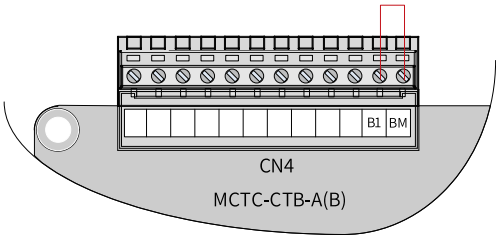
2. **Door operator controller commissioning**

The door operator commissioning is used to check whether the input/output control of the door operator controller is normal in the terminal control mode.

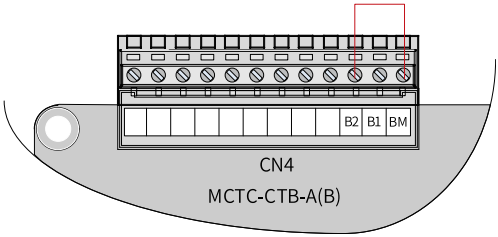
a. Check whether F7-05 is 0, the default value. If yes, it indicates that the door operator allows door open (You may choose to skip this step).

b. Check whether the door open/close output of the door operator controller is normal.

a. Short BM-B1 terminal of CTB CN4, and it indicates normal output control of door operator controller 1 if door 1 opens.



b. Short BM-B2 terminal of CTB CN4, and it indicates normal output control of door operator controller 1 if door 1 closes.



c. Observe the X3 and X5 terminal signal indicators on the CTB and judge whether door open/close limit feedback from the door operator controller is normal. See the following table for the judgment method.

Table 6–3 Door open/close limit feedback judgment

	Door state	X3 signal indicator	X5 signal indicator
Door open/close limit signal set to NO	At door open limit	Steady ON	Steady OFF
	During door open/ close	Steady OFF	Steady OFF
	At door close limit	Steady OFF	Steady ON
Door open/close limit signal set to NC	At door open limit	Steady OFF	Steady ON
	During door open/ close	Steady ON	Steady ON
	At door close limit	Steady ON	Steady OFF

d. Check F5-25 bit2 and bit4 to make sure their settings are consistent with open/ close limit signal NO/NC states. The following table shows details about the consistency check.

Table 6–4 Consistency check

Signal	Signal state monitoring		Signal state judging	Whether to reset bit2/bit4
	At door open limit	At door close limit		
Door open limit signal (segment C)			Normal	No
			Abnormal	Set bit2 to the opposite state: If the original value is 0, change it to 1. If the original value is 1, change it to 0.
Door close limit signal (segment E)			Normal	No
			Abnormal	Set bit4 to the opposite state: If the original value is 0, change it to 1. If the original value is 1, change it to 0.

6.2.8 Shaft Auto-tuning

Checks Before Shaft Auto-tuning

The operator is responsible for performing checks including but not limited to those listed in the following table in accordance with the recognized technical rules in the country of installation and with applicable regional guidelines. Tick after each check of the item.

☑	No.	Item
☐	1	Ensure that the shaft switches act properly, including final limit switches, limit switches, slow-down switches, and leveling switches.
☐	2	Ensure that leveling switches operate in the correct sequence. Generally, one leveling switch is installed. If multiple leveling switches are installed, check that the acting sequence is correct. For example, if three leveling switches are installed: Acting sequence for EEO up: up leveling switch → door zone switch → down leveling switch. Acting sequence for EEO down: down leveling switch → door zone switch → up leveling switch.
☐	3	Ensure that CAN communication between the MCB and CTB is normal (CAN1 indicator flashing and E51 not reported). If CAN communication is abnormal, refer to E51 solutions in Chapter 7.

Shaft auto-tuning enables the MCB to obtain the following information: floor height, floor-to-floor height, and positions of final limit switches, limit switches, slow-down switches, and leveling switches. These data provide a computation basis for generating a running curve for the MCB.

Conditions

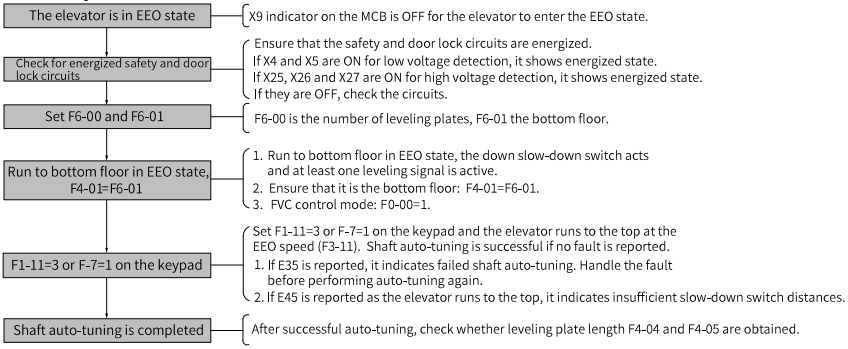
1. The elevator is in EEO state.
2. The elevator runs to a position below the leveling position of the bottom floor (at least one leveling switch is disconnected from the leveling plate) and the down slow-down switch 1 signal input to the MCB is active (for two landing floors only).
3. The system is not in the fault state. If there is a fault, press STOP RES to reset the fault.

Related Parameters

The following table shows the related parameters.

Parameter	Name	Range	Default	Notes
F0-04	Rated speed	0.250 to 4.000	1.600 m/s	/
F6-00	Top floor of the elevator	F6-01 to 48	9	Actual number of floors + 1 - Bottom floor
F6-01	Bottom floor of the elevator	1 to F6-00	1	/
F3-26	Shaft auto-tuning speed	0.250 to 0.630	0.250 m/s	/

Operation Steps



Note

Precautions for shaft auto-tuning of two-floor elevators:

When the elevator runs down to the bottom floor at inspection speed, the leveling switch needs to be completely detached from the leveling plate.

Perform shaft auto-tuning again in following conditions:

- The positions of leveling plates or slow-down switches are adjusted on site.
- F0-04 (Rated speed), F6-00 (Top floor of the elevator), or F6-01 (Bottom floor of the elevator) is modified.
- Each time the MCB or equipment is replaced, perform motor auto-tuning again.

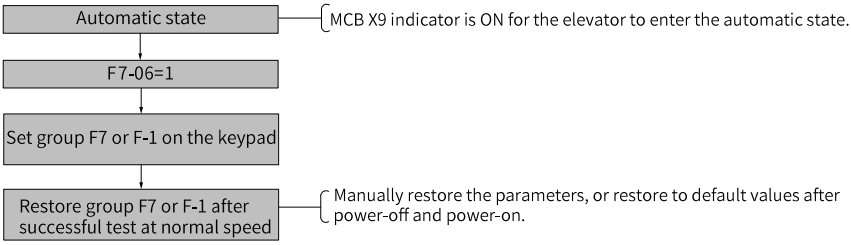
6.2.9 Trial Run at Normal Speed

Perform trial run at normal speed to test whether the elevator runs properly in the normal state.

Parameters in group F7 (set using the LED operating panel) are used in this test. F7-00 can be used as the car call button and set to any floor.

Parameter	Name	Description	Notes
F7-00	Register the car call	Set the car call floor	Same to F-1 on the keypad
F7-01	Register the hall up call	Set the hall up call floor	/
F7-02	Register the hall down call	Set the hall down call floor	/
F7-03	Random running times	Set the random running times	/
F7-04	Hall call	0: Hall call enabled 1: Hall call disabled	Set F-8 on the keypad to 1: hall call disabled
F7-05	Door open	0: Door open enabled 1: Door open disabled	Set F-8 on the keypad to 2: door open disabled
F7-06	Overload function	0: Overload disabled 1: Overload enabled	Set F-8 on the keypad to 3: overload disabled
F7-07	Limit function	0: Limit function enabled 1: Limit function disabled	Set F-8 on the keypad to 4: limit switch disabled
F7-08	Random running interval	Interval between two random runnings	/

Operation steps:



After the trial run is completed, power off and then get power back on. Then restore parameters F7-00 to F7-07 to 0.

Note

- Parameters F7-00 to F7-08 can automatically change back to default values after power-off and power-on.
- After shaft auto-tuning is completed, running at normal speed may fail as the full-load/overload function is not commissioned. You can set F7-07 to 1 or set F-8 to 3 on the keypad to enable system overload before normal-speed running.

6.2.10HCB Commissioning (Optional)

The HCB address and the leveling plate are in a one-to-one relationship. It means that the address is numbered according to the leveling plate numbered from bottom to top on the same floor. If a leveling plate is installed on a non-service floor, an address must be reserved for this floor.

Procedure

1. Install an HCB for each service floor. The non-service floors do not require the HCB.
2. Take MCTC-HCB-R600 as an example to set the HCB address. Short CN5 and adjust the floor address through the up/down buttons. Press CN2 to add 1 and CN3 to subtract 1.
   A long press for 3s keeps increasing or decreasing the address until reaching the required value: 1 to 56 (HCB address), 0/D2/D3/D4 (CCB address) and DH (HCB-B without address display). Disconnect CN5 and the set address is automatically saved after flashing for three times.

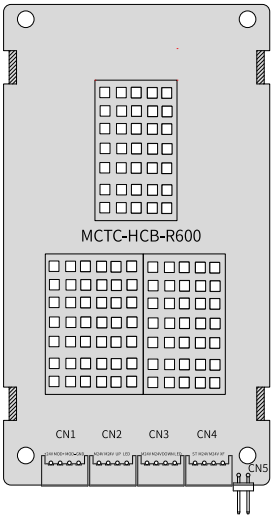


Figure 6-5 MCTC-HCB-R600

Note

The HCB address is the same as the number of leveling plates on the same floor. For example, the HCB address is set to N for the floor where the Nth leveling plate is located. If a leveling plate is installed on a non-service floor, an address must be reserved for this floor.

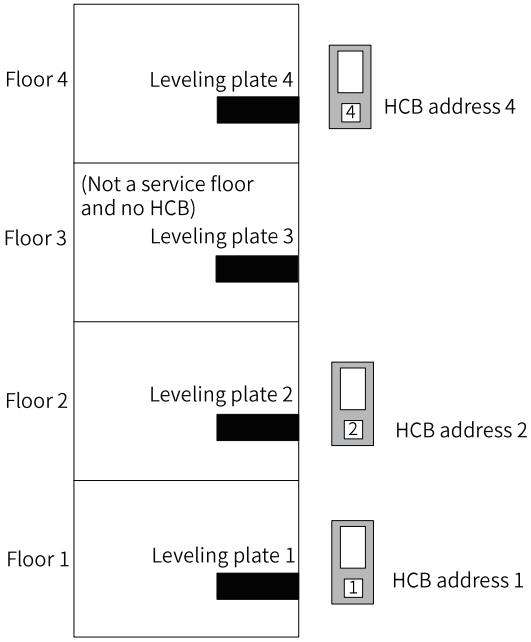


Figure 6-6 HCB installation and address setting

3. After setting an address for each HCB, you can call the elevator by using the HCB to start normal-speed running.

Note

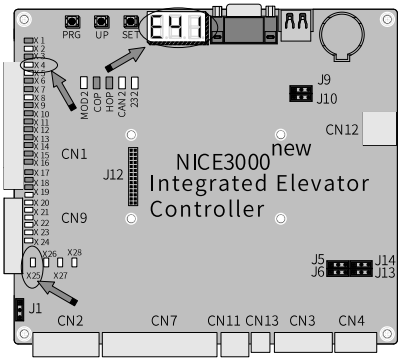
- Set a unique address for each HCB. Otherwise, the HCB cannot be used.
- When the display board is used inside the car, its address must be set to 0.

7 Commissioning Fault Handling

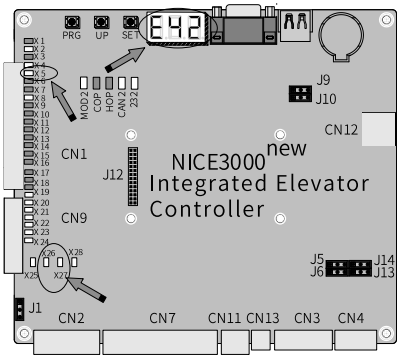
7.1 Fault Handling at Power-on

During commissioning, especially at first-time power-on, certain faults may occur because the conditions for automatic elevator running are not met or some peripheral signals are not connected. Such faults include E41, E42, E35, E51, E52, and E58. The following part describes the MCB state at fault and handling of these faults.

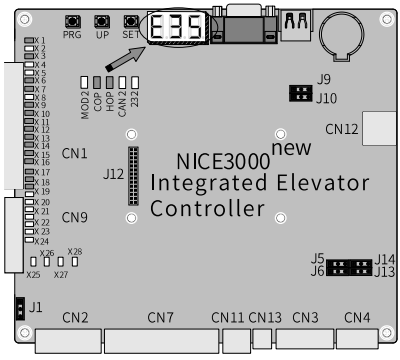
- MCB state at E41, E42, E35, E51, E52, and E58



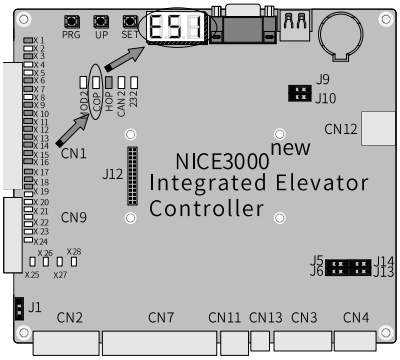
MCB state at fault E41



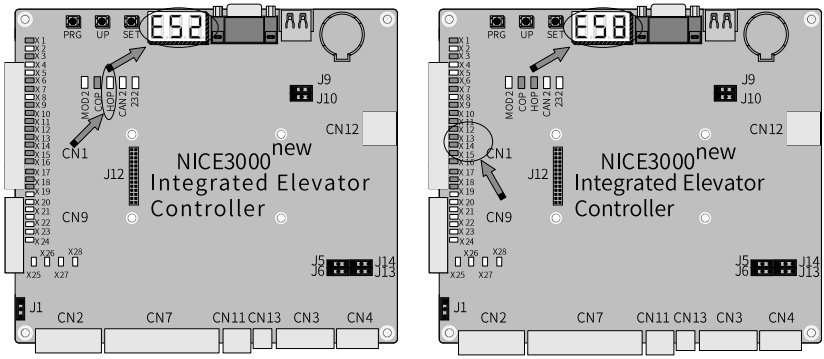
MCB state at fault E42



MCB state at fault E35



MCB state at fault E51



MCB state at fault E52

MCB state at fault E58

Figure 7-1 MCB state at faults during commissioning

- Handling of faults E41, E42, E35, E51, E52, and E58

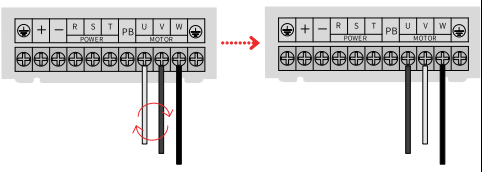
Table 7–1 Fault handling before commissioning at inspection speed

Fault	Name	Description	Solution
E41	Safety circuit fault	At this fault, the elevator cannot run or be commissioned. By default, the safety circuit input signal is connected to terminals X4 and X25.	Observe whether the signal indicator of input terminals X4 and X25 is ON. If this indicator is OFF, the safety circuit is disconnected. In this case, you need to repair the safety circuit. Then, you can perform commissioning at inspection speed.
E42	Door lock circuit fault	At this fault, the elevator cannot run or be commissioned. By default, the door lock circuit signal is connected to terminals X5, X26, and X27.	Observe whether the signal indicator of terminals X5, X26, and X27 is ON. If this indicator is OFF, the door lock circuit is disconnected. In this case, you need to repair the door lock circuit. Then, you can perform commissioning at inspection speed. Never short the door lock circuit for commissioning.

Fault	Name	Description	Solution
E35	Shaft auto-tuning data abnormal	This fault does not affect commissioning at inspection speed, and is reported at each power-on before shaft auto-tuning is performed.	Press MF.K key on the LED operating panel to clear the fault code display, and then perform commissioning at inspection speed.
E51	CAN communication fault	This fault does not affect commissioning at inspection speed, and it affects only commissioning at normal speed. The COP indicator is OFF at this fault.	
E52	HCB communication abnormal	This fault does not affect motor auto-tuning or commissioning at inspection speed. The HOP indicator is OFF at this fault.	
E58	Shaft position switches abnormal	The elevator cannot run, You need to rectify the fault first and then perform commissioning at inspection speed. The fault cause may be: The feedback inputs of both up and down slow-down switches 1 are active; feedback inputs of both up and down limit switches are active simultaneously.	Connect X14 and X15 to slow-down switches 1 (NC inputs), and check whether they are OFF simultaneously. Additionally, confirm whether slow-down switches 1 are connected to the MCB and act properly. Terminals X12 and X13 are connected to the up and down limit switches (NC input). Observe whether the signal indicators of both X12 and X13 are OFF. Check whether limited switches act properly.

7.2 Motor Auto-tuning Fault Handling

Fault	Symptom	Solution
Auto-tuning failure	Err19	Check whether the encoder cable is broken or replace a new PG card before auto-tuning again. Subcodes 1, 5 and 6. Check the three-phase motor cables and output contactor for tight connection.
	Err20	Subcode 3 Check the UVW power cables and interchange phases VW before auto-tuning. Check whether the brake is fully released. If not, check the brake power supply circuit. Subcode 9 Check whether group F1 motor parameters are correctly set. Set F8-01 to 0 and perform auto-tuning again. Check whether the encoder cable suffers interference because it is too close to the motor cables. Check whether the encoder is in good condition and installed securely. The low-power motor (such as P ⩽ 5.5 kW) may jitter after auto-tuning starts. If this occurs, decrease F2-00 properly to a value within 10 to 40. Subcodes 12 and 13 Check whether the brake is released. Subcodes 19 and 55 Check whether the encoder signal suffers interference.

Fault	Symptom	Solution
Incorrect motor wiring	Err20 and Err33	Change the motor wiring sequence and perform auto-tuning again. The following figure shows how to interchange motor phases.  Note: Description of fault symptoms ① During no-load auto-tuning, if the motor wiring sequence is incorrect, Err20 (E0-00) with fault subcode 3 (E0-01) will be reported. ① During with-load auto-tuning, if the motor wiring sequence is incorrect, the synchronous motor will jitter abnormally during auto-tuning, Err33 is reported, and auto-tuning stops. For the asynchronous motor, there is no prompt during auto-tuning, but Err33 is reported during inspection running.

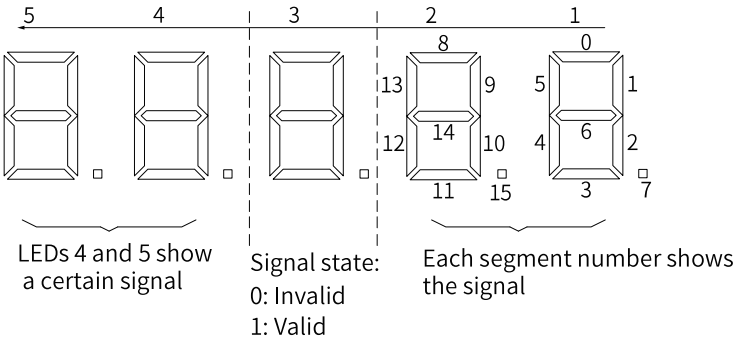
Note

- When the preceding two problems occur, change the sequence of motor cables connected to the controller.
- Adjustment principle of motor wiring sequence: interchange any two adjacent motor cables once.

7.3 Handling of Common Door Control Problems

- In the door close state, the system sends a door open command but the door does not open.

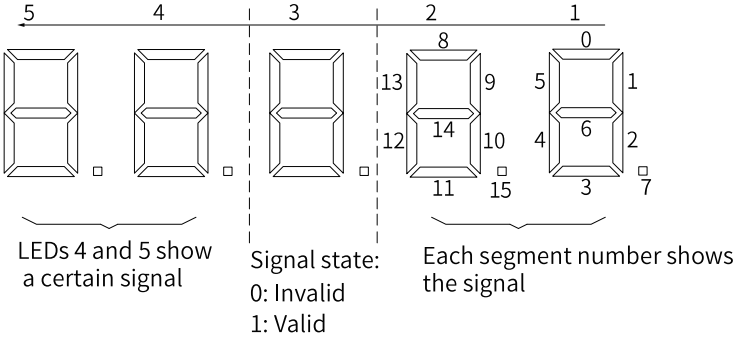
  1. Check whether the door open limit signal is normally active.
  2. Check whether there is door open output by viewing segment 1 of LED 1 in FA-34.



3. If there is door open output (segment 1 ON), check whether cable connection between the CTB and the door operator controller is correct and whether the door operator controller works properly.

- The door does not close with a close command after reaching the open limit position.

1. Check whether the light curtain signal is normally active.
2. Check whether there is door close output by viewing segment 2 of LED 1 in FA-34.



3. If there is door close output (segment 2 ON), check whether cable connection between the CTB and the door operator controller is correct and whether the door operator controller works properly.

7.4 Adjustment to Abnormal Motor Startup

F2-00/01/03/04 are used to adjust the speed dynamic response characteristics of the motor:

To achieve a faster system response, increase the proportional gain or reduce the integral time. However, too large proportional gain or too small integral time may lead to motor jitter due to oscillation.

Decreasing the proportional gain or increasing the integral time will slow the dynamic response of the motor. However, too small proportional gain or too large integral time may cause motor speed tracking abnormality, resulting in fault E33 or unstable leveling at stop.

The default setting is proper for most large-power motors, and you need not modify these parameters. These parameters need to be adjusted only for small-power motors (such as P ⩽ 5.5 kW) because they may have oscillation. To eliminate oscillation, do as follows:

1. Decrease the proportional gain first (between 10 and 40) to ensure that the system does not oscillate,
2. and then reduce the integral time (between 0.1 and 0.8) to ensure that the system has quick response but small overshoot.

8 Electrical Wiring Diagram

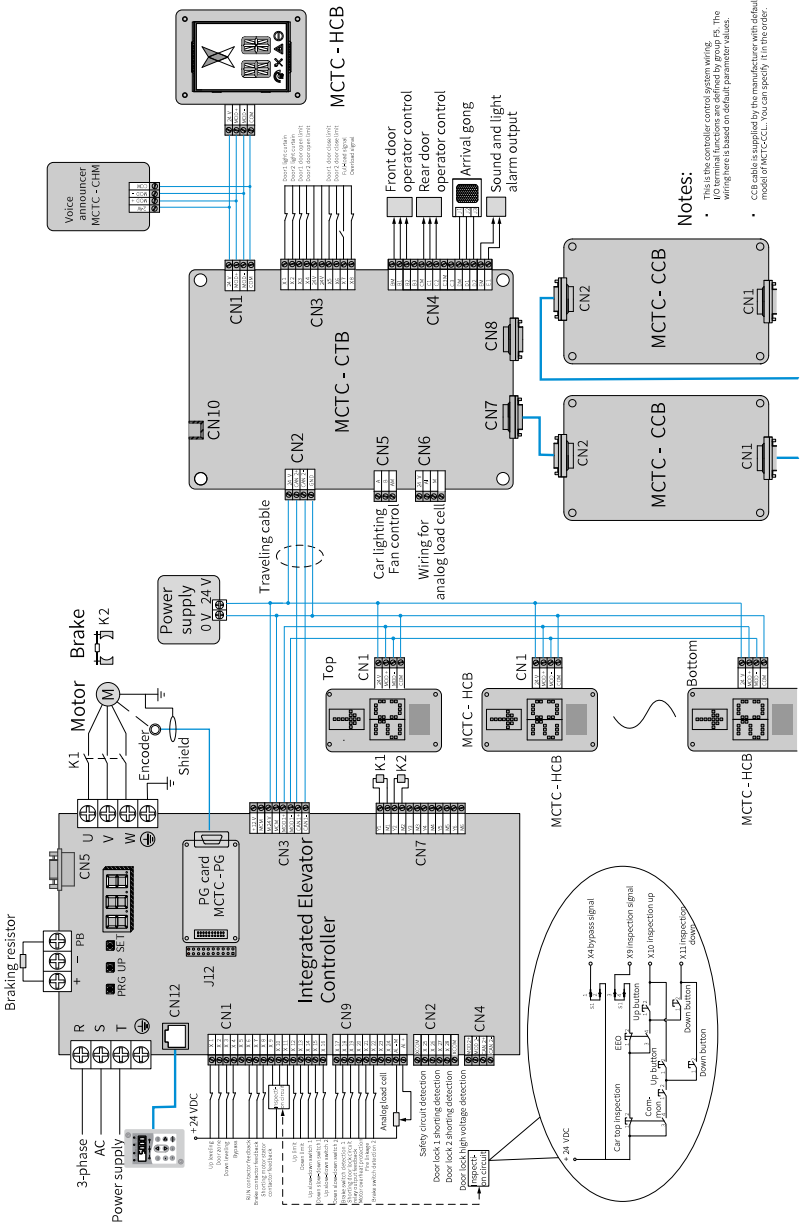


Figure 8-1 Standard wiring diagram

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Shenzhen Inovance Technology Co., Ltd.

www.inovance.com

Add.: Inovance Headquarters Tower, High-tech Industrial Park, Guanlan Street, Longhua New District, Shenzhen
Tel: (0755) 2979 9595 Fax: (0755) 2961 9897

Suzhou Inovance Technology Co., Ltd.

www.inovance.com

Add.: No. 16 Youxiang Road, Yuexi Town, Wuzhong District, Suzhou 215104, P.R. China
Tel: (0512) 6637 6666 Fax: (0512) 6285 6720