YASKAWA

YASKAWA AC Drive-L1000A

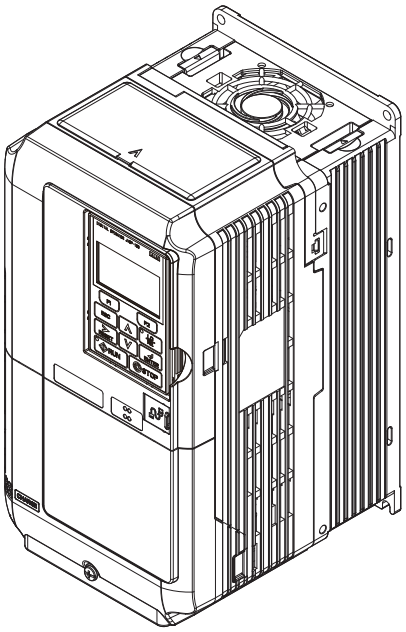
AC Drive for Elevator Applications

Quick Start Guide

Type: CIMR-LU□A □□□□

Models: 200 V Class: 1.5 to 110 kW (2 to 150 HP)
400 V Class: 1.5 to 315 kW (2 to 500 HP)
600 V Class: 1.5 to 160 kW (2 to 250 HP)

To properly use the product, read this manual thoroughly and retain for easy reference, inspection, and maintenance. Ensure the end user receives this manual.



iQRISE™

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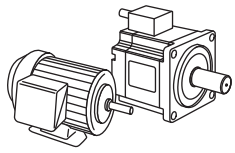
◆ Quick Reference

Drive a Synchronous PM Motor	
L1000A can operate synchronous PM motors. *Refer to Flowchart C: Auto-Tuning for PM Motors on page 69*.	

Perform Auto-Tuning
Automatic tuning sets motor parameters. *Refer to Types of Auto-Tuning on page 71*.

Maintenance Check Using Drive Monitors
Use drive monitors to check fans, capacitors, and other components may require maintenance. *Refer to Performance Life Monitors Maintenance Monitors on page 144*.

Fault Display and Troubleshooting
Refer to Troubleshooting on page 130.

Standards Compliance	
Refer to European Standards on page 215 and *UL and CSA Standards on page 223*.	CE c UL us LISTED CSA B44.1 / ASME A17.5

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i Preface & General Safety

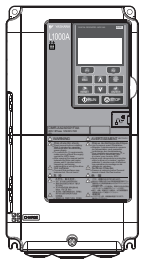
◆ Preface

Yaskawa manufactures products used as components in a wide variety of industrial systems and equipment. The selection and application of Yaskawa products remain the responsibility of the equipment manufacturer or end user. Yaskawa accepts no responsibility for the way its products are incorporated into the final system design. Under no circumstances should any Yaskawa product be incorporated into any product or design as the exclusive or sole safety control. Without exception, all controls should be designed to detect faults dynamically and fail safely under all circumstances. All systems or equipment designed to incorporate a product manufactured by Yaskawa must be supplied to the end user with appropriate warnings and instructions as to the safe use and operation of that part. Any warnings provided by Yaskawa must be promptly provided to the end user. Yaskawa offers an express warranty only as to the quality of its products in conforming to standards and specifications published in the Yaskawa manual. NO OTHER WARRANTY, EXPRESS OR IMPLIED, IS OFFERED. Yaskawa assumes no liability for any personal injury, property damage, losses, or claims arising from misapplication of its products.

This manual is designed to ensure correct and suitable application of L1000A-Series Drives. Read this manual before attempting to install, operate, maintain, or inspect a drive and keep it in a safe, convenient location for future reference. Be sure you understand all precautions and safety information before attempting application.

■ Applicable Documentation

The following manuals are available for L1000A series drives:

	L1000A Series AC Drive Quick Start Guide (this book)
	Read this manual first. This guide is packaged together with the product. It contains basic information required to install and wire the drive, in addition to an overview of fault diagnostics, maintenance, and parameter settings. Use the information in this book to prepare the drive for a trial run with the application and for basic operation.
	L1000A Series AC Drive Technical Manual
	This manual provides detailed information on parameter settings, drive functions, and MEMOBUS/Modbus specifications. Use this manual to expand drive functionality and to take advantage of higher performance features.

◆ General Safety

■ Supplemental Safety Information

General Precautions
• The diagrams in this manual may be indicated without covers or safety shields to show details. Replace the covers or shields before operating the drive and run the drive according to the instructions described in this manual. • Any illustrations, photographs, or examples used in this manual are provided as examples only and may not apply to all products to which this manual is applicable. • The products and specifications described in this manual or the content and presentation of the manual may be changed without notice to improve the product and/or the manual. • When ordering a new copy of the manual due to damage or loss, contact your Yaskawa representative or the nearest Yaskawa sales office and provide the manual number shown on the front cover. • If nameplate becomes worn or damaged, order a replacement from your Yaskawa representative or the nearest Yaskawa sales office.

⚠ WARNING

Read and understand this manual before installing, operating or servicing this drive. The drive must be installed according to this manual and local codes.

The following conventions are used to indicate safety messages in this manual. Failure to heed these messages could result in serious or fatal injury or damage to the products or to related equipment and systems.

⚠ DANGER

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

⚠ WARNING

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

WARNING! *may also be indicated by a bold key word embedded in the text followed by an italicized safety message.*

⚠ CAUTION

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

CAUTION! *may also be indicated by a bold key word embedded in the text followed by an italicized safety message.*

NOTICE

Indicates a property damage message.

NOTICE: *may also be indicated by a bold key word embedded in the text followed by an italicized safety message.*

■ Safety Messages

⚠ DANGER

Heed the safety messages in this manual.

Failure to comply will result in death or serious injury.

The operating company is responsible for any injuries or equipment damage resulting from failure to heed the warnings in this manual.

Electrical Shock Hazard

Do not connect or disconnect wiring or service the drive while the power is on.

Failure to comply will result in death or serious injury.

Before servicing, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. After shutting off the power, wait for at least the amount of time specified on the drive before touching any components.

⚠ WARNING

Sudden Movement Hazard

The drive system or elevator may start unexpectedly upon application of power, resulting in death or serious injury.

- Clear all personnel from the drive, motor, and machine area before applying power.
- Secure covers, couplings, shaft keys, and machine loads before applying power to the drive.

Ensure there are no short circuits between the main circuit terminals (R/L1, S/L2, and T/L3) or between the ground and main circuit terminals before restarting the drive.

Failure to comply may result in serious injury or death and will cause damage to equipment.

⚠ WARNING

System may start unexpectedly upon application of power when the Auto-restart function is enabled resulting in death or serious injury.

Use care when enabling Auto-restart as this function may cause unintended start of the elevator.

Use parameter S1-12 to enable/disable automatic switching of the Motor Contactor Control output signal during Auto-Tuning.

When using setting S1-12 = 1 or 2, ensure that the multi-function output terminals are properly wired and in the correct state before setting parameter S1-12.

Failure to comply could result in damage to the drive, serious injury or death.

Electrical Shock Hazard

Do not attempt to modify or alter the drive in any way not explained in this manual.

Yaskawa is not responsible for damage caused by modification of the product made by the user. Failure to comply could result in death or serious injury from operation of damaged equipment.

Do not operate equipment with covers removed.

Failure to comply could result in death or serious injury.

The diagrams in this section may show drives without covers or safety shields to show details. Be sure to reinstall covers or shields before operating the drives and run the drives according to the instructions described in this manual.

When a drive is running a PM motor, voltage continues to be generated at the motor terminals after the drive is shut off while the motor coasts to stop. Take the precautions described below to prevent shock and injury:

- In applications where the machine can still rotate even though the drive has fully stopped a load, install a switch to the drive output side to disconnect the motor and the drive.
- Do not allow an external force to rotate the motor beyond the maximum allowable speed or to rotate the motor when the drive has been shut off.
- Wait for at least the time specified on the warning label after opening the load switch on the output side before inspecting the drive or performing any maintenance.
- Do not open and close the load switch while the motor is running, as this can damage the drive.

If the motor is coasting, make sure the power to the drive is turned on and the drive output has completely stopped before closing the load switch.

Do not connect or disconnect wiring to the drive or motor while the power is on.

Failure to comply will result in death or serious injury. Before servicing, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. The charge indicator LED will extinguish when the DC bus voltage is below 50 Vdc. To prevent electric shock, wait at least five minutes after all indicators are OFF and measure the DC bus voltage level to confirm safe level.

Do not operate equipment with covers removed.

Failure to comply could result in death or serious injury.

The diagrams in this section may show drives without covers or safety shields to show details. Be sure to reinstall covers or shields before operating the drives and run the drives according to the instructions described in this manual.

Do not perform work on the drive while wearing loose clothing, jewelry or without eye protection.

Failure to comply could result in death or serious injury.

Remove all metal objects such as watches and rings, secure loose clothing, and wear eye protection before beginning work on the drive.

⚠ WARNING

Do not change wiring, remove covers, connectors or options cards, or attempt to service the drive with power applied to the drive.

Failure to comply could result in death or serious injury. Disconnect all power to the drive and check for unsafe voltages before servicing.

Do not allow unqualified personnel to use the equipment.

Failure to comply could result in death or serious injury.

Maintenance, inspection, and replacement of parts must be performed only by authorized personnel familiar with installation, adjustment and maintenance of AC drives.

Fire Hazard

Drive Short-Circuit Current Rating

Install adequate branch circuit protection according to applicable local codes and this Installation Manual.

Failure to comply could result in fire and damage to the drive or injury to personnel.

The device is suitable for use on a circuit capable of delivering not more than 100,000 RMS symmetrical amperes, 240 Vac maximum (200 V class) and 480 Vac maximum (400 V class), and 600 Vac maximum (600 V class) when protected by branch circuit protection devices specified in this manual.

Applications using a braking option should wire a thermal relay so that the output contactor opens when the thermal relay trips.

Inadequate braking circuit protection could result in death or serious injury by fire from overheating resistors.

Do not use improper combustible materials.

Failure to comply could result in death or serious injury by fire.

Attach the drive to metal or other noncombustible material.

NOTICE

Equipment Hazard

Do not modify the drive circuitry.

Failure to comply could result in damage to the drive and will void warranty.

Yaskawa is not responsible for any modification of the product made by the user. This product must not be modified.

Failure to comply could result in damage to the drive or braking circuit.

Observe proper electrostatic discharge procedures (ESD) when handling the drive, circuit boards, and option cards.

Failure to comply may result in ESD damage to the drive circuitry.

Do not operate damaged equipment.

Failure to comply could result in further damage to the equipment.

Do not connect or operate any equipment with visible damage or missing parts.

NOTICE

Do not lift the drive up while the cover is removed.

This can damage the terminal board and other components.

Do not expose the drive to halogen group disinfectants.

Failure to comply may cause damage to the electrical components in the drive.

Do not pack the drive in wooden materials that have been fumigated or sterilized.

Do not sterilize the entire package after the product is packed.

■ General Application Precautions

Motor Selection

Drive Capacity

The output current should not exceed 150% of the drive rated current. Select a drive that can output enough current when accelerating a load at 100%.

For specialized motors, make sure that the motor rated current is less than the rated output current for the drive.

Starting Torque

The startup and acceleration characteristics of the motor are restricted to the drive's overload current rating (150% rated current for 60 s).

The overload rating for the drive determines the starting and accelerating characteristics of the motor. Expect lower torque than when running from line power. To get more starting torque, use a larger drive or increase both the motor and drive capacity.

Stopping

Fast Stop

When the drive faults out, a protective circuit is activated and drive output is shut off. This, however, does not stop the motor immediately. A mechanical brake may be required to stop the motor if Fast Stop deceleration is insufficient.

Mechanical Brake

A mechanical brake is required to prevent the elevator from free falling during a drive fault condition.

Repetitive Starting/Stopping

Elevators and other applications with frequent starts and stops often approach 150% of their rated current values. Heat stress generated from repetitive high current will shorten the life span of the IGBTs. The expected lifetime for the IGBTs is about 3 million start and stop cycles with a default carrier frequency of 2 kHz (CIMR-LU2A0346, 2A0415, 4A0450 to 4A0605, 5A0099 to 5A0200), 5 kHz (CIMR-LU4A0112 to 4A0370, 5A0077), or 8 kHz (CIMR-LU2A0008 to 2A0115, 4A0005 to 4A0091, 5A0003 to 5A0062) and a 150% peak current.

Yaskawa recommends lowering the carrier frequency, particularly when audible noise is not a concern. It is beneficial to reduce the load, increase the acceleration and deceleration times, or switch to a larger drive to help keep peak current levels under 150%. Be sure to check the peak current levels when starting and stopping repeatedly during the initial test run, and make adjustments accordingly.

Installation

Enclosure Panels

Keep the drive in a clean environment by installing the drive in an enclosure panel or selecting an installation area free of airborne dust, lint, and oil mist. Be sure to leave the required space between drives to provide for cooling, and take proper measures so the ambient temperature remains within allowable limits and keep flammable materials away from the drive. Yaskawa offers protective designs for drives that must be used in areas subjected to oil mist and excessive vibration. Contact Yaskawa or your Yaskawa agent for details.

Installation Direction

NOTICE: *Install the drive upright as specified in the manual.* ***Refer to Mechanical Installation on page 17*** *for more information on installation. Failure to comply may damage the drive due to improper cooling.*

Settings

DC Injection Braking

NOTICE: *Excessive current during DC Injection Braking and excessive duration of DC Injection Braking can cause motor overheating. Adjust DC Injection parameters to prevent motor overheating.*

Acceleration/Deceleration Ramp

Acceleration and deceleration times are affected by the amount of torque generated by the motor, the load torque, and the inertia moment. Set a longer accel/decel time when Stall Prevention is enabled. The accel/decel times are lengthened for as long as the Stall Prevention function is in operation. Install one of the available braking options or increase the capacity of the drive for faster acceleration and deceleration.

General Handling

Selecting a Molded Case Circuit Breaker or Ground Fault Circuit Interrupter (GFCI)

Select an appropriate GFCI. This drive can cause a residual current with a DC component in the protective earthing conductor. Where a residual current operated protective or monitoring device is used for protection in case of direct or indirect contact, always use an GFCI of type B according to IEC/EN 60755.

Select a MCCB (Molded Case Circuit Breaker) with a rated current that is 1.5 to 2 times higher than the rated current of the drive in order to avoid nuisance trips caused by harmonics in the drive input current.

WARNING! *Sudden Movement Hazard. Install a properly controlled contactor on the input-side of the drive for applications where power should be removed from the drive during a fault condition. Improper equipment sequencing could result in death or serious injury.*

WARNING! *Fire Hazard. Shut off the drive with a magnetic contactor (MC) when a fault occurs in any external equipment such as braking resistors. Failure to comply may cause resistor overheating, fire, and injury to personnel.*

NOTICE: *To get the full performance life out of the electrolytic capacitors and circuit relays, refrain from switching the drive power supply off and on more than once every 30 minutes. Frequent use can damage the drive. Use the drive to stop and start the motor.*

Inspection and Maintenance

WARNING! *Electrical Shock Hazard. Capacitors in the drive do not immediately discharge after shutting off the power. Wait for at least the amount of time specified on the drive before touching any components after shutting off the power. Failure to comply may cause injury to personnel from electrical shock.*

CAUTION! *Burn Hazard. Because the heatsink can get very hot during operation, take proper precautions to prevent burns. When replacing the cooling fan, shut off the power and wait at least 15 minutes to be sure that the heatsink has cooled down. Failure to comply may cause burn injury to personnel.*

WARNING! *Electrical Shock Hazard. When a drive is running a PM motor, voltage continues to be generated at the motor terminals after the drive is shut off while the motor coasts to stop. Take the precautions described below to prevent shock and injury:*

- In applications where the machine can still rotate after the drive has fully stopped a load, install a load disconnect switch on the drive output side to disconnect the motor and the drive.
- Do not allow an external force to rotate the motor beyond the maximum allowable speed or to rotate the motor when the drive is powered off.
- Wait for at least the time specified on the warning label after opening the load switch on the output side before inspecting the drive or performing any maintenance.
- Do not open and close the load switch while the motor is running.
- If the motor is coasting, make sure the power to the drive is turned on and the drive output has completely stopped before closing the load switch to reconnect the drive to the motor.

Wiring

Yaskawa recommends using ring terminals on all drive models for UL/cUL compliance. Use only the tools recommended by the terminal manufacturer for crimping.

Transporting the Drive

NOTICE: *Never steam clean the drive. During transport, keep the drive from coming into contact with salts, fluorine, bromine, phthalate ester, and other such harmful chemicals. Failure to comply may damage the drive.*

■ Motor Application Precautions

Standard Induction Motors

Insulation Tolerance

NOTICE: *Consider motor voltage tolerance levels and motor insulation in applications with an input voltage of over 440 V or particularly long wiring distances.*

NOTICE: *Ensure that the motor is suitable for inverter duty and/or the motor service factor is adequate to accommodate the additional heating with the intended operating conditions. A motor connected to a PWM drive may operate at a higher temperature than a utility-fed motor and the operating speed range may reduce motor cooling capacity.*

High-Speed Operation

NOTICE: *Mechanical damage may occur with the motor bearings and dynamic balance of the machine when operating a motor beyond its rated speed. Operate the motor within specifications to prevent motor damage.*

Low-Speed Range

The cooling fan of a standard motor should sufficiently cool the motor at the rated speed. As the self-cooling capability of such a motor reduces with the speed, applying full torque at low speed will possibly damage the motor. Reduce the load torque as the motor slows to prevent motor damage from overheat. Use a motor designed specifically for operation with a drive when 100% continuous torque is needed at low speeds.

Torque Characteristics

Torque characteristics differ compared to operating the motor directly from line power. The user should have a full understanding of the load torque characteristics for the application.

Vibration and Shock

The drive allows selection of high carrier PWM control and low carrier PWM control. Selecting high carrier PWM can help reduce motor oscillation.

If resonance occurs, install shock-absorbing rubber mounts around the base of the motor and utilize the Jump frequency selection to prevent continuous operation in the resonant frequency ranges.

Audible Noise

Noise created during run varies by the carrier frequency setting. When using a high carrier frequency, audible noise from the motor is comparable to the motor noise generated when running from line power. Operating above the rated r/min, however, can create unpleasant motor noise.

Precautions for PM Motors

NOTICE: *Damage to Equipment. Improper sequencing of output motor circuits could result in damage to the drive. Do not connect electromagnetic switches or magnetic contactors to the output motor circuits without proper sequencing. Do not open the main circuit between the drive and the motor while the PM motor is rotating.*

- Contact Yaskawa or your Yaskawa agent if you plan to use any PM motor not endorsed by Yaskawa.
- When using a holding brake, release the brake prior to starting the motor. Failure to set the proper timing can result in speed loss.

WARNING! *Sudden Movement Hazard. Use the Initial Pole Search Status Signal (H2-□□= 61) to interlock the brake to ensure the brake is not released before the Initial Magnetic Pole Search is completed. Failure to comply may cause inadvertent elevator movement resulting in serious injury.*
This safety message is applicable under these conditions:

- When applying a PM motor, with an external brake sequence, and the PG-F3 option is not being used.

WARNING! *Electrical Shock Hazard. The motor must be at a complete stop before performing any maintenance, inspection, or wiring.*

- With a PM motor, drive output must be fully interrupted when the power is shut off and the motor is still rotating. Failure to comply can result in personal injury from electrical shock.

■ Drive Label Warnings

Always heed the warning information listed in ***Figure 1*** in the position shown in ***Figure 2***.

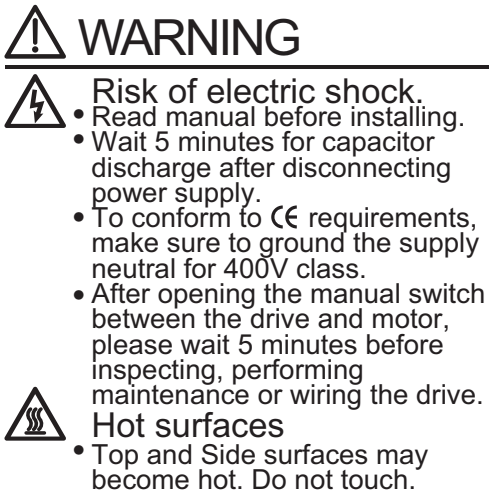


Figure 1 Warning Information

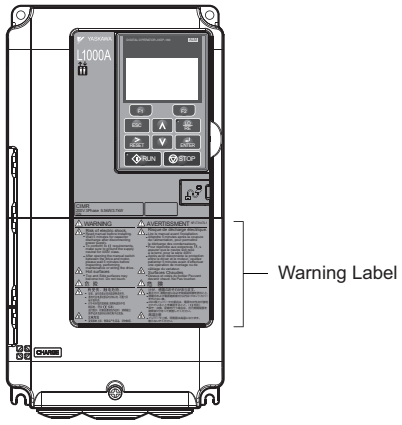


Figure 2 Warning Information Position

■ Warranty Information

Restrictions

The drive is not designed or manufactured for use in devices or systems that may directly affect or threaten human lives or health.

Customers who intend to use the product described in this manual for devices or systems relating to transportation, health care, space aviation, atomic power, electric power, or in underwater applications must first contact their Yaskawa representatives or the nearest Yaskawa sales office.

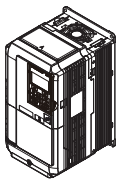
WARNING! *Injury to Personnel. This product has been manufactured under strict quality-control guidelines. However, if this product is to be installed in any location where failure of this product could involve or result in a life-and-death situation or loss of human life or in a facility where failure may cause a serious accident or physical injury, safety devices must be installed to minimize the likelihood of any accident.*

1 Receiving

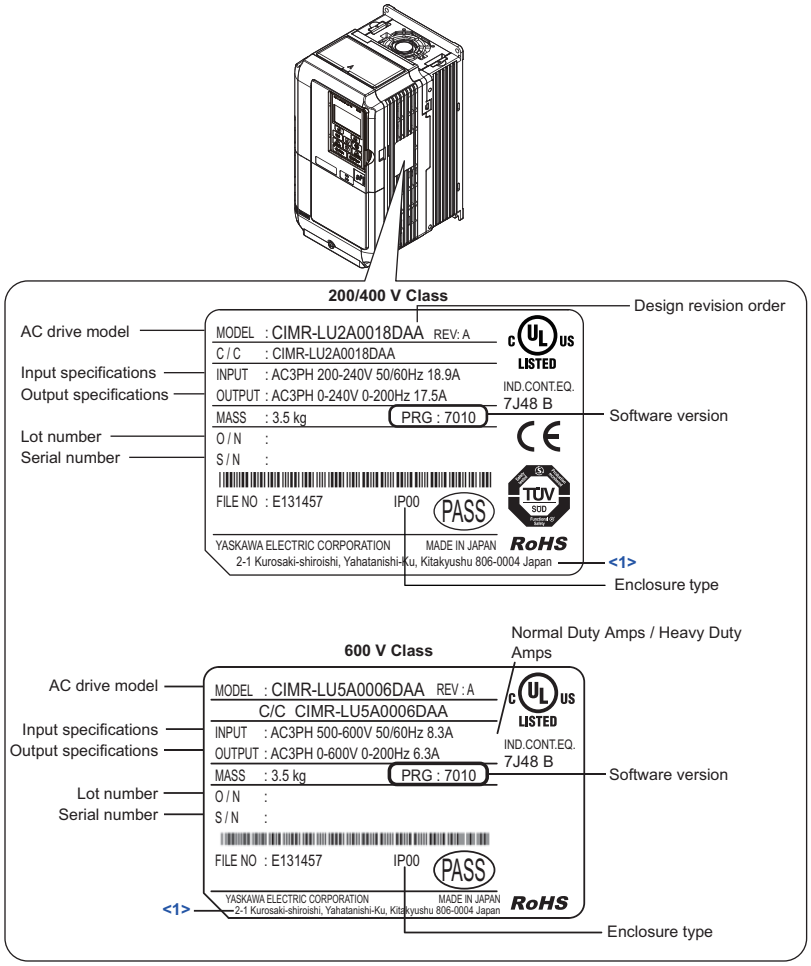
◆ Model Number and Nameplate Check

Please perform the following tasks after receiving the drive:

- Inspect the drive for damage.
  If the drive appears damaged upon receipt, contact the shipper immediately.
- Verify receipt of the correct model by checking the information on the nameplate.
- If you have received the wrong model or the drive does not function properly, contact your supplier.

Description	Drive	Controller Power Supply Cable for Rescue Operation	Quick Start Guide
–			
Quantity	1	1	1

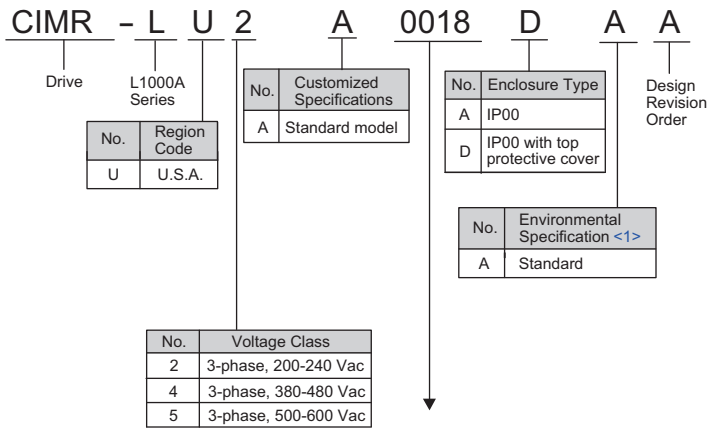
■ Nameplate



<1> The address of the head office of Yaskawa Electric Corporation (responsible for product liability) is shown on the nameplate.

Figure 3 Nameplate Information

■ Model Number



<1> Drives with these specifications do not guarantee complete protection for the environmental conditions indicated.

Table 1 Model Number and Specifications

Three-Phase 200 V Class			Three-Phase 400 V Class			Three-Phase 600 V Class		
Drive Model	Max. Motor Capacity (HP)	Rated Output Current (A)	Drive Model	Max. Motor Capacity (HP)	Rated Output Current (A)	Drive Model	Max. Motor Capacity (HP)	Rated Output Current (A)
2A0008	2	8	4A0005	3	4.8	5A0003	2	3.5
2A0011	3	11	4A0006	3	5.5	5A0004	3	4.1
2A0014	3	14	4A0007	5	7.2	5A0006	5	6.3
2A0018	5	17.5	4A0009	5	9.2	5A0010	7.5	9.8
2A0025	7.5	25	4A0015	7.5	14.8	5A0013	10	12.5
2A0033	10	33	4A0018	10	18	5A0017	15	17
2A0047	15	47	4A0024	15	24	5A0022	20	22
2A0060	20	60	4A0031	20	31	5A0027	25	27
2A0075	25	75	4A0039	25-30	39	5A0032	25-30	32
2A0085	30	85	4A0045	25-30	45	5A0041	40	41
2A0115	40	115	4A0060	40	60	5A0052	50-60	52
2A0145	50	145	4A0075	50-60	75	5A0062	50-60	62
2A0180	60	180	4A0091	50-60	91	5A0077	75	77
2A0215	75	215	4A0112	75	112	5A0099	100	99
2A0283	100	283	4A0150	100	150	5A0130	125	130
2A0346	125	346	4A0180	125-150	180	5A0172	150	172
2A0415	150	415	4A0216	150	216	5A0200	200	200
–	–	–	4A0260	200	260	–	–	–
–	–	–	4A0304	250	304	–	–	–
–	–	–	4A0370	300	370	–	–	–
–	–	–	4A0450	350	450	–	–	–
–	–	–	4A0605	400-450-500	605	–	–	–

2 Mechanical Installation

◆ Mechanical Installation

This section outlines specifications, procedures, and the environment for proper mechanical installation of the drive.

CAUTION! *Crush Hazard. Carrying the drive by the front cover may cause the main body of the drive to fall, resulting in minor or moderate injury. Always hold the case when carrying the drive.*

■ Installation Environment

Install the drive in an environment matching the specifications below to help prolong the optimum performance life of the drive.

Table 2 Installation Environment

Environment	Conditions
Installation Area	Indoors
Ambient Temperature	IP00 enclosure with top protective cover: -10 to +40°C (14 to 104°F) IP00 enclosure: -10 to +50°C (14 to 122°F) Drive reliability improves in environments without wide temperature fluctuations. When using the drive in an enclosure panel, install a cooling fan or air conditioner in the area to ensure that the air temperature inside the enclosure does not exceed the specified levels. Do not allow ice to develop on the drive.
Humidity	95% RH or less and free of condensation
Storage Temperature	-20 to 60°C (-4 to 140°F)
Surrounding Area	Install the drive in an area free from: • oil mist and dust • metal shavings, oil, water or other foreign materials • radioactive materials • combustible materials (e.g., wood) • harmful gases and liquids • excessive vibration • chlorides • direct sunlight
Altitude	1000 m or lower, up to 3000 m with derating 1000 m (3280 ft.) or lower, up to 3000 m (9842 ft.) with derating (Refer to ***Altitude Derating on page 164***)
Vibration	10 to 20 Hz at 9.8 m/s^2 20 to 55 Hz at 5.9 m/s^2 (CIMR-LU2A0008 to 2A0180, 4A0005 to 4A0150, and 5A0003 to 5A0077) 2.0 m/s^2 (CIMR-LU2A0215 to 2A0415, CIMR-LU4A0180 to 4A0605, and 5A0099 to 5A0200)
Orientation	Install the drive vertically to maintain maximum cooling effects.

NOTICE: *Avoid placing drive peripheral devices, transformers, or other electronics near the drive as the noise created can lead to erroneous operation. If such devices must be used in close proximity to the drive, take proper steps to shield the drive from noise.*

NOTICE: *Prevent foreign matter such as metal shavings and wire clippings from falling into the drive during installation. Failure to comply could result in damage to the drive. Place a temporary cover over the top of the drive during installation. Remove the temporary cover before startup, as the cover will reduce ventilation and cause the drive to overheat.*

■ Installation Orientation and Spacing

WARNING! *Fire Hazard. Provide sufficient cooling when installing the drive inside an enclosed panel or cabinet. Failure to comply could result in overheating and fire. When drives are placed inside the same enclosure panel, install proper cooling to ensure air entering the enclosure does not exceed 40 °C (104 °F).*

Installation Orientation

Install the drive upright as illustrated in ***Figure 4*** to maintain proper cooling. Refer to ***Mechanical Installation on page 17*** for details on installing the drive.

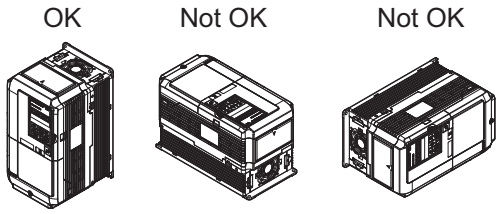
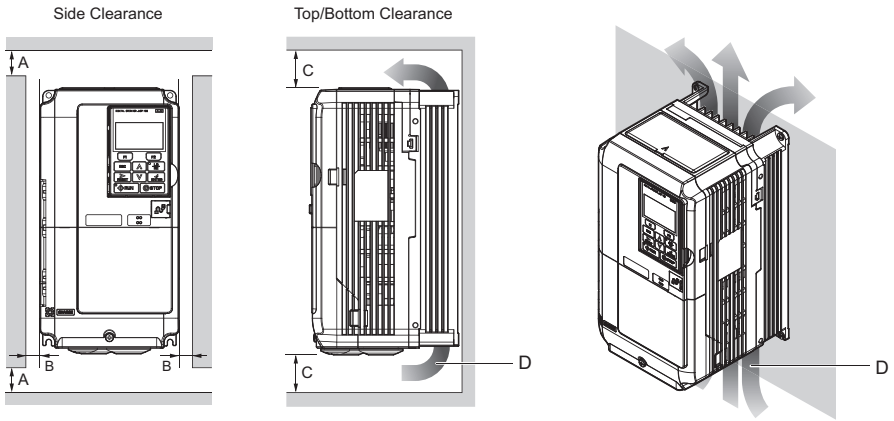


Figure 4 Correct Installation Orientation

Installation Spacing

Figure 5 shows the installation distance required to maintain sufficient space for airflow and wiring.



A – 50 mm (1.97 in.) minimum
B – 30 mm (1.18 in.) minimum
C – 120 mm (4.72 in.) minimum
D – Airflow direction

Figure 5 Correct Installation Spacing

■ Instructions on Installation

Eye bolts are used to install the drive or to temporarily lift the drive when replacing it. The drive can be installed in an enclosure panel or on a wall. Do not leave the drive suspended by the wires in a horizontal or vertical position for long periods of time. Do not transport the drive over long distances. Read the following precautions and instructions before installing the drives.

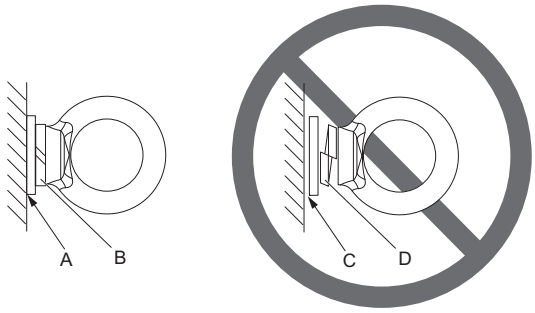
WARNING! *Be sure to observe the following instructions and precautions. Failure to comply could result in minor or moderate injury and damage to the drive from falling equipment.*

- *Before using wires to suspend the drive vertically and horizontally, make sure that the drive front cover, terminal blocks and other drive components are securely fixed with screws.*
- *Do not subject the drive to vibration or impact greater than 1.96 m/s^2 (0.2 G) while it is suspended by the wires.*
- *Do not overturn the drive while it is suspended by the wires.*
- *Do not leave the drive suspended by the wires for long periods of time.*

Horizontal Suspension of the Drive (CIMR-LU2A0346, 2A0415, 4A0216 to 4A0605, and 5A0172 to 5A0200)

To make a wire hanger or frame for use when lifting the drive with a crane, lay the drive in a horizontal position and pass a wire through the holes of the four eye bolts.

When lifting the drive, confirm that the spring washer is fully closed. If not, the drive may become deformed or damaged when lifted.



A – No space between drive and washer
B – Spring washer: Fully closed
C – Space between drive and washer
D – Spring washer: Open

Figure 6 Details of Spring Washers

Vertical Suspension of the Drive (CIMR-LU2A0346, 2A0415, 4A0216 to 4A0605, and 5A0172 to 5A0200)

When vertical suspension of the drive is required in an enclosure panel, the orientation of the eye bolts for these drive models can be easily changed by turning the eye bolts counterclockwise 90 degrees.

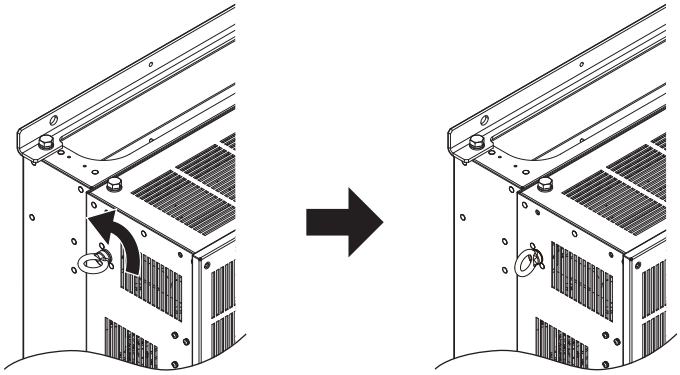


Figure 7 Adjusting Angle of Eye Bolts (CIMR-LU2A0346, 2A0415, 4A0216 to 4A0605, and 5A0172 to 5A0200)

■ Exterior and Mounting Dimensions

IP00 Enclosure Drive with Top Protective Cover

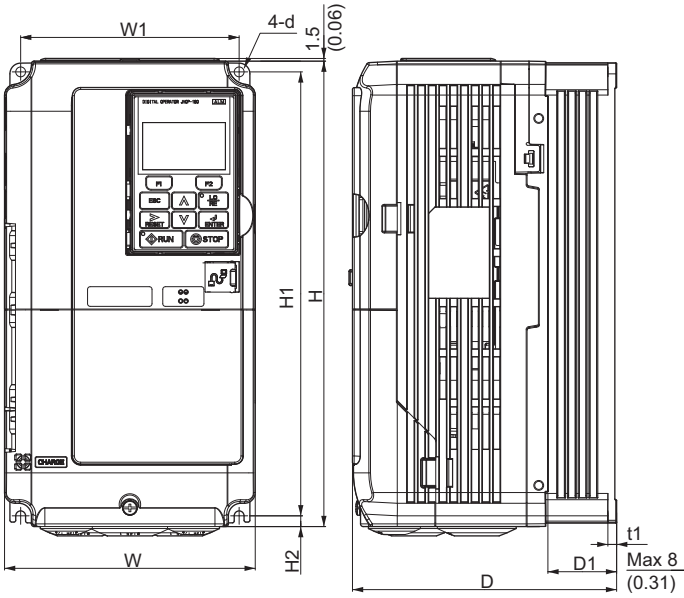


Figure 1

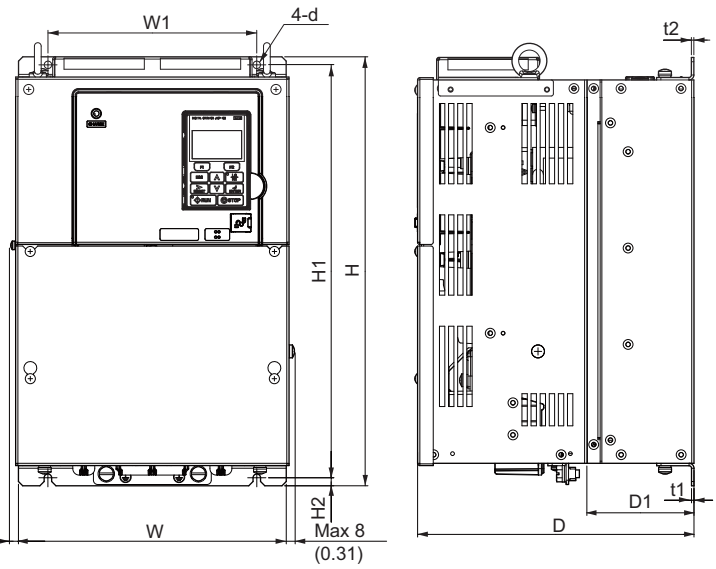


Figure 2

Table 3 Dimensions: 200 V Class

Drive Model CIMR-LU2A	Figure	Dimensions mm (in)										Wt. kg (lb)
		W	H	D	W1	H1	H2	D1	t1	t2	d	
0008	1	140 (5.51)	260 (10.24)	147 (5.79)	122 (4.80)	248 (9.76)	6 (0.24)	38 (1.50)	5 (0.20)	–	M5	3.2 (7.1)
0011		140 (5.51)	260 (10.24)	147 (5.79)	122 (4.80)	248 (9.76)	6 (0.24)	38 (1.50)	5 (0.20)	–	M5	3.2 (7.1)
0014		140 (5.51)	260 (10.24)	164 (6.46)	122 (4.80)	248 (9.76)	6 (0.24)	55 (2.17)	5 (0.20)	–	M5	3.5 (7.7)
0018		140 (5.51)	260 (10.24)	164 (6.46)	122 (4.80)	248 (9.76)	6 (0.24)	55 (2.17)	5 (0.20)	–	M5	3.5 (7.7)
0025		140 (5.51)	260 (10.24)	167 (6.57)	122 (4.80)	248 (9.76)	6 (0.24)	55 (2.17)	5 (0.20)	–	M5	4 (8.8)
0033		140 (5.51)	260 (10.24)	167 (6.57)	122 (4.80)	248 (9.76)	6 (0.24)	55 (2.17)	5 (0.20)	–	M5	4 (8.8)
0047		180 (7.09)	300 (11.81)	187 (7.36)	160 (6.30)	284 (11.18)	8 (0.31)	75 (2.95)	5 (0.20)	–	M5	5.6 (12.3)
0060		220 (8.66)	350 (13.78)	197 (7.76)	192 (7.56)	335 (13.19)	8 (0.31)	78 (3.07)	5 (0.20)	–	M6	8.7 (19.2)
0075		220 (8.66)	365 (14.37)	197 (7.76)	192 (7.56)	335 (13.19)	8 (0.31)	78 (3.07)	5 (0.20)	–	M6	9.7 (21.4)
0085	2	250 (9.84)	400 (15.75)	258 (10.16)	195 (7.68)	385 (15.16)	7.5 (0.30)	100 (3.94)	2.3 (0.09)	2.3 (0.09)	M6	21 (46.3)
0115		275 (10.83)	450 (17.72)	258 (10.16)	220 (8.66)	435 (17.13)	7.5 (0.30)	100 (3.94)	2.3 (0.09)	2.3 (0.09)	M6	25 (55.1)
0145		325 (12.80)	550 (21.65)	283 (11.14)	260 (10.24)	535 (21.06)	7.5 (0.30)	110 (4.33)	2.3 (0.09)	2.3 (0.09)	M6	37 (81.6)
0180		325 (12.80)	550 (21.65)	283 (11.14)	260 (10.24)	535 (21.06)	7.5 (0.30)	110 (4.33)	2.3 (0.09)	2.3 (0.09)	M6	38 (83.8)

Table 4 Dimensions: 400 V Class

Drive Model CIMR-LU4A	Figure	Dimensions mm (in)										Wt. kg (lb)
		W	H	D	W1	H1	H2	D1	t1	t2	d	
0005	1	140 (5.51)	260 (10.24)	147 (5.79)	122 (4.80)	248 (9.76)	6 (0.24)	38 (1.50)	5 (0.20)	–	M5	3.2 (7.1)
0006		140 (5.51)	260 (10.24)	164 (6.46)	122 (4.80)	248 (9.76)	6 (0.24)	55 (2.17)	5 (0.20)	–	M5	3.4 (7.5)
0007		140 (5.51)	260 (10.24)	164 (6.46)	122 (4.80)	248 (9.76)	6 (0.24)	55 (2.17)	5 (0.20)	–	M5	3.5 (7.7)
0009		140 (5.51)	260 (10.24)	164 (6.46)	122 (4.80)	248 (9.76)	6 (0.24)	55 (2.17)	5 (0.20)	–	M5	3.5 (7.7)
0015		140 (5.51)	260 (10.24)	167 (6.57)	122 (4.80)	248 (9.76)	6 (0.24)	55 (2.17)	5 (0.20)	–	M5	3.9 (8.6)
0018		140 (5.51)	260 (10.24)	167 (6.57)	122 (4.80)	248 (9.76)	6 (0.24)	55 (2.17)	5 (0.20)	–	M5	3.9 (8.6)
0024		180 (7.09)	300 (11.81)	167 (6.57)	160 (6.30)	284 (11.18)	8 (0.31)	55 (2.17)	5 (0.20)	–	M5	5.4 (11.9)
0031		180 (7.09)	300 (11.81)	187 (7.36)	160 (6.30)	284 (11.18)	8 (0.31)	75 (2.95)	5 (0.20)	–	M5	5.7 (12.6)
0039		220 (8.66)	350 (13.78)	197 (7.76)	192 (7.56)	335 (13.19)	8 (0.31)	78 (3.07)	5 (0.20)	–	M6	8.3 (18.3)
0045	2	250 (9.84)	400 (15.75)	258 (10.16)	195 (7.68)	385 (15.16)	7.5 (0.30)	100 (3.94)	2.3 (0.09)	2.3 (0.09)	M6	21 (46.3)
0060		275 (10.83)	450 (17.72)	258 (10.16)	220 (8.66)	435 (17.13)	7.5 (0.30)	100 (3.94)	2.3 (0.09)	2.3 (0.09)	M6	25 (55.1)
0075		325 (12.80)	510 (20.08)	258 (10.16)	260 (10.24)	495 (19.49)	7.5 (0.30)	105 (4.13)	2.3 (0.09)	3.2 (0.13)	M6	36 (79.4)
0091		325 (12.80)	510 (20.08)	258 (10.16)	260 (10.24)	495 (19.49)	7.5 (0.30)	105 (4.13)	2.3 (0.09)	3.2 (0.13)	M6	36 (79.4)
0112		325 (12.80)	550 (21.65)	283 (11.14)	260 (10.24)	535 (21.06)	7.5 (0.30)	110 (4.33)	2.3 (0.09)	2.3 (0.09)	M6	41 (90.4)
0150		325 (12.80)	550 (21.65)	283 (11.14)	260 (10.24)	535 (21.06)	7.5 (0.30)	110 (4.33)	2.3 (0.09)	2.3 (0.09)	M6	42 (92.6)

Table 5 Dimensions: 600 V Class

Drive Model CIMR-LU5A	Figure	Dimensions mm (in)										Wt. kg (lb)
		W	H	D	W1	H1	H2	D1	t1	t2	d	
0003	1	140 (5.51)	260 (10.24)	147 (5.79)	122 (4.80)	248 (9.76)	6 (0.24)	38 (1.50)	5 (0.20)	–	M5	3.2 (7.1)
0004		140 (5.51)	260 (10.24)	164 (6.46)	122 (4.80)	248 (9.76)	6 (0.24)	55 (2.17)	5 (0.20)	–	M5	3.5 (7.7)
0006		140 (5.51)	260 (10.24)	164 (6.46)	122 (4.80)	248 (9.76)	6 (0.24)	55 (2.17)	5 (0.20)	–	M5	3.5 (7.7)
0010		140 (5.51)	260 (10.24)	167 (6.57)	122 (4.80)	248 (9.76)	6 (0.24)	55 (2.17)	5 (0.20)	–	M5	3.9 (8.6)
0013		180 (7.09)	300 (11.81)	187 (7.36)	160 (6.30)	284 (11.18)	8 (0.31)	75 (2.95)	5 (0.20)	–	M5	5.7 (12.6)
0017		180 (7.09)	300 (11.81)	187 (7.36)	160 (6.30)	284 (11.18)	8 (0.31)	75 (2.95)	5 (0.20)	–	M5	5.7 (12.6)
0022		220 (8.66)	350 (13.78)	197 (7.76)	192 (7.56)	335 (13.19)	8 (0.31)	78 (3.07)	5 (0.20)	–	M6	8.3 (18.3)
0027		220 (8.66)	350 (13.78)	197 (7.76)	192 (7.56)	335 (13.19)	8 (0.31)	78 (3.07)	5 (0.20)	–	M6	8.3 (18.3)
0032	2	275 (10.83)	450 (17.72)	258 (10.16)	220 (8.66)	435 (17.13)	7.5 (0.30)	100 (3.94)	2.3 (0.09)	2.3 (0.09)	M6	25 (55.1)
0041		275 (10.83)	450 (17.72)	258 (10.16)	220 (8.66)	435 (17.13)	7.5 (0.30)	100 (3.94)	2.3 (0.09)	2.3 (0.09)	M6	25 (55.1)
0052		325 (12.80)	550 (21.65)	283 (11.14)	260 (10.24)	535 (21.06)	7.5 (0.30)	110 (4.33)	2.3 (0.09)	2.3 (0.09)	M6	41 (90.4)
0062		325 (12.80)	550 (21.65)	283 (11.14)	260 (10.24)	535 (21.06)	7.5 (0.30)	110 (4.33)	2.3 (0.09)	2.3 (0.09)	M6	41 (90.4)
0077		325 (12.80)	550 (21.65)	283 (11.14)	260 (10.24)	535 (21.06)	7.5 (0.30)	110 (4.33)	2.3 (0.09)	2.3 (0.09)	M6	41 (90.4)
0099		450 (17.72)	705 (27.76)	330 (12.99)	325 (12.80)	680 (26.77)	12.5 (0.49)	130 (5.12)	3.2 (0.13)	3.2 (0.13)	M10	80.5 (177.5)

IP00 Enclosure Drive

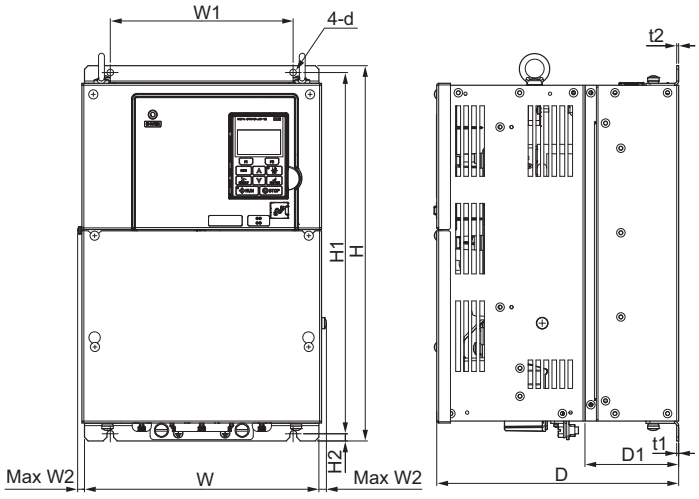


Figure 1

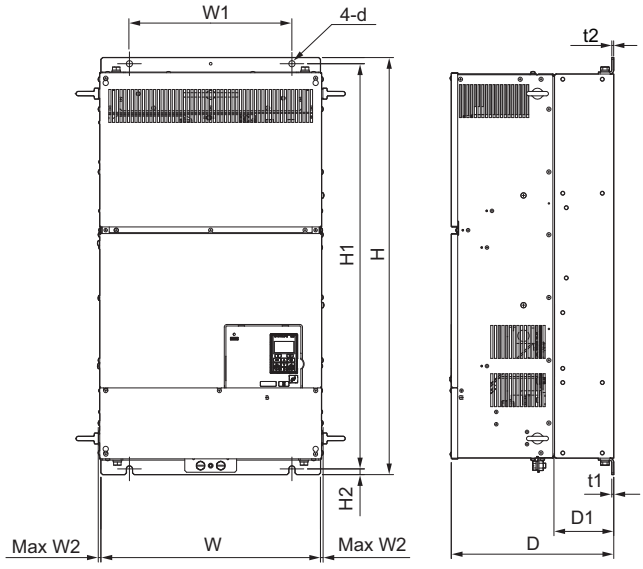


Figure 2

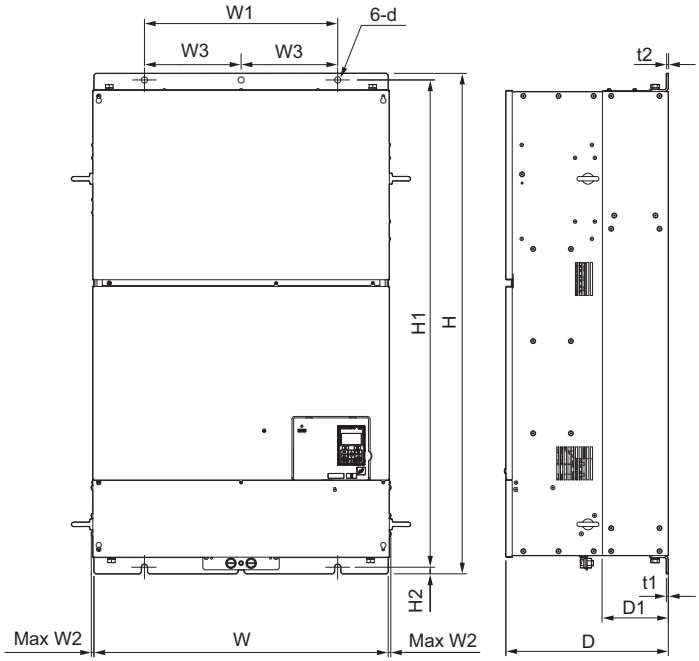


Figure 3

Table 6 Dimensions: 200 V Class

Drive Model CIMR-LU2A	Figure	Dimensions mm (in)												Wt. kg (lb)
		W	H	D	W1	W2	W3	H1	H2	D1	t1	t2	d	
0215	1	450 (17.72)	705 (27.76)	330 (12.99)	325 (12.80)	10 (0.39)	–	680 (26.77)	12.5 (0.49)	130 (5.12)	3.2 (0.13)	3.2 (0.13)	M10	76 (167.6)
0283		450 (17.72)	705 (27.76)	330 (12.99)	325 (12.80)	10 (0.39)	–	680 (26.77)	12.5 (0.49)	130 (5.12)	3.2 (0.13)	3.2 (0.13)	M10	80 (176.4)
0346		500 (19.69)	800 (31.50)	350 (13.78)	370 (14.57)	10 (0.39)	–	773 (30.43)	13 (0.51)	130 (5.12)	4.5 (0.18)	4.5 (0.18)	M12	98 (216.1)
0415		500 (19.69)	800 (31.50)	350 (13.78)	370 (14.57)	10 (0.39)	–	773 (30.43)	13 (0.51)	130 (5.12)	4.5 (0.18)	4.5 (0.18)	M12	99 (218.3)

Table 7 Dimensions: 400 V Class

Drive Model CIMR-LU4A	Figure	Dimensions mm (in)												Wt. kg (lb)
		W	H	D	W1	W2	W3	H1	H2	D1	t1	t2	d	
0180	1	450 (17.72)	705 (27.76)	330 (12.99)	325 (12.80)	10 (0.39)	–	680 (26.77)	12.5 (0.49)	130 (5.12)	3.2 (0.13)	3.2 (0.13)	M10	79 (174.2)
0216		500 (19.69)	800 (31.50)	350 (13.78)	370 (14.57)	10 (0.39)	–	773 (30.43)	13 (0.51)	130 (5.12)	4.5 (0.18)	4.5 (0.18)	M12	96 (211.6)
0260		500 (19.69)	800 (31.50)	350 (13.78)	370 (14.57)	10 (0.39)	–	773 (30.43)	13 (0.51)	130 (5.12)	4.5 (0.18)	4.5 (0.18)	M12	102 (224.9)
0304		500 (19.69)	800 (31.50)	350 (13.78)	370 (14.57)	10 (0.39)	–	773 (30.43)	13 (0.51)	130 (5.12)	4.5 (0.18)	4.5 (0.18)	M12	107 (235.9)
0370	2	500 (19.69)	950 (37.40)	370 (14.57)	370 (14.57)	8 (0.31)	–	923 (36.34)	13 (0.51)	135 (5.31)	4.5 (0.18)	4.5 (0.18)	M12	125 (275.6)
0450	3	670 (26.38)	1140 (44.88)	370 (14.57)	440 (17.32)	6 (0.24)	220 (8.66)	1110 (43.70)	15 (0.59)	150 (5.91)	4.5 (0.18)	4.5 (0.18)	M12	216 (476.2)
0605		670 (26.38)	1140 (44.88)	370 (14.57)	440 (17.32)	6 (0.24)	220 (8.66)	1110 (43.70)	15 (0.59)	150 (5.91)	4.5 (0.18)	4.5 (0.18)	M12	221 (487.2)

Table 8 Dimensions: 600 V Class

Drive Model CIMR-LU5A	Figure	Dimensions mm (in)												Wt. kg (lb)
		W	H	D	W1	W2	W3	H1	H2	D1	t1	t2	d	
0130	1	450 (17.72)	705 (27.76)	330 (12.99)	325 (12.80)	10 (0.39)	–	680 (26.77)	12.5 (0.49)	130 (5.12)	3.2 (0.13)	3.2 (0.13)	M10	79 (174.2)
0172		500 (19.69)	800 (31.50)	350 (13.78)	370 (14.57)	10 (0.39)	–	773 (30.43)	13 (0.51)	130 (5.12)	4.5 (0.18)	4.5 (0.18)	M12	107 (235.9)
0200		500 (19.69)	800 (31.50)	350 (13.78)	370 (14.57)	10 (0.39)	–	773 (30.43)	13 (0.51)	130 (5.12)	4.5 (0.18)	4.5 (0.18)	M12	107 (235.9)

3 Electrical Installation

◆ Standard Connection Diagram

Connect the drive and peripheral devices as shown in ***Figure 8***. It is possible to set and run the drive via the digital operator without connecting digital I/O wiring. This section does not discuss drive operation; ***Refer to Start-Up Programming & Operation on page 56*** for instructions on operating the drive.

WARNING! *Sudden Movement Hazard. Ensure holding brake circuits are properly configured, load equipment may fall or drop during power loss or drive fault, which could result in death or serious injury.*
・Provide a separate holding brake if necessary.
・Always construct the external sequence to confirm that the holding brake is activated in the event of an emergency, a power failure, or an abnormality in the drive.
・When using the drive with an elevator, provide safety measures on the elevator to prevent the elevator from dropping.

NOTICE: *Equipment Hazard. Separate motor and/or braking circuit wiring (terminals, U/T1, V/T2, W/T3, +3, +2, +1,(-), B1, B2, from all other wiring. Place motor wiring within its own conduit or cable tray with appropriate divider, and use shielded motor cable where appropriate. Improper wiring practices could result in malfunction of drive due to electrical interference.*

NOTICE: *Inadequate wiring could result in damage to the drive. Install adequate branch circuit short circuit protection per applicable codes. The drive is suitable for circuits capable of delivering not more than 100,000 RMS symmetrical amperes, 240 Vac maximum (200 V class), 480 Vac maximum (400 V class), and 600 Vac maximum (600 V class).*

NOTICE: *When the input voltage is 440 V or higher or the wiring distance is greater than 100 meters (328 ft.), pay special attention to the motor insulation voltage or use a drive rated motor. Failure to comply could lead to motor insulation breakdown.*

Note: Do not connect AC control circuit ground to drive enclosure. Improper drive grounding can cause control circuit malfunction.

NOTICE: *The minimum load for the multi-function relay output MA-MB-MC is 10 mA. If a circuit requires less than 10 mA (reference value), connect it to a photocoupler output (P1-C1, P2-C2). Improper application of peripheral devices could result in damage to the photocoupler output of the drive.*

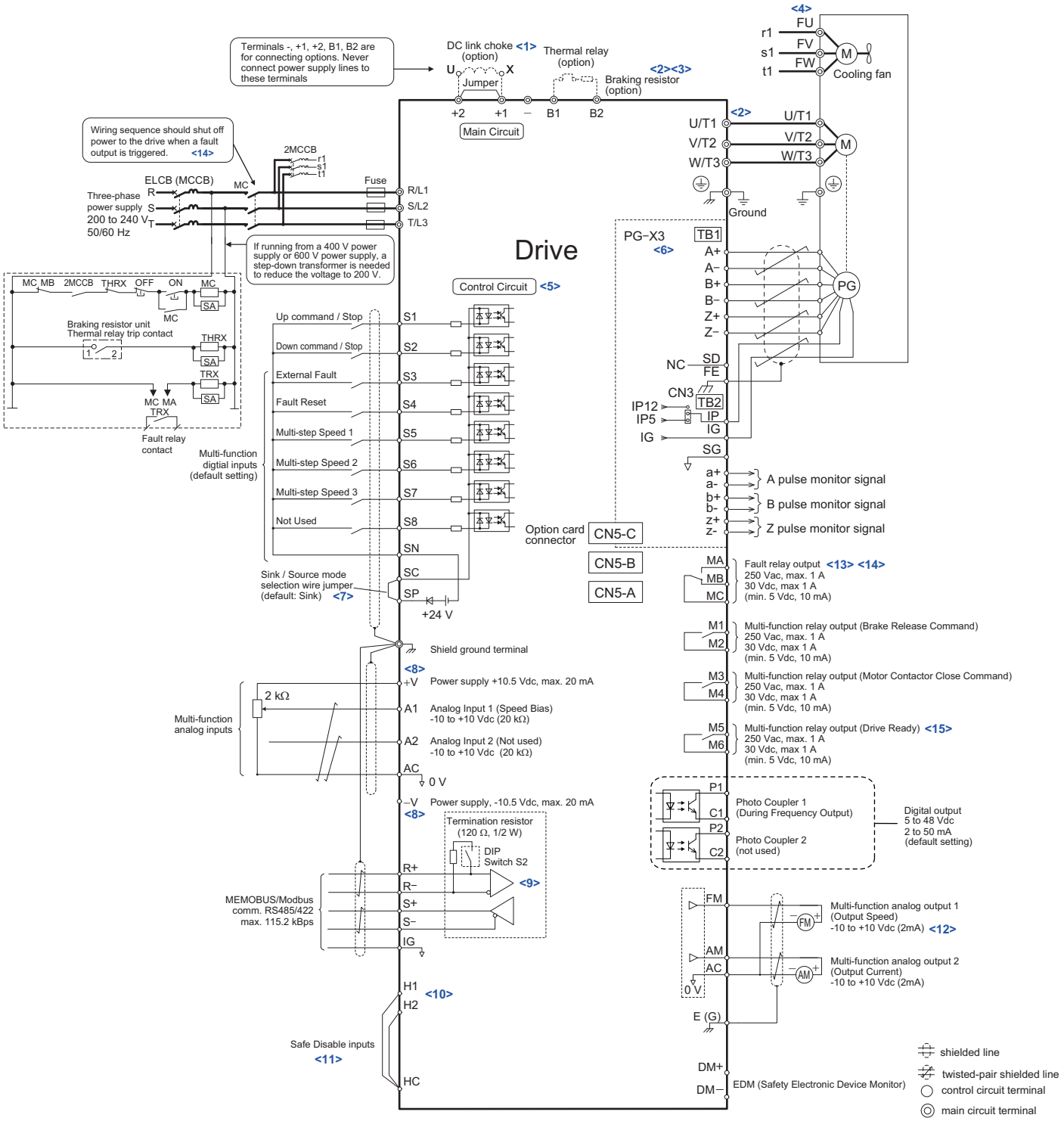


Figure 8 Drive Standard Connection Diagram (example: CIMR-LU2A0033)

<1> Remove the jumper when installing a DC link choke. Models CIMR-LU2A0085 through 2A0415, 4A0045 through 4A0605, and 5A0032 through 5A0200 come with a built-in DC link choke.

<2> Set L8-55 to 0 to disable the protection function of the built-in braking transistor of the drive when using an optional regenerative converter or dynamic braking option.

<3> Set up a thermal relay sequence to disconnect drive main power in the event of an overheat condition on the dynamic braking option.

<4> Self-cooling motors do not require the same wiring necessary for motors with separate cooling fans.

<5> Supplying power to the control circuit separately from the main circuit requires a 24 V power supply (option).

<6> For control modes that do not use a motor speed feedback signal, PG option card wiring is not necessary.

<7> This figure illustrates an example of a sequence input to S1 through S8 using a non-powered relay or an NPN transistor. Install the wire link between terminals SC-SP for Sink mode, between SC-SN for Source mode, or leave the link out for external power supply. Never short terminals SP and SN, as it will damage the drive.

<8> The maximum output current capacity for the +V and -V terminals on the control circuit is 20 mA. Never short terminals +V, -V, and AC, as it can cause erroneous operation or damage the drive.

<9> Set DIP switch S2 to the ON position to enable the termination resistor in the last drive in a MEMOBUS/Modbus network.

<10> The sink/source setting for the Safe Disable input is the same as with the sequence input. Jumper S3 has the drive set for an external power supply. When not using the Safe Disable input feature, remove the jumper shorting the input and connect an external power supply. Refer to ***Sinking/Sourcing Mode Selection for Safe Disable Inputs on page 54*** for instructions.

<11> Disconnect the wire jumper between H1 - HC and H2 - HC when utilizing the Safe Disable input. Terminals H1, H2, DM+, and DM- on 600 V class models are designed to the functionality, but are not certified to IEC/EN 61800-5-1,ISO/EN 13849 Cat.3, IEC/EN 61508 SIL2, Insulation coordination: class 1.

<12> Monitor outputs work with devices such as analog frequency meters, ammeters, voltmeters, and wattmeters. They are not intended for use as a feedback-type of signal.

<13> When the drive is set to trigger a fault output upon activation of the fault reset function (L5-02 = 1), a sequence to interrupt power when a fault occurs will shut off the power to the drive when the drive attempts a reset. The default setting for L5-02 is 0 (fault output not active during reset attempt).

<14> Wire fault contact outputs MA, MB, and MC. Wire so that a fault will open the safety circuit and interrupt drive output.

<15> When using the Programming Mode to edit parameter settings, L1000A will not accept an Up/Down command. If the drive still will not run when an Up/Down command has been entered and no fault is present, then use the "Drive ready" signal (the default setting for terminal M5-M6) to interlock components.

WARNING! *Sudden Movement Hazard. Ensure start/stop and safety circuits are wired properly and in the correct state before energizing the drive. Failure to comply could result in death or serious injury from moving equipment.*

NOTICE: *When using the automatic fault reset function with wiring designed to shut off the power supply upon drive fault, make sure the drive does not trigger a fault output during fault reset (L5-02 = 0, default). Failure to comply will prevent the automatic fault reset function from working properly.*

◆ Main Circuit Connection Diagram

Refer to the ***Figure 9*** when wiring the main circuit of the drive. Connections may vary based on drive capacity. The DC power supply for the main circuit also provides power to the control circuit.

NOTICE: *Do not use the negative DC bus terminal "-" as a ground terminal. This terminal is at high DC voltage potential. Improper wiring connections could damage the drive.*

NOTICE: *Equipment Hazard. Separate motor and/or braking circuit wiring (terminals, U/T1, V/T2, W/T3, +3, +2, +1,(-), B1, B2, from all other wiring. Place motor wiring within its own conduit or cable tray with appropriate divider, and use shielded motor cable where appropriate. Improper wiring practices could result in malfunction of drive due to electrical interference.*

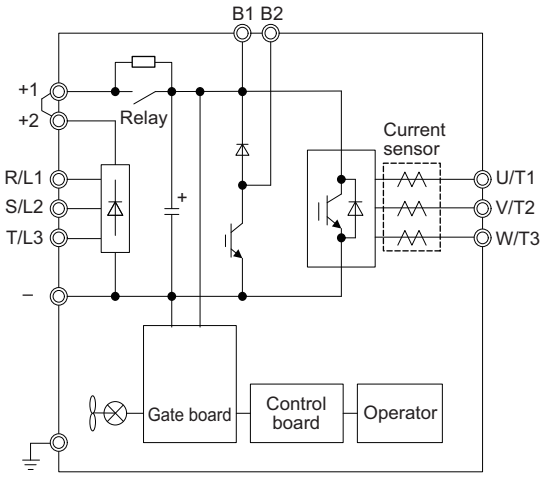
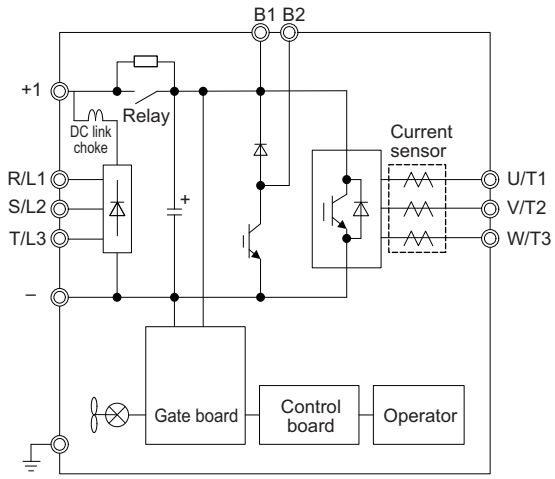
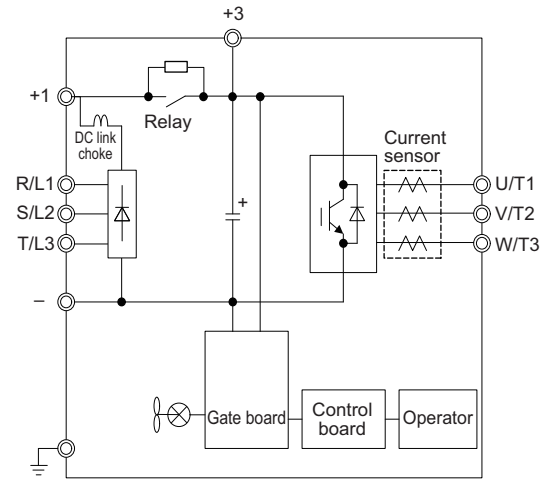
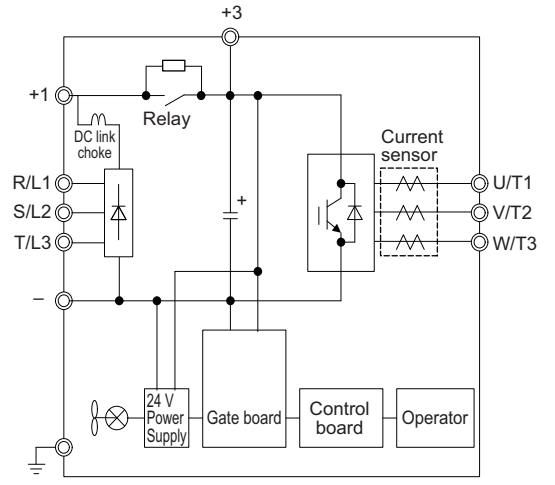
<table>
<tr><td>CIMR-LU2A0008 to 2A0075
CIMR-LU4A0005 to 4A0039
CIMR-LU5A0003 to 5A0027</td><td>CIMR-LU2A0085, 2A0115
CIMR-LU4A0045, 4A0060
CIMR-LU5A0032, 5A0041</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>CIMR-LU2A0145 to 2A0180
CIMR-LU4A0075 to 4A0112
CIMR-LU5A0052 to 5A0077</td><td>CIMR-LU2A0215 to 2A0415
CIMR-LU4A0150 to 4A0605
CIMR-LU5A0003 to 5A0200
CIMR-LU5A0099 to 5A0200</td></tr>
<tr><td> 
</td><td> 
</td></tr>
</table>

Figure 9 Drive main circuit configurations

◆ Terminal Cover

Follow the procedure below to remove the terminal cover for wiring and to reattach the terminal cover after wiring is complete.

■ Removing/Reattaching the Terminal Cover

Removing the Terminal Cover

Models CIMR-LU2A0008 to 2A0075, 4A0005 to 4A0039, and 5A0003 to 5A0027

1. Loosen the terminal cover screw using a #2 Phillips screwdriver. Screw sizes vary by drive model.

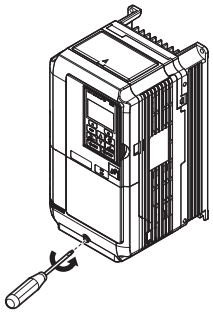


Figure 10 Removing the Terminal Cover

2. Push in on the tab located on the bottom of the terminal cover and gently pull forward to remove the terminal cover.

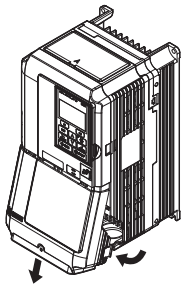


Figure 11 Removing the Terminal Cover

Models CIMR- LU2A0085 to 2A0415, 4A0045 to 4A0605, and 5A0003 to 5A0027

1. Loosen the screws on the terminal cover, then pull down on the cover.

CAUTION! *Do not completely remove the cover screws, just loosen them. If the cover screws are removed completely, the terminal cover may fall off causing an injury.*

Note: The shape of the terminal covers and the numbers of screws differ depending on the drive models.

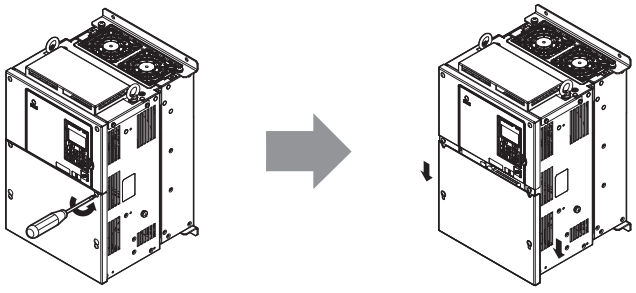


Figure 12 Removing the Terminal Cover

2. Pull forward on the terminal cover to free it from the drive.

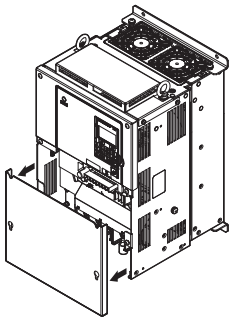


Figure 13 Removing the Terminal Cover

Reattaching the Terminal Cover

Models CIMR-LU2A0008 to 2A0075, 4A0005 to 4A0039, and 5A0003 to 5A0027

Power lines and signal wiring should pass through the opening provided. *Refer to Wiring the Main Circuit Terminal on page 46* and *Wiring the Control Circuit Terminal on page 50* for details on wiring.

NOTICE: *Equipment Hazard. Separate motor and/or braking circuit wiring (terminals, U/T1, V/T2, W/T3, +3, +2, +1,(-), B1, B2, from all other wiring. Place motor wiring within its own conduit or cable tray with appropriate divider, and use shielded motor cable where appropriate. Improper wiring practices could result in malfunction of drive due to electrical interference.*

Reattach the terminal cover after completing the wiring to the drive and other devices.

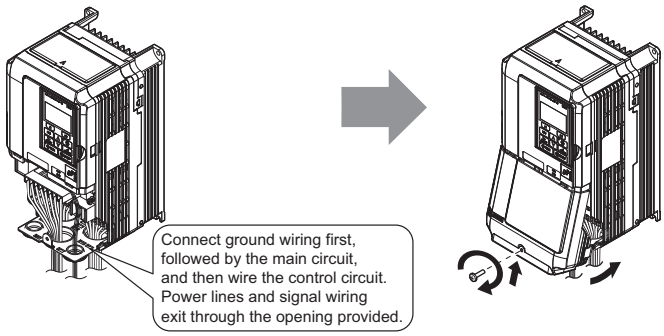


Figure 14 Reattaching the Terminal Cover

Models CIMR- LU2A0085 to 2A0415, 4A0045 to 4A0605, and 5A0003 to 5A0027

After wiring the terminal board and other devices, double-check connections and reattach the terminal cover. *Refer to Wiring the Main Circuit Terminal on page 46* and *Wiring the Control Circuit Terminal on page 50* for details on wiring.

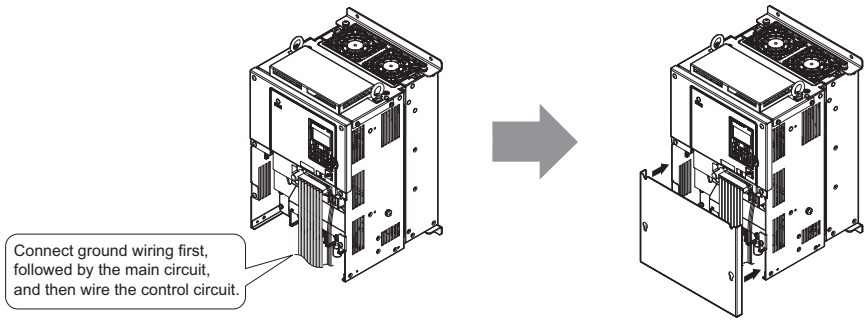


Figure 15 Reattaching the Terminal Cover

◆ Digital Operator and Front Cover

Detach the digital operator from the drive for remote operation or when opening the front cover to install an option card.

Note: Be sure to remove the digital operator prior to opening or reattaching the front cover. Leaving the digital operator plugged into the drive when removing the front cover can result in erroneous operation caused by a poor connection. Firmly fasten the front cover back into place before reattaching the digital operator.

■ Removing/Reattaching the Digital Operator

Removing the Digital Operator

While pressing on the tab located on the right side of the digital operator, pull the digital operator forward to remove it from the drive.

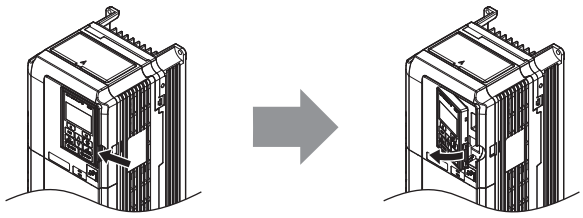


Figure 16 Removing the Digital Operator

Reattaching the Digital Operator

Insert the digital operator into the opening in the top cover while aligning it with the notches on the left side of the opening.

Next, press gently on the right side of the operator until it clicks into place.

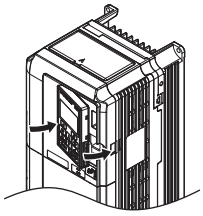


Figure 17 Reattaching the Digital Operator

■ Removing/Reattaching the Front Cover

Removing the Front Cover
Models CIMR- LU2A0008 to 2A0075, 4A0005 to 4A0039, and 5A0003 to 5A0027

After removing the terminal cover and the digital operator, loosen the screw that affixes the front cover (model CIMR-LU2A0047, 4A0024, 4A0031, 5A0017, and 5A0022 does not use a screw to affix the front cover). Pinch inwards on the tabs found on each side of the front cover, then pull forward to remove it from the drive.

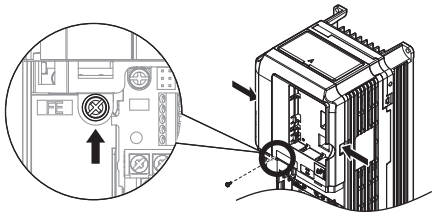


Figure 18 Remove the Front Cover (Models CIMR-LU2A0008 to 2A0075, 4A0005 to 4A0039, and 5A0003 to 5A0027)

Models CIMR-LU2A0085 to 2A0415, 4A0045 to 4A0605, and 5A0032 to 5A0200

1. Remove the terminal cover and the digital operator.
2. Loosen the installation screw on the front cover.
3. Use a straight-edge screwdriver to loosen the hooks on each side of the cover that hold it in place.

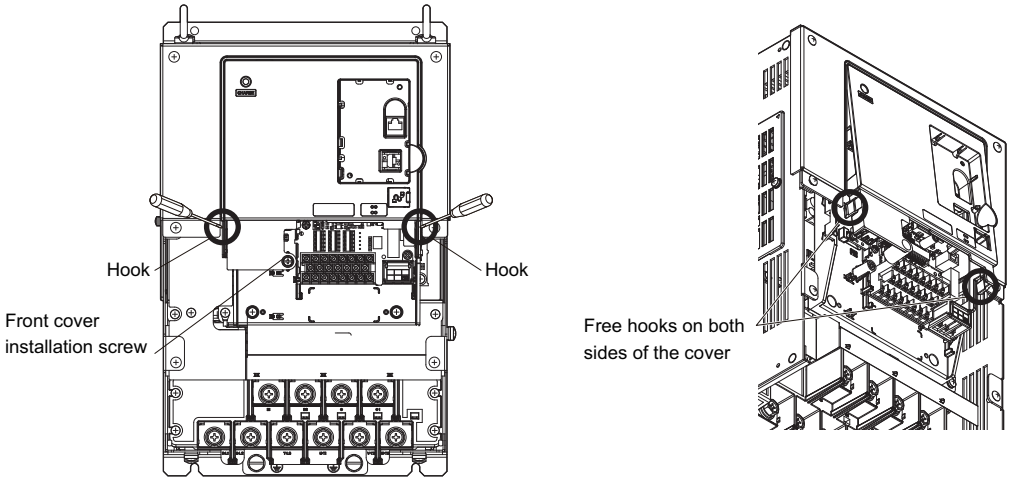


Figure 19 Remove the Front Cover (Models CIMR-LU2A0085 to 2A0415, 4A0045 to 4A0605, and 5A0032 to 5A0200)

4. Unhook the left side of the front cover then swing the left side towards you as shown in ***Figure 20*** until the cover comes off.

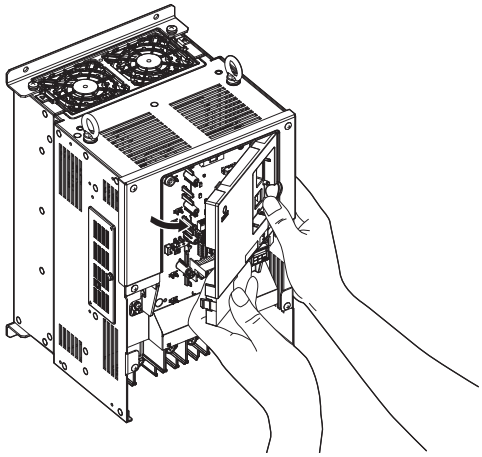


Figure 20 Remove the Front Cover (Models CIMR-LU2A0085 to 2A0415, 4A0045 to 4A0605, and 5A0032 to 5A0200)

Reattaching the Front Cover

Models CIMR-LU2A0008 to 2A0075, 4A0005 to 4A0039, and 5A0003 to 5A0027

Reverse the instructions given in ***Remove the Front Cover (Models CIMR-LU2A0008 to 2A0075, 4A0005 to 4A0039, and 5A0003 to 5A0027) on page 31*** to reattach the front cover. Pinch inwards on the hooks found on each side of the front cover while guiding it back into the drive. Make sure it clicks firmly into place.

Models CIMR-LU2A0085 to 2A0415, 4A0045 to 4A0605, and 5A0032 to 5A0200

1. Slide the front cover so the hooks on the top connect to the drive.

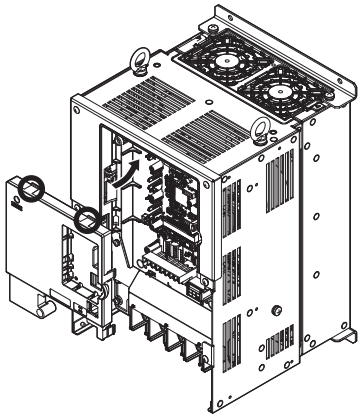


Figure 21 Reattach the Front Cover (Models CIMR- LU2A0085 to 2A0415, 4A0045 to 4A0605, and 5A0032 to 5A0200)

2. After connecting the hooks to the drive, press firmly on the cover to lock it into place.

◆ Main Circuit Wiring

This section describes the functions, specifications, and procedures required to safely and properly wire the main circuit in the drive.

NOTICE: *Only connect recommended devices to the drives braking transistor terminals. Failure to comply could result in damage to the drive or braking circuit. Carefully review instruction manual TOBP C720600 0☐ when connecting a braking option to the drive.*

NOTICE: *Do not use the negative DC bus terminal "-" as a ground terminal. This terminal is at high DC voltage potential. Improper wiring connections could damage the drive.*

NOTICE: *Equipment Hazard. Separate motor and/or braking circuit wiring (terminals, U/T1, V/T2, W/T3, +3, +2, +1,(-), B1, B2, from all other wiring. Place motor wiring within its own conduit or cable tray with appropriate divider, and use shielded motor cable where appropriate. Improper wiring practices could result in malfunction of drive due to electrical interference.*

NOTICE: *Equipment Hazard. Comply with proper wiring practices. The motor may run in reverse if the phase order is backward, causing incorrect elevator direction movement. Connect motor input terminals U, V and W to drive output terminals U/T1,V/T2, and W/T3. The phase order for the drive and motor should match.*

NOTICE: *Do not solder the ends of wire connections to the drive. Soldered wiring connections can loosen over time. Improper wiring practices could result in drive malfunction due to loose terminal connections.*

NOTICE: *Do not switch the drive input to start or stop the motor. Frequently switching the drive on and off shortens the life of the DC bus charge circuit and the DC bus capacitors, and can cause premature drive failures. For the full performance life, refrain from switching the drive on and off more than once every 30 minutes.*

■ Main Circuit Terminal Functions

Table 9 Main Circuit Terminal Functions

<table>
<tr><th colspan="2" rowspan="2">Terminal</th><th colspan="3">Type</th><th rowspan="2">Function</th><th rowspan="2">Page</th></tr>
<tr><th rowspan="3">Model CIMR-LU</th><th>2A0008 to 2A0075</th><th>2A0085, 2A0115</th><th>2A0145 to 2A0415</th></tr>
<tr><th>200 V Class
400 V Class</th><th>4A0005 to 4A0039</th><th>4A0045, 4A0060</th><th>4A0075 to 4A0605</th></tr>
<tr><th>600 V Class</th><th>5A0003 to 5A0027</th><th>5A0032, 5A0041</th><th>5A0052 to 5A0200</th></tr>
<tr><td colspan="2">R/L1
S/L2
T/L3</td><td colspan="3">Main circuit power supply input</td><td>Connects line power to the drive</td><td>26</td></tr>
<tr><td colspan="2">U/T1
V/T2
W/T3</td><td colspan="3">Drive output</td><td>Connects to the motor</td><td>26</td></tr>
<tr><td colspan="2">B1
B2</td><td colspan="2">Braking resistor</td><td>Not available</td><td>Available for connecting a braking resistor or a braking resistor unit option</td><td>–</td></tr>
<tr><td colspan="2">+2</td><td rowspan="3">• DC reactor connection (+1, +2) (remove the shorting bar between +1 and +2)
• DC power supply input (+1, –)</td><td colspan="2">not available</td><td rowspan="4">For connection
• of the drive to a DC power supply (terminals +1 and – are not UL approved)
• of dynamic braking options</td><td rowspan="4">–</td></tr>
<tr><td colspan="2">+1</td><td rowspan="3">• DC power supply input (+1, –)</td><td rowspan="3">• DC power supply input (+1, –)
• Braking unit connection (+3, –)</td></tr>
<tr><td colspan="2">–</td></tr>
<tr><td colspan="2">+3</td><td colspan="2">not available</td></tr>
<tr><td colspan="2">⏚</td><td colspan="3">For 200 V class: 100 Ω or less
For 400 V class: 10 Ω or less
For 600 V class: 10 Ω or less</td><td>Grounding terminal</td><td>45</td></tr>
</table>

Note: Use terminal B1 and - terminals when installing the braking unit (CDBR type) to the drives with built-in braking transistor (2A0008 to 2A0115, 4A0005 to 4A0060, and 5A0003 to 5A0041).

■ Protecting Main Circuit Terminals

Insulation Cap or Sleeves

Use insulation caps or sleeves when wiring the drive with crimp terminals. Take particular care to ensure that the wiring does not touch nearby terminals or the surrounding case.

Insulation Barrier

Insulation barriers are packaged with drive models CIMR-LU4A0370 through 4A0605 to provide added protection between terminals. Yaskawa recommends using the provided insulation barriers to ensure proper wiring. Refer to *Figure 22* for instructions on placement of the insulation barriers.

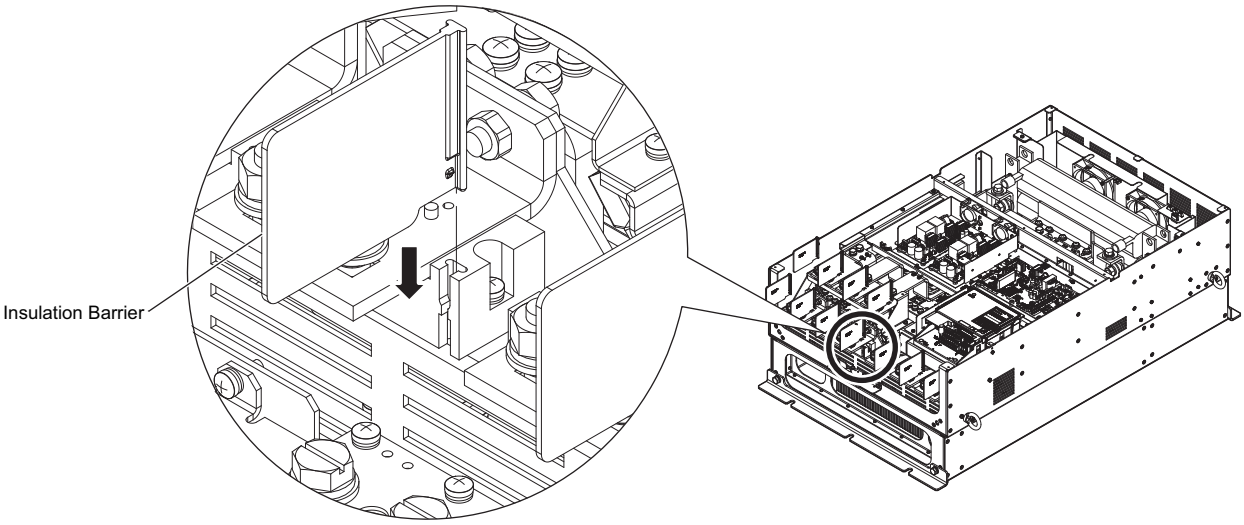


Figure 22 Installing Insulation Barriers

■ Wire Gauges and Tightening Torque

Use the tables in this section to select the appropriate wires and crimp terminals.

Gauges listed in the tables are for use in the United States.

Note: **1.** Wire gauge recommendations based on drive continuous current ratings using 75°C (167°F) 600 Vac vinyl-sheathed wire assuming ambient temperature within 40°C (104°F) and wiring distance less than 100 m (328 ft.).

2. Terminals B1, B2, -, +1, +2, and +3, are for connecting a DC link choke, braking resistor or DC power supply. Do not connect other nonspecific devices to these terminals.

- Consider the amount of voltage drop when selecting wire gauges. Increase the wire gauge when the voltage drop is greater than 2% of motor rated voltage. Ensure the wire gauge is suitable for the terminal block. Use the following formula to calculate the amount of voltage drop:
  Line drop voltage (V) = $\sqrt{3}$ × wire resistance (Ω/km) × wire length (m) × current (A) × 10^{-3}
- Refer to instruction manual TOBP C720600 0□ for braking transistor option or braking resistor option wire gauges.
- Use terminal +1 and the negative terminal when connecting a regenerative converter or a regen unit.
- Use terminal B1 and - terminals when installing the braking unit to the drives with built-in braking transistor (2A0008 to 2A0115, 4A0005 to 4A0060, and 5A0003 to 5A0041).
- ***Refer to UL Standards Compliance on page 223*** for information on UL compliance.

Yaskawa recommends using closed-loop crimp terminals on all drive models. UL/cUL approval requires the use of closed-loop crimp terminals when wiring the drive main circuit terminals on models CIMR-LU2A0085 to 2A0415 and 4A0045 to 4A0260. Use only the tools recommended by the terminal manufacturer for crimping. Refer to ***Closed-Loop Crimp Terminal Size on page 230*** for closed-loop crimp terminal recommendations.

The wire gauges listed in the following tables are Yaskawa recommendations. Refer to local codes for proper wire gauge selections.

Three-Phase 200 V Class

Table 10 Wire Gauge and Torque Specifications (Three-Phase 200 V Class)

Model CIMR-LU	Terminal	Recomm. Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
2A0008	R/L1, S/L2, T/L3	14	14 to 10	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	14	14 to 10		
	–, +1, +2	–	14 to 10		
	B1, B2	–	14 to 10		
	⏚	10 <1>	14 to 10		
2A0011	R/L1, S/L2, T/L3	12	14 to 10	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	14	14 to 10		
	–, +1, +2	–	14 to 10		
	B1, B2	–	14 to 10		
	⏚	10 <1>	14 to 10		
2A0014	R/L1, S/L2, T/L3	10	12 to 10	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	10	14 to 10		
	–, +1, +2	–	14 to 10		
	B1, B2	–	14 to 10		
	⏚	10 <1>	14 to 10		
2A0018	R/L1, S/L2, T/L3	10	18 to 10	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	10	18 to 10		
	–, +1, +2	–	12 to 10		
	B1, B2	–	14 to 10		
	⏚	10 <1>	12 to 10		
2A0025	R/L1, S/L2, T/L3	8	12 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	U/T1, V/T2, W/T3	8	12 to 6		
	–, +1, +2	–	10 to 6		
	B1, B2	–	12 to 10		
	⏚	8 <2>	10 to 8	M5	2.0 to 2.5 (17.7 to 22.1)
2A0033	R/L1, S/L2, T/L3	6	12 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	U/T1, V/T2, W/T3	8	12 to 6		
	–, +1, +2	–	6		
	B1, B2	–	12 to 10		
	⏚	8	10 to 8	M5	2.0 to 2.5 (17.7 to 22.1)
2A0047	R/L1, S/L2, T/L3	4	6 to 4	M6	5.4 to 6.0 (47.8 to 53.1)
	U/T1, V/T2, W/T3	4	6 to 4		
	–, +1, +2	–	6 to 4		
	B1, B2	–	10 to 6	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	6	8 to 6	M6	5.4 to 6.0 (47.8 to 53.1)
2A0060	R/L1, S/L2, T/L3	3	10 to 2	M8	9.9 to 11.0 (87.6 to 97.4)
	U/T1, V/T2, W/T3	3	10 to 2		
	–, +1, +2	–	4 to 3		
	B1, B2	–	8 to 6	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	6	6 to 4	M6	5.4 to 6.0 (47.8 to 53.1)

Model CIMR-LU	Terminal	Recomm. Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
2A0075	R/L1, S/L2, T/L3	2	10 to 2	M8	9.9 to 11.0 (87.6to 97.4)
	U/T1, V/T2, W/T3	2	10 to 2		
	–, +1, +2	–	3 to 2		
	B1, B2	–	6	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	6	6 to 4	M6	5.4 to 6.0 (47.8 to 53.1)
2A0085	R/L1, S/L2, T/L3	1/0	10 to 1/0	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	1/0	10 to 1/0		
	–, +1	–	2 to 1/0		
	B1, B2	–	6 to 1/0		
	⏚	6	6 to 4		
2A0115	R/L1, S/L2, T/L3	2/0	10 to 3/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	2/0	10 to 3/0		
	–, +1	–	1/0 to 3/0		
	B1, B2	–	4 to 2/0		
	⏚	4	4	M8	9 to 11 (79.7 to 97.4)
2A0145	R/L1, S/L2, T/L3	4/0	1/0 to 4/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	4/0	1/0 to 4/0		
	–, +1	–	1 to 4/0		
	+3	–	1/0 to 4/0		
	⏚	4	4 to 2		9 to 11 (79.7 to 97.4)
2A0180	R/L1, S/L2, T/L3	1/0 × 2P	1/0 to 4/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	1/0 × 2P	1/0 to 4/0		
	–, +1	–	1 to 4/0		
	+3	–	1/0 to 4/0		
	⏚	4	4 to 1/0		9 to 11 (79.7 to 97.4)
2A0215	R/L1, S/L2, T/L3	2/0 × 2P	3/0 to 300	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	2/0 × 2P	3/0 to 300		
	–, +1	–	3/0 to 300		
	+3	–	2 to 300	M10	18 to 23 (159 to 204)
	⏚	3	3 to 300	M12	32 to 40 (283 to 354)
2A0283	R/L1, S/L2, T/L3	3/0 × 2P	3/0 to 300	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	3/0 × 2P	3/0 to 300		
	–, +1	–	3/0 to 300		
	+3	–	3/0 to 300	M10	18 to 23 (159 to 204)
	⏚	2	2 to 300	M12	32 to 40 (283 to 354)
2A0346	R/L1, S/L2, T/L3	250 × 2P	4/0 to 600	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	4/0 × 2P	4/0 to 600		
	–, +1	–	250 to 600		
	+3	–	3/0 to 600	M10	18 to 23 (159 to 204)
	⏚	1	1 to 350	M12	32 to 40 (283 to 354)

Model CIMR-LU	Terminal	Recomm. Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
2A0415	R/L1, S/L2, T/L3	350 × 2P	250 to 600	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	300 × 2P	300 to 600		
	–, +1	–	300 to 600		
	+3	–	3/0 to 600	M10	18 to 23 (159 to 204)
	⏚	1	1 to 350	M12	32 to 40 (283 to 354)

<1> When using the wire of this gauge in accordance with IEC/EN 61800-5-1, install an ELCB.
<2> When using the wire of this gauge in accordance with IEC/EN 61800-5-1, install an ELCB, or use copper wire of 10 mm² (AWG 8).

Note: When connecting peripheral devices and options to the terminals –, +1, +3, B1, and B2, refer to the instruction manuals for each device. For more information, contact Yaskawa or your nearest sales representative.

Three-Phase 400 V Class

Table 11 Wire Gauge and Torque Specifications (Three-Phase 400 V Class)

Model CIMR-LU	Terminal	Recomm. Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
4A0005 4A0006 4A0007	R/L1, S/L2, T/L3	14	14 to 10	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	14	14 to 10		
	–, +1, +2	–	14 to 10		
	B1, B2	–	14 to 10		
	⏚	10 <1>	14 to 10		
4A0009	R/L1, S/L2, T/L3	12	18 to 10	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	14	18 to 10		
	–, +1, +2	–	14 to 10		
	B1, B2	–	14 to 10		
	⏚	10 <1>	14 to 10		
4A0015	R/L1, S/L2, T/L3	10	12 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	U/T1, V/T2, W/T3	10	12 to 6		
	–, +1, +2	–	12 to 6		
	B1, B2	–	12 to 10		
	⏚	10 <1>	14 to 10	M5	2.0 to 2.5 (17.7 to 22.1)
4A0018	R/L1, S/L2, T/L3	10	12 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	U/T1, V/T2, W/T3	10	12 to 6		
	–, +1, +2	–	12 to 6		
	B1, B2	–	12 to 10		
	⏚	10 <1>	12 to 10	M5	2.0 to 2.5 (17.7 to 22.1)
4A0024	R/L1, S/L2, T/L3	8	10 to 6	M5	3.6 to 4.0 (31.8 to 35.4)
	U/T1, V/T2, W/T3	8	10 to 6		
	–, +1, +2	–	10 to 6		
	B1, B2	–	10 to 8	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	8 <2>	10 to 8	M6	5.4 to 6.0 (47.8 to 53.1)
4A0031	R/L1, S/L2, T/L3	6	10 to 6	M5	3.6 to 4.0 (31.8 to 35.4)
	U/T1, V/T2, W/T3	8	10 to 6		
	–, +1, +2	–	6		
	B1, B2	–	10 to 8	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	6	10 to 6	M6	5.4 to 6.0 (47.8 to 53.1)

Model CIMR-LU	Terminal	Recomm. Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
4A0039	R/L1, S/L2, T/L3	6	6 to 4	M6	5.4 to 6.0 (47.8 to 53.1)
	U/T1, V/T2, W/T3	6	6 to 4		
	–, +1, +2	–	6 to 4		
	B1, B2	–	10 to 8	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	6	8 to 6	M6	5.4 to 6.0 (47.8 to 53.1)
4A0045	R/L1, S/L2, T/L3	4	10 to 1/0	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	4	10 to 1/0		
	–, +1	–	6 to 1		
	B1, B2	–	8 to 4		
	⏚	6	8 to 6		
4A0060	R/L1, S/L2, T/L3	3	10 to 3/0	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	3	10 to 3/0		
	–, +1	–	4 to 1		
	B1, B2	–	6 to 3		
	⏚	6	6		
4A0075	R/L1, S/L2, T/L3	2	6 to 250	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	2	6 to 250		
	–, +1	–	3 to 1/0		
	+3	–	6 to 1/0		
	⏚	4	6 to 4		
4A0091	R/L1, S/L2, T/L3	1/0	6 to 250	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	1	6 to 250		
	–, +1	–	3 to 1/0		
	+3	–	4 to 1/0		
	⏚	4	6 to 4		
4A0112	R/L1, S/L2, T/L3	3/0	1/0 to 4/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	2/0	1/0 to 4/0		
	–, +1	–	1/0 to 4/0		
	+3	–	3 to 4/0		
	⏚	4	4		
4A0150	R/L1, S/L2, T/L3	4/0	1/0 to 4/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	4/0	1/0 to 4/0		
	–, +1	–	1 to 4/0		
	+3	–	1/0 to 4/0		
	⏚	4	4 to 2		
4A0180	R/L1, S/L2, T/L3	1 × 2P	2 to 300	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	1 × 2P	2 to 300		
	–, +1	–	1 to 250		
	+3	–	3 to 3/0		
	⏚	4	4 to 300		
4A0216	R/L1, S/L2, T/L3	2/0 × 2P	1 to 600	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	2/0 × 2P	1/0 to 600		
	–, +1	–	3/0 to 600		
	+3	–	1 to 325		
	⏚	2	2 to 350		

Model CIMR-LU	Terminal	Recomm. Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
4A0260	R/L1, S/L2, T/L3	3/0 × 2P	2/0 to 600	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	3/0 × 2P	2/0 to 600		
	–, +1	–	3/0 to 600		
	+3	–	1 to 325	M10	18 to 23 (159 to 204)
	⏚	2	2 to 350	M12	32 to 40 (283 to 354)
4A0304	R/L1, S/L2, T/L3	4/0 × 2P	3/0 to 600	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	4/0 × 2P	3/0 to 600		
	–, +1	–	4/0 to 600		
	+3	–	3/0 to 600	M10	18 to 23 (159 to 204)
	⏚	1	1 to 350	M12	32 to 40 (283 to 354)
4A0370	R/L1, S/L2, T/L3	300 × 2P	4/0 to 300	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	300 × 2P	4/0 to 300		
	–, +1	–	3/0 to 300		
	+3	–	3/0 to 300		
	⏚	1	1 to 3/0		
4A0450	R/L1, S/L2, T/L3	3/0 × 4P	3/0 to 300	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	3/0 × 4P	3/0 to 300		
	–, +1	–	1/0 to 300		
	+3	–	1/0 to 300		
	⏚	1/0	1/0 to 300		
4A0605	R/L1, S/L2, T/L3	300 × 4P	4/0 to 300	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	300 × 4P	4/0 to 300		
	–, +1	–	1/0 to 300		
	+3	–	1/0 to 300		
	⏚	2/0	2/0 to 300		

<1> When using the wire of this gauge in accordance with IEC/EN 61800-5-1, install an ELCB.
<2> When using the wire of this gauge in accordance with IEC/EN 61800-5-1, install an ELCB, or use copper wire of 10 mm^2 (AWG 8).

Note: When connecting peripheral devices and options to the terminals –, +1, +3, B1, and B2, refer to the instruction manuals for each device. For more information, contact Yaskawa or your nearest sales representative.

Table 12 Wire Gauge and Torque Specifications (Three-Phase 600 V Class)

Model CIMR-LU	Terminal	Recomm. Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
5A0003 5A0004	R/L1, S/L2, T/L3	14	14 to 10	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	14	14 to 10		
	–, +1, +2	–	14 to 10		
	B1, B2	–	14 to 10		
	⏚	10	14 to 10		
5A0006	R/L1, S/L2, T/L3	14	14 to 10	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	14	14 to 10		
	–, +1, +2	–	14 to 10		
	B1, B2	–	14 to 10		
	⏚	10	12 to 10		
5A00010	R/L1, S/L2, T/L3	10	14 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	U/T1, V/T2, W/T3	14	14 to 6		
	–, +1, +2	–	14 to 6		
	B1, B2	–	14 to 10		
	⏚	8	12 to 8	M5	2.0 to 2.5 (17.7 to 22.1)
5A0013	R/L1, S/L2, T/L3	10	10 to 6	M5	3.6 to 4.0 (31.8 to 35.4)
	U/T1, V/T2, W/T3	10	10 to 6		
	–, +1, +2	–	10 to 6		
	B1, B2	–	10 to 8		2.7 to 3.0 (23.9 to 26.6)
	⏚	8	12 to 8	M6	5.4 to 6.0 (47.8 to 53.1)
5A0017	R/L1, S/L2, T/L3	8	10 to 6	M5	3.6 to 4.0 (31.8 to 35.4)
	U/T1, V/T2, W/T3	10	10 to 6		
	–, +1, +2	–	10 to 6		
	B1, B2	–	10 to 8		2.7 to 3.0 (23.9 to 26.6)
	⏚	8	10 to 8	M6	5.4 to 6.0 (47.8 to 53.1)
5A0022 5A0027	R/L1, S/L2, T/L3	6	6 to 4	M6	5.4 to 6.0 (47.8 to 53.1)
	U/T1, V/T2, W/T3	6	6 to 4		
	–, +1, +2	–	6 to 4		
	B1, B2	–	10 to 8	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	6	10 to 6	M6	5.4 to 6.0 (47.8 to 53.1)
5A0032	R/L1, S/L2, T/L3	6	10 to 3	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	6	10 to 3		
	–, +1	–	6 to 1		
	B1, B2	–	12 to 3		
	⏚	6	6		
5A0041	R/L1, S/L2, T/L3	4	10 to 3	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	6	10 to 3		
	–, +1	–	6 to 1		
	B1, B2	–	8 to 3		
	⏚	6	6		

Model CIMR-LU	Terminal	Recomm. Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
5A0052	R/L1, S/L2, T/L3	4	10 to 4/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	4	10 to 4/0		
	–, +1	–	4 to 4/0		
	+3	–	6 to 4/0		
	⏚	4	4		
5A0062	R/L1, S/L2, T/L3	3	10 to 4/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	3	10 to 4/0		
	–, +1	–	3 to 4/0		
	+3	–	6 to 4/0		
	⏚	4	4		
5A0077	R/L1, S/L2, T/L3	1/0	10 to 4/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	1	10 to 4/0		
	–, +1	–	2 to 4/0		
	+3	–	4 to 4/0		
	⏚	4	4		
5A0099	R/L1, S/L2, T/L3	2/0	1 to 300	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	2/0	1 to 300		
	–, +1	–	2/0 to 3/0		
	+3	–	1 to 1/0		
	⏚	3	4 to 300		
5A0130	R/L1, S/L2, T/L3	3/0	2/0 to 300	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	3/0	2/0 to 300		
	–, +1	–	3/0 to 4/0		
	+3	–	1/0 to 2/0		
	⏚	3	4 to 300		
5A0172	R/L1, S/L2, T/L3	300	2/0 to 600	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	250	2/0 to 600		
	–, +1	–	2/0 to 400		
	+3	–	2/0 to 250	M10	18 to 23 (159 to 204)
	⏚	1	1 to 350	M12	32 to 40 (283 to 354)
5A0200	R/L1, S/L2, T/L3	400	2/0 to 600	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	350	2/0 to 600		
	–, +1	–	2/0 to 500		
	+3	–	250 to 300	M10	18 to 23 (159 to 204)
	⏚	1	1 to 350	M12	32 to 40 (283 to 354)

■ Main Circuit Terminal and Motor Wiring

This section outlines the various steps, precautions, and checkpoints for wiring the main circuit terminals and motor terminals.

WARNING! *Electrical Shock Hazard. Before servicing, disconnect all power to the equipment and lock out the power source. Failure to comply may result in injury from electrical shock. Wait at least five minutes after all indicators are OFF and measure the DC bus voltage level and main circuit terminals to confirm the circuit is safe before wiring.*

WARNING! *Electrical Shock Hazard. Verify motor wiring bare wire ends do not contact the drive chassis or enclosure when wiring drive terminals U/T1, V/T2, W/T3. Failure to comply may result in serious injury or death due to electrical shock.*

WARNING! *Electrical Shock Hazard. Improper equipment grounding could result in death or serious injury by contacting the motor case. Always properly ground the motor-side grounding terminal.*

WARNING! *Fire Hazard. Tighten all terminal screws to the specified tightening torque. Loose electrical connections could result in death or serious injury by fire due to overheating of electrical connections. Improperly tightened terminal screws can also cause erroneous equipment operation.*

WARNING! *Fire Hazard. Do not use an improper voltage source. Failure to comply could result in death or serious injury by fire. Verify that the rated voltage of the drive matches the voltage of the incoming power supply before applying power.*

WARNING! *Do not connect the AC power line to the output motor terminals of the drive. Failure to comply could result in death or serious injury by fire as a result of drive damage from line voltage application to output terminals.*

NOTICE: *Equipment Hazard. Separate motor and/or braking circuit wiring (terminals, U/T1, V/T2, W/T3, +3, +2, +1,(-), B1, B2, from all other wiring. Place motor wiring within its own conduit or cable tray with appropriate divider, and use shielded motor cable where appropriate. Improper wiring practices could result in malfunction of drive due to electrical interference.*

NOTICE: *Equipment Hazard. Comply with proper wiring practices. The motor may run in reverse if the phase order is backward, causing incorrect elevator direction movement and injury to personnel. Connect motor input terminals U/T1, V/T2, and W/T3 to drive output terminals U/T1,V/T2, and W/T3. The phase order for the drive and motor should match.*

NOTICE: *Equipment Hazard. Improper equipment sequencing could shorten useful life of the electrolytic capacitors and circuit relays of the drive. Refrain from switching an input contactor more often than once every 30 minutes. Normally the drive I/O should be used to stop and start the motor.*

NOTICE: *Equipment Hazard. Standard motors used with PWM drives may experience winding failures due to surge voltages, when input line voltage is greater than 480 V or motor wire distance is greater than 100 meters. Select a motor design with insulation tolerant of surge voltages and drive-rated motor for use with PWM drives. Failure to comply could lead to motor winding failure.*

NOTICE: *Do not use the negative DC bus terminal "-" as a ground terminal. This terminal is at high DC voltage potential. Improper wiring connections could damage the drive.*

NOTICE: *Improper application of devices on drive output circuits can damage the drive. Do not connect unapproved LC or RC interference suppression filters, capacitors, ground fault circuits, or overvoltage protection devices to the output of the drive.*

NOTICE: *Do not connect phase-advancing capacitors or LC/RC noise filters to the output circuits. Failure to comply could result in damage to the drive, phase-advancing capacitors, LC/RC noise filters or ground fault circuit interrupters.*

NOTICE: *Properly integrate auxiliary contacts into the control logic circuit to avoid unnecessary fault displays caused by contactors or output switches placed between drive and motor. Improper installation of input and output contactors could result in damage to the drive.*

NOTICE: *Before applying power to the drive, use power-off resistance checks to check for short-circuits between (R/L1, S/L2, and T/L3) or between main circuit terminals and ground. Failure to comply may result in damage to the drive.*

Cable Length Between Drive and Motor

Voltage drop along the motor cable may cause reduced motor torque when the wiring between the drive and the motor is too long, especially at low frequency output. This can also be a problem when motors are connected in parallel with a fairly long motor cable. Drive output current will increase as the leakage current from the cable increases. An increase in leakage current may trigger an overcurrent situation and weaken the accuracy of the current detection.

Adjust the drive carrier frequency according to ***Table 13***. If the motor wiring distance exceeds 100 m (328 ft.) because of the system configuration, reduce the ground currents. ***Refer to C6: Carrier Frequency on page 171***.

NOTICE: *Equipment Hazard. Separate motor and/or braking circuit wiring (terminals, U/T1, V/T2, W/T3, +3, +2, +1,(-), B1, B2, from all other wiring. Place motor wiring within its own conduit or cable tray with appropriate divider, and use shielded motor cable where appropriate. Improper wiring practices could result in malfunction of drive due to electrical interference.*

Table 13 Cable Length Between Drive and Motor

Cable Length	50 m (164 ft.) or less	100 m (328 ft.) or less	Greater than 100 m (328 ft.)
Carrier Frequency	15 kHz or less	5 kHz or less	2 kHz or less

Note: When setting carrier frequency for drives running multiple motors, calculate cable length as the total wiring distance to all connected motors.

Ground Wiring

Follow the precautions to wire the ground for one drive or a series of drives.

WARNING! *When using an EMC filter, the leakage current exceeds 3.5 mA. Therefore, according to IEC/EN 61800-5-1, at least one of the conditions below must be satisfied:*
a) The cross-section of the protective earthing conductor must be at least 10 mm^2 (Cu) or 16 mm^2 (Al).
b) The power supply must be disconnected automatically in case of discontinuity of the protective earthing conductor.

WARNING! *Electrical Shock Hazard. Always use a ground wire that complies with technical standards on electrical equipment and local installation regulations. Minimize the length of the ground wire. Improper equipment grounding may cause dangerous electrical potentials on equipment chassis, which could result in death or serious injury.*

WARNING! *Electrical Shock Hazard. Be sure to ground the drive ground terminal (200 V class: Ground to 100 Ω or less, 400 V class: Ground to 10 Ω or less, and 600 V class: ground to 10 Ω or less). Improper equipment grounding may cause dangerous electrical potentials on equipment chassis, which could result in death or serious injury.*

NOTICE: *Do not share the ground wire with other devices such as welding machines or large-current electrical equipment. Improper equipment grounding could result in drive or equipment malfunction due to electrical interference.*

NOTICE: *When using more than one drive, ground multiple drives according to instructions. Improper equipment grounding could result in abnormal operation of drive or equipment.*

Refer to ***Figure 23*** when using multiple drives. Do not loop the ground wire.

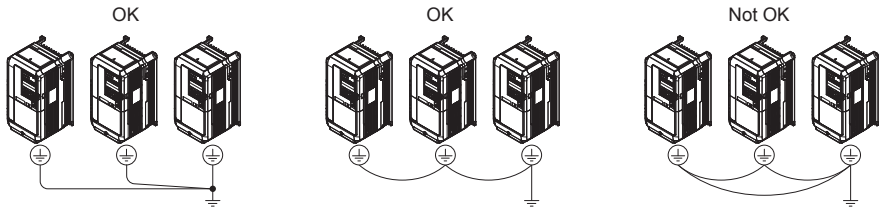


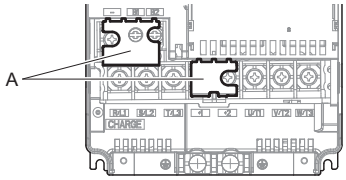
Figure 23 Multiple Drive Wiring

Wiring the Main Circuit Terminal

WARNING! *Electrical Shock Hazard. Shut off the power supply to the drive before wiring the main circuit terminals. Failure to comply may result in death or serious injury.*

Wire the main circuit terminals after the terminal board has been properly grounded.

Models CIMR-LU2A0008 to 2A0075, 4A0005 to 4A0039, and 5A0003 to 5A0027 have a cover placed over the DC bus and braking circuit terminals prior to shipment to help prevent miswiring. Use wire cutters to cut away covers as needed for terminals.



A – Protecting Cover

Figure 24 Protecting Cover to Prevent Miswiring (CIMR-LU2A0047)

Main Circuit Connection Diagram

Refer to on page 28 when wiring terminals on the main power circuit of the drive.

WARNING! *Fire Hazard. The braking resistor connection terminals are B1 and B2. Do not connect braking resistors to any other terminals. Improper wiring connections could cause the braking resistor to overheat and cause death or serious injury by fire. Failure to comply may result in damage to the braking circuit or drive.*

Refer to Standard Connection Diagram on page 25 when wiring the drive control circuit terminals.

■ Control Circuit Terminal Block Functions

Drive parameters determine which functions apply to the multi-function digital inputs (S3 to S8), multi-function digital outputs (M1 to M6), multi-function photocoupler outputs (P1-C1, P2-C2), multi-function analog inputs (A1, A2), and multi-function analog monitor output (FM, AM). The default setting is listed next to each terminal in *Figure 8* on page *26*.

NOTICE: *Equipment Hazard. Improper equipment sequencing could shorten useful life of the electrolytic capacitors and circuit relays of the drive. Refrain from switching an input contactor more often than once every 30 minutes. Normally the drive I/O should be used to stop and start the motor.*

WARNING! *Sudden Movement Hazard. Always check the operation and wiring of control circuits after being wired. Operating a drive with untested control circuits could result in death or serious injury.*

WARNING! *Sudden Movement Hazard. Confirm the drive I/O signals and external sequence before starting test run. Failure to comply may result in death or serious injury.*

NOTICE: *Frequently switching the drive power supply to stop and start the motor can damage the drive.*

NOTICE: *To get the full performance life out of the electrolytic capacitors and circuit relays, refrain from switching the drive power supply off and on more than once every 30 minutes. Frequent use can damage the drive. Use the drive to stop and start the motor.*

Note: Do not solder the ends of wire connections to the drive. Soldered wiring connections can loosen over time. Improper wiring practices could result in drive malfunction due to loose terminal connections.

Input Terminals

Table 14 lists the input terminals on the drive. Text in parenthesis indicates the default setting for each multi-function input.

Table 14 Control Circuit Input Terminals

Type	No.	Terminal Name (Function)	Function (Signal Level) Default Setting	Page
Digital Inputs	S1	Up Command (Closed: Up, Open: Stop)	Photocoupler 24 Vdc, 8 mA Use the wire link between terminals SC and SN or between SC and SP to select sinking or sourcing, and to select the power supply.	*182*
	S2	Down Command (Closed: Down, Open: Stop)		
	S3	Multi-function input 1 (External Fault)		
	S4	Multi-function input 2 (Fault Reset)		
	S5	Multi-function input 3 (Multi-Step Speed Reference 1)		
	S6	Multi-function input 4 (Multi-Step Speed Reference 2)		
	S7	Multi-function input 5 (Multi-Step Speed Reference 3)		
	S8	Multi-function input 6 (Not used)		
Digital Input Power Supply	SC	Multi-function input common	24 Vdc, 150 mA (only when DI-A3 is not used) Use the wire jumper between terminals SC and SN or between SC and SP to select sinking or sourcing, and to select the power supply.	*53*
	SN	0 V		
	SP	+24 Vdc		
Safe Disable Inputs <1>	H1	Safe Disable input 1 <2>	24 Vdc, 8 mA One or both open: Drive output disabled Both closed: Normal operation Internal impedance: 3.3 kΩ Off time of at least 1 ms Set the S3 jumper to select sinking or sourcing, and to select the power supply.	*236*
	H2	Safe Disable input 2 <2>		
	HC	Safe Disable function common	Common for the Safe Disable function	
Analog Inputs	+V	Power supply for analog inputs	10.5 Vdc (max allowable current 20 mA)	*233*
	-V	Power supply for analog inputs	-10.5 Vdc (max allowable current 20 mA)	–
	A1	Multi-function analog input 1 (Speed reference bias)	-10 to 10 Vdc, 0 to 10 Vdc (input impedance: 20 kΩ)	–
	A2	Multi-function analog input 2 (Not used)	-10 to 10 Vdc, 0 to 10 Vdc (input impedance: 20 kΩ)	–
	AC	Analog input common	0 V	–
	E (G)	Ground for shielded lines and option cards	–	–

<1> Setting jumper S3 for an external power supply makes the wire jumper between terminals H1, H2, and HC ineffective. Remove the wire jumper and connect an external power supply that can supply terminals H1, H2, and HC continuously.
<2> Terminals H1, H2, DM+, and DM- on 600 V class models are designed to the functionality, but are not certified to IEC/EN 61800-5-1,ISO/EN 13849 Cat.3, IEC/EN 61508 SIL2, Insulation coordination: class 1.

Output Terminals

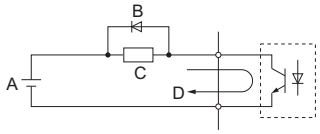
Table 15 lists the output terminals on the drive. Text in parenthesis indicates the default setting for each multi-function output.

Note: Multi-function relay output terminals are rated at a minimum of 10 mA. If less than 10 mA is required, use the photocoupler outputs (P1-C1, P2-C2). Using the wrong current output level may cause the output to malfunction when the terminal is activated.

Table 15 Control Circuit Output Terminals

Type	No.	Terminal Name (Function)	Function (Signal Level) Default Setting
Fault Relay	MA	N.O.	30 Vdc, 10 mA to 1 A; 250 Vac, 10 mA to 1 A Minimum load: 5 Vdc, 10 mA
	MB	N.C. output	
	MC	Fault output common	
Multi-Function Relay Output <1>	M1	Multi-function relay output 1 (Brake release command)	Contact relay output 30 Vdc, 10 mA to 1 A 250 Vac, 10 mA to 1 A Minimum load: 5 Vdc, 10 mA
	M2		
	M3	Multi-function relay output 2 (Output contactor close command)	
	M4		
	M5	Multi-function relay output 3 (Drive ready)	
	M6		
Multi-Function Photocoupler Output	P1	Photocoupler output 1 (During Frequency output)	48 Vdc, 2 to 50 mA <2>
	C1		
	P2	Photocoupler output 2 (Not Used/Through Mode)	
	C2		
Monitor Output	FM	Analog monitor output 1 (Output speed)	-10 to +10 Vdc or 0 to +10 Vdc
	AM	Analog monitor output 2 (Output current)	
	AC	Monitor common	0 V
Safety Monitor Output <3>	DM+	Safety monitor output	Outputs status of Safe Disable function. Closed when both Safe Disable channels are closed. Up to +48 Vdc 50 mA
	DM-	Safety monitor output common	

<1> Refrain from assigning functions to terminals M1 thru M6 that involve frequent switching, as doing so may shorten relay performance life. Switching life is estimated at 200,000 times (assumes 1 A, resistive load).
<2> Connect a suppression diode as shown in *Figure 25* when driving a reactive load such as a relay coil. Make sure the diode rating is greater than the circuit voltage.
<3> Terminals H1, H2, DM+, and DM- on 600 V class models are designed to the functionality, but are not certified to IEC/EN 61800-5-1,ISO/EN 13849 Cat.3, IEC/EN 61508 SIL2, Insulation coordination: class 1.



A – External power, 48 V max. **C – Coil**
B – Suppression diode **D – 50 mA or less**

Figure 25 Connecting a Suppression Diode

Serial Communication Terminals

Table 16 Control Circuit Terminals: Serial Communications

Type	No.	Signal Name	Function (Signal Level)	
MEMOBUS/Modbus Communication <1>	R+	Communications input (+)	MEMOBUS/Modbus communication: Use an RS-485 or RS-422 cable to connect the drive.	RS-485/422 MEMOBUS/Modbus communication protocol 115.2 kbps (max.)
	R-	Communications input (-)		
	S+	Communications output (+)		
	S-	Communications output (-)		
	IG	Shield ground	0 V	

<1> Enable the termination resistor in the last drive in a MEMOBUS network by setting DIP switch S2 to the ON position.

■ Terminal Configuration

Control circuit terminals are arranged as shown in ***Figure 26***.

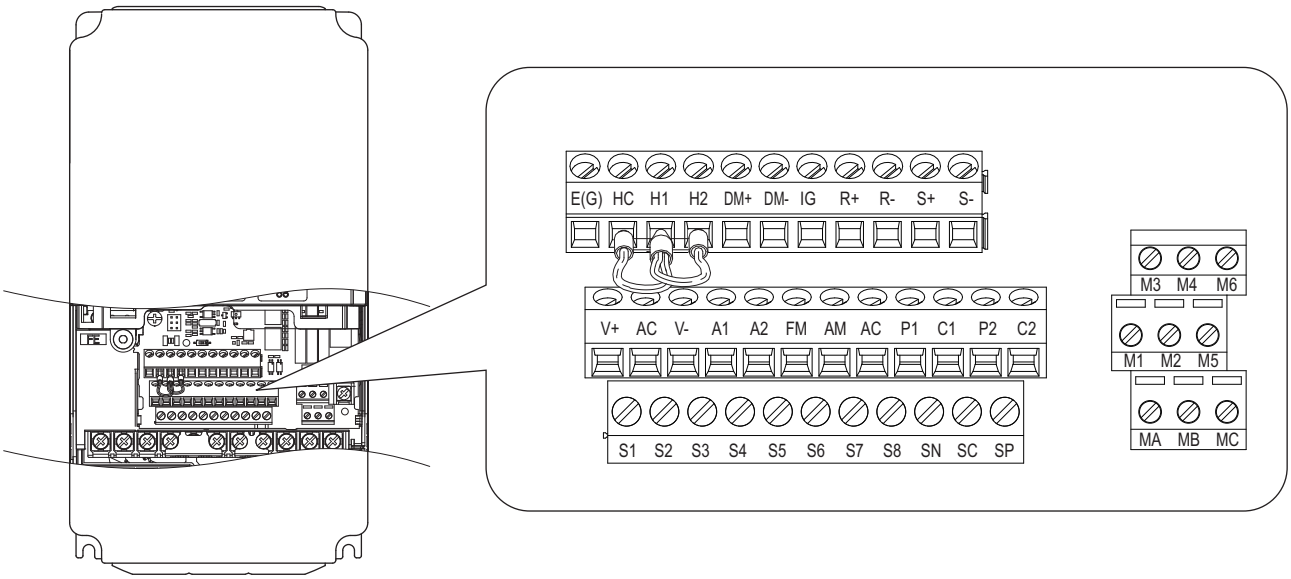


Figure 26 Control Circuit Terminal Arrangement

Wire Size and Torque Specifications

WARNING! *Fire hazard. Tighten all terminal screws to the specified tightening torque. Loose electrical connections could result in death or serious injury by fire due to overheating of electrical connections. Improperly tightened terminal screws can also cause erroneous equipment operation.*

Select appropriate wire type and gauges from ***Table 17***. For simpler and more reliable wiring, use crimp ferrules on the wire ends. Refer to ***Table 18*** for ferrule terminal types and sizes.

Table 17 Wire Gauges and Torque Specifications

Terminal Block	Terminal	Size	Tightening Torque N·m (lb.in.)	Bare Wire Terminal		Ferrule-Type Terminal		
				Applicable Wire Size mm^2 (AWG)	Recomm. mm^2 (AWG)	Applicable Wire Size mm^2 (AWG)	Recomm. mm^2 (AWG)	Wire Type
TB1, TB2, TB4, TB5, TB6	FM, AC, AM, P1, P2, PC, SC, A1, A2, A3, +V, -V, S1-S8, MA, MB, MC, M1, M2, HC, H1, H2, DM+, DM-, IG, R+, R-, S+, S-, RP, MP, E (G)	M2	0.22 to 0.25 (1.9 to 2.2)	Standard wire: 0.25 to 1.0 (24 to 17) Solid wire: 0.25 to 1.5 (24 to 16)	0.75 (18)	0.25 to 0.5 (24 to 20)	0.5 (20)	Shielded wire, etc.

Ferrule-Type Wire Terminals

Yaskawa recommends using CRIMPFOX 6, a crimping tool manufactured by PHOENIX CONTACT, to prepare wire ends with insulated sleeves before connecting to the drive. Refer to ***Table 18*** for dimensions.

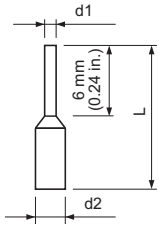


Figure 27 Ferrule Dimensions

Table 18 Ferrule Terminal Types and Sizes

Size mm² (AWG)	Type	Lmm (in)	d1 mm (in)	d2 mm (in)	Manufacturer
0.25 (24)	AI 0.25-6YE	10.5 (0.41)	0.8 (0.03)	2 (0.08)	PHOENIX CONTACT
0.34 (22)	AI 0.34-6TQ	10.5 (0.41)	0.8 (0.03)	2 (0.08)	
0.5 (20)	AI 0.5-6WH	14 (0.55)	1.1 (0.04)	2.5 (0.10)	

■ Wiring the Control Circuit Terminal

This section describes the proper procedures and preparations for wiring the control terminals.

WARNING! *Sudden Movement Hazard. Operating a drive with untested emergency circuits could result in death or serious injury. Verify all drive fast stop circuit wiring and any additional emergency circuits before operating the drive.*

WARNING! *Fire hazard. Tighten all terminal screws to the specified tightening torque. Loose electrical connections could result in death or serious injury by fire due to overheating of electrical connections.*

WARNING! *Electrical Shock Hazard. Do not remove covers or touch the circuit boards while the power is on. Failure to comply could result in death or serious injury.*

WARNING! *Electrical Shock Hazard. Before servicing, disconnect all power to the equipment and lock out the power source. Failure to comply may result in injury from electrical shock. Wait at least five minutes after all indicators are OFF and measure the DC bus voltage level and main circuit terminals to confirm the circuit is safe before wiring.*

WARNING! *Sudden Movement and Hazard. Install additional emergency circuits separately from the drive fast stop circuits. Failure to comply may result in personal injury.*

NOTICE: *Equipment Hazard. Do not connect control circuit ground terminals to the drive enclosure. Improper drive grounding can cause control circuit malfunction.*

NOTICE: *Equipment Hazard. Insulate shields with heat shrink tubing or tape to prevent contact with other signal lines and equipment. Improper wiring practices could result in drive or equipment malfunction due to short circuit.*

NOTICE: *Equipment Hazard. Use twisted-pair or shielded twisted-pair cables for control circuits. Improper wiring practices could result in drive or equipment malfunction or nuisance trips.*

NOTICE: *Connect the shield of shielded cable to the appropriate ground terminal. Improper equipment grounding could result in drive or equipment malfunction or nuisance trips.*

NOTICE: *Separate wiring for output terminals MA, MB, MC, M1 and M2 from wiring to other control circuit lines. Improper wiring practices could result in drive or equipment malfunction or nuisance trips.*

NOTICE: *Separate control circuit wiring from main circuit wiring (terminals R/L1, S/L2, T/L3, B1, B2, U/T1, V/T2, W/T3, -, +1, +2) and other high-power lines. Improper wiring practices could result in drive malfunction due to electrical interference.*

NOTICE: *Use a class 2 power supply (UL standard) when connecting to the control terminals. Improper application of peripheral devices could result in drive performance degradation due to improper power supply.*

NOTICE: *Do not exceed 50 meters (164 feet) for the control line between the drive and the operator when using an analog signal from a remote source to supply the frequency reference. Failure to comply could result in poor system performance.*

NOTICE: *Do not use unshielded cable for control wiring. Failure to comply may cause electrical interference resulting in poor system performance. Use shielded, twisted-pair wires, and ground the shield to the ground terminal of the drive.*

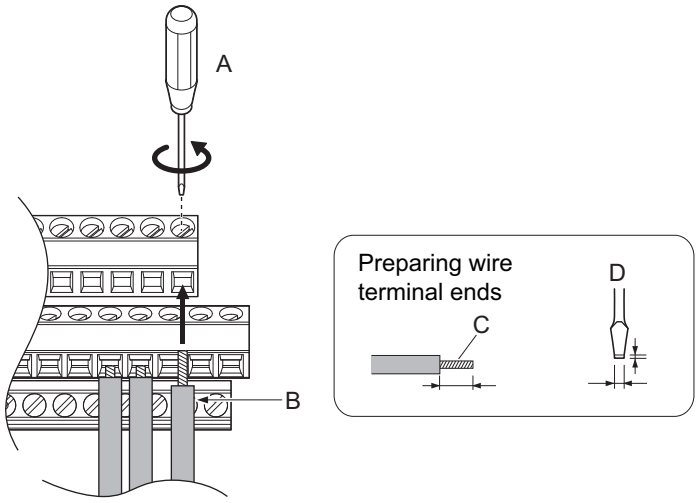
NOTICE: *Insulate shields with tape or shrink tubing to prevent contact with other signal lines and equipment. Improper wiring practices could result in drive or equipment malfunction due to short circuit.*

Wire the control circuit only after terminals have been properly grounded and main circuit wiring is complete. Refer to ***Figure 28*** for details. Prepare the ends of the control circuit wiring as shown in ***Figure 29***. Refer to ***Wire Size and Torque Specifications on page 49***.

WARNING! *Do not tighten screws beyond the specified tightening torque. Failure to comply may result in erroneous operation, damage the terminal block, or cause injury due to fire from overheating of loose electrical connections.*

NOTICE: *Use shielded twisted-pair cables as indicated to prevent operating faults. Improper wiring practices could result in drive or equipment malfunction due to electrical interference.*

Connect control wires as shown in ***Figure 28***.



A – Loosen screw to insert wire

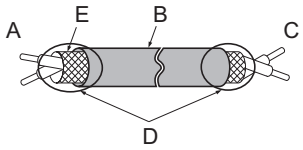
B – Single wire or stranded wire

C – Avoid fraying wire strands when stripping insulation from wire. Strip length 5.5 mm (0.22 in.)

D – Blade depth of 0.4 mm (0.02 in.) or less Blade width of 2.5 mm (0.10 in.) or less

Figure 28 Terminal Board Wiring Guide

When connecting control wires to the terminals, use shielded twisted-pair wires (treating wire ends as shown in ***Figure 29*** and connect the shield to the ground terminal (E [G]) of the drive.



A – Drive side

B – Insulation

C – Control device side

D – Shield sheath (insulate with tape or heat-shrink tubing)

E – Shield

Figure 29 Preparing the Ends of Shielded Cables

NOTICE: *Do not exceed 50 meters (164 ft.) for the control line between the drive and the operator when using an analog signal from a remote source to supply the frequency reference. Failure to comply could result in poor system performance.*

■ Switches and Jumpers on the Terminal Board

The terminal board is equipped with several switches used to adapt the drive I/Os to the external control signals. *Figure 30* shows the location of these switches. Refer to *Control I/O Configuration on page 53* for setting instructions.

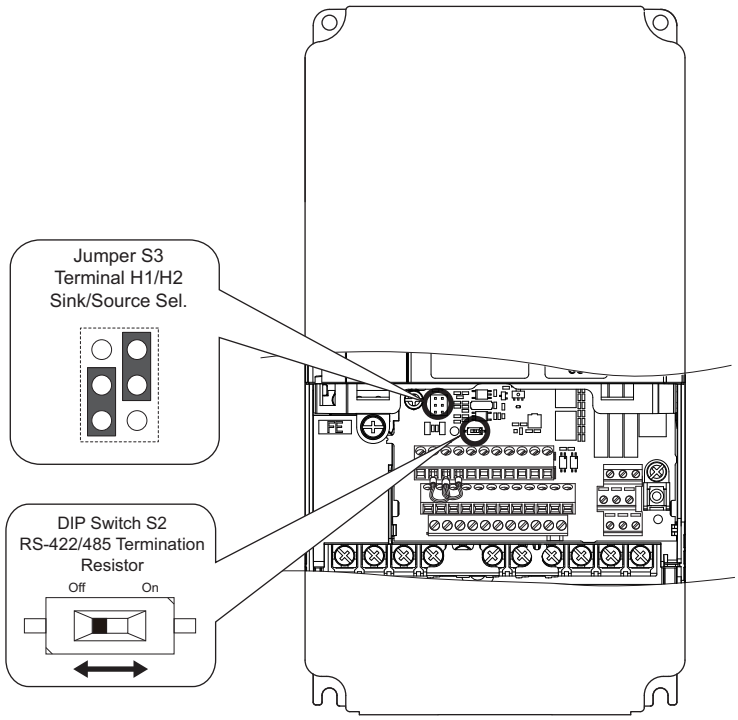


Figure 30 Locations of Jumpers and Switches on the Terminal Board

◆ Control I/O Configuration

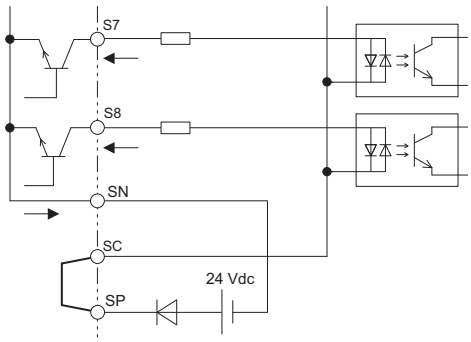
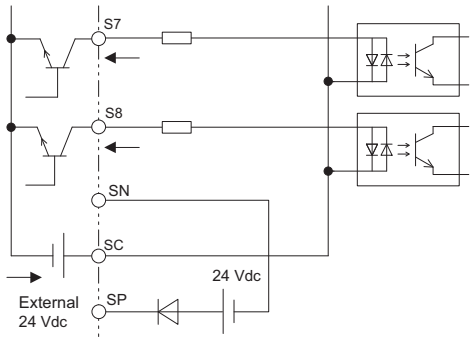
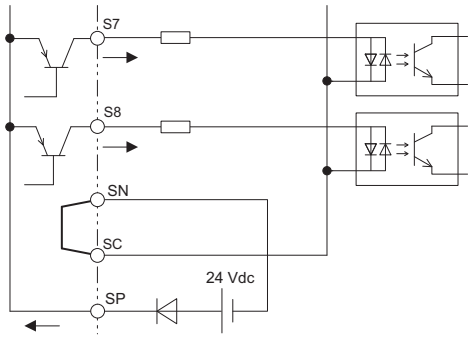
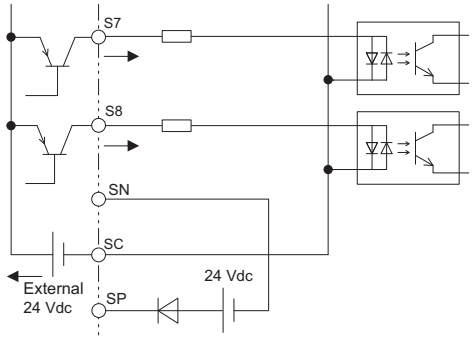
■ Setting Sink/Source with Input Terminals SN and SP

Note: Terminals H1, H2, DM+, and DM- on 600 V class models are designed to the functionality, but are not certified to IEC/EN 61800-5-1, ISO/EN 13849 Cat.3, IEC/EN 61508 SIL2, Insulation coordination: class 1.

Use the wire jumper between terminals SC and SP or SC and SN to select between Sink mode, Source mode or external power supply for the digital inputs S1 to S8 as shown in ***Table 19*** (Default: Sink mode, internal power supply).

NOTICE: *Damage to Equipment. Do not short terminals SP and SN. Failure to comply will damage the drive.*

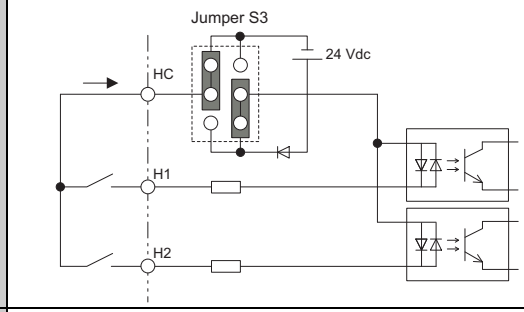
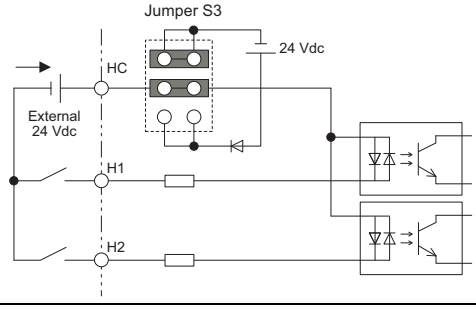
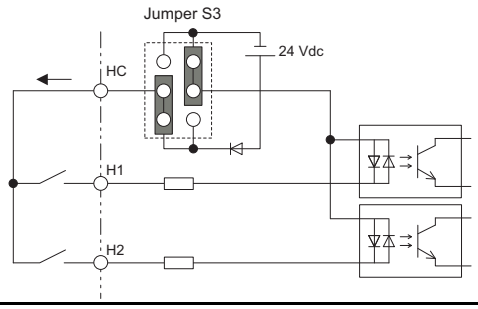
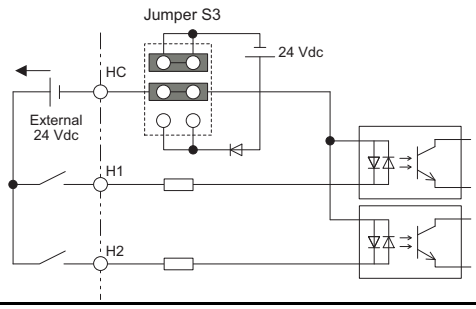
Table 19 Digital Input Sink / Source / External Power Supply Selection

	Drive Internal Power Supply (Terminal SN and SP)	External 24 Vdc Power Supply
Sinking Mode (NPN)		
Sourcing Mode (PNP)		

■ Sinking/Sourcing Mode Selection for Safe Disable Inputs

Use jumper S3 on the terminal board to select between Sink mode, Source mode or external power supply for the Safe Disable inputs H1 and H2 as shown in *Table 20* (Default: Sink mode, internal power supply).

Table 20 Safe Disable Input Sink / Source / External Power Supply Selection

	Drive Internal Power Supply	External 24 Vdc Power Supply
Sinking Mode		
Sourcing Mode		

◆ Connect to a PC

This drive is equipped with a USB port (type-B).

The drive can connect to a USB port on a PC using a USB 2.0, AB-type cable (sold separately). After connecting the drive to a PC, Yaskawa DriveWizard Plus software can be used to monitor drive performance and manage parameter settings. Contact Yaskawa for more information on DriveWizard Plus.

Download and install the USB driver before connecting L1000A to a PC with the USB cable.
To obtain the driver and software of USB Copy Unit, CopyUnitManager and DriveWizardPlus, access these sites:
U.S.A: http://www.yaskawa.com

Other areas: contact a Yaskawa representative.

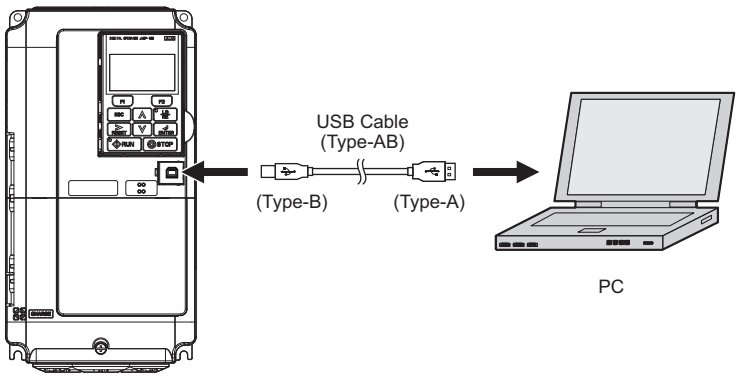


Figure 31 Connecting to a PC (USB)

◆ Wiring Checklist

☑	No.	Item	Page
		Drive, peripherals, option cards	
☐	1	Check drive model number to ensure receipt of correct model.	–
☐	2	Make sure you have the correct braking resistors, DC link choke, noise filters, and other peripheral devices installed.	–
☐	3	Check the option card model number.	–
		Installation area and physical setup	
☐	4	Ensure that the area surrounding the drive complies with specifications.	*17*
		Power supply voltage, output voltage	
☐	5	The voltage from the power supply should be within the input voltage specification range of the drive.	–
☐	6	The voltage rating for the motor should match the drive output specifications.	*15* *204*
☐	7	Verify that the drive is properly sized to run the motor.	*15* *204*
		Main circuit wiring	
☐	8	Confirm proper branch circuit protection as specified by national and local codes.	*25*
☐	9	Properly wire the power supply to drive terminals R/L1, S/L2, and T/L3.	*28*
☐	10	Properly wire the drive and motor together. The motor lines and drive output terminals R/T1, V/T2, and W/T3 should match in order to produce the desired phase order. If the phase order is incorrect, the drive will rotate in the opposite direction.	*44*
☐	11	Use 600 Vac vinyl-sheathed wire for the power supply and motor lines.	*36*
☐	12	Use the correct wire gauges for the main circuit. *Refer to Wire Gauges and Tightening Torque on page 36*. • Consider the amount of voltage drop when selecting wire gauges. Increase the wire gauge when the voltage drop is greater than 2% of motor rated voltage. Ensure the wire gauge is suitable for the terminal block. Use the following formula to calculate the amount of voltage drop: Line drop voltage (V) = 3 × wire resistance (Ω/km) × wire length (m) × current (A) × 10^{-3} • If the cable between the drive and motor exceeds 50 m (164 feet), adjust the carrier frequency set to C6-02 accordingly.	*36* *36* *45*
☐	13	Properly ground the drive. Review page *45*.	*45*
☐	14	Tightly fasten all terminal screws (control circuit terminals, grounding terminals). *Refer to Wire Gauges and Tightening Torque on page 36*.	*36*
☐	15	Install a magnetic contactor when using a dynamic braking option. Properly install the resistor and ensure that overload protection shuts off the power supply using the magnetic contactor.	–
☐	16	Verify phase advancing capacitors, input noise filters, or ground fault circuit interrupters are NOT installed on the output side of the drive.	–
		Control circuit wiring	
☐	17	Use twisted-pair line for all drive control circuit wiring.	*46*
☐	18	Connect the shields of shielded wiring to the ground terminal (E [G]).	*50*
☐	19	Properly wire any option cards.	*49*
☐	20	Check for any other wiring mistakes. Only use a multimeter to check wiring.	–
☐	21	Properly fasten the control circuit terminal screws in the drive. *Refer to Wire Gauges and Tightening Torque on page 36*.	*36*
☐	22	Pick up all wire clippings.	–
☐	23	Ensure that no frayed wires on the terminal block are touching other terminals or connections.	–
☐	24	Properly separate control circuit wiring and main circuit wiring.	–
☐	25	Analog signal line wiring should not exceed 50 m (164 ft.).	–
☐	26	Safe Disable input wiring should not exceed 30 m (98 ft.).	–

4 Start-Up Programming & Operation

◆ Using the Digital Operator

Use the digital operator to enter Run and Stop commands, edit parameters, and display data including fault and alarm information.

■ Keys and Displays

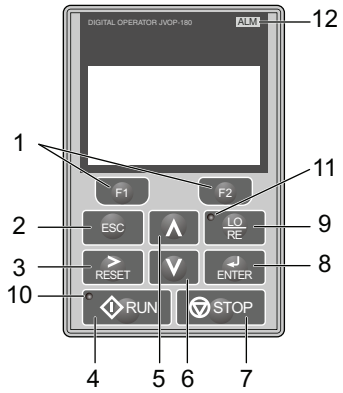


Figure 32 Keys and Displays on the Digital Operator

No.	Display	Name	Function
1	F1 F2	Function Key (F1, F2)	The functions assigned to F1 and F2 vary depending on the currently displayed menu. The name of each function appears in the lower half of the display window.
2	ESC	ESC Key	• Returns to the previous display. • Moves the cursor one space to the left. • Pressing and holding this button will return to the Speed Reference display.
3	RESET	RESET Key	• Moves the cursor to the right. • Resets the drive to clear a fault situation.
4	RUN	RUN Key	Starts the drive in the LOCAL mode. The Run LED • is on, when the drive is operating the motor. • flashes during deceleration to stop or when the speed reference is 0. • flashes quickly, the drive is disabled by a DI, the drive was stopped using a fast stop DI, or an Up/Down command was active during power up.
5		Up Arrow Key	Scrolls up to display the next item, select parameter numbers, and increment setting values.
6		Down Arrow Key	Scrolls down to display the previous item, select parameter numbers, and decrements setting values.
7	STOP	STOP Key <1>	Stops drive operation.
8	ENTER	ENTER Key	• Enters parameter values and settings. • Selects a menu item to move between displays.
9	LO RE	LO/RE Selection Key <2>	Switches drive control between the operator (LOCAL) and the control circuit terminals (REMOTE) for the Run command and speed reference. The LED is on when the drive is in the LOCAL mode (operation from keypad).
10	RUN	RUN Light	Lit while the drive is operating the motor. Refer to page *59* for details.
11	LO RE	LO/RE Light	Lit while the operator is selected to run the drive (LOCAL mode). Refer to page *59* for details.

No.	Display	Name	Function
12	ALM	ALM LED Light	*Refer to ALARM (ALM) LED Displays on page 59*.

<1> The STOP key has highest priority. Pressing the STOP key will always cause the drive to stop the motor, even if an Up/Down command is active at any external Up/Down command source. To disable the STOP key priority, set parameter o2-02 to 0.
<2> The LO/RE key can only switch between LOCAL and REMOTE when the drive is stopped. By default settings the LO/RE key function is disabled. To allow using the LO/RE key for switching between LOCAL and REMOTE, set parameter o2-01 to 1.

■ LCD Display

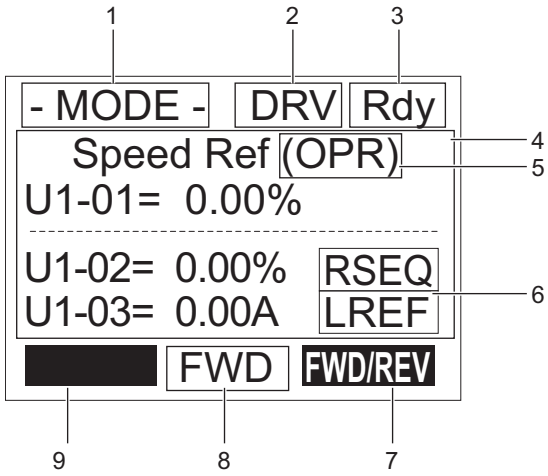


Figure 33 LCD Display

Table 21 Display and Contents

No.	Name	Display	Content
1	Operation Mode Menus	MODE	Displayed when in Mode Selection.
		MONITR	Displayed when in Monitor Mode.
		VERIFY	Indicates the Verify Menu.
		PRMSET	Displayed when in Parameter Setting Mode.
		A.TUNE	Displayed during Auto-Tuning.
		SETUP	Displayed when in Setup Mode.
2	Mode Display Area	DRV	Displayed when in Drive Mode.
		PRG	Displayed when in Programming Mode.
3	Ready	Rdy	Indicates the drive is ready to run.
4	Data Display	–	Displays specific data and operation data.
5	Speed Reference Source Assignment <1>	OPR	Displayed when the speed reference source is assigned to the LCD Operator.
		COM	Displayed when the speed reference source is assigned to MEMOBUS/Modbus Communication.
		OP	Displayed when the speed reference is assigned to an option card.
6	LO/RE Display <2>	RSEQ	Displayed when the Up/Down command is supplied from a remote source.
		LSEQ	Displayed when the Up/Down command is supplied from the operator keypad.
		RREF	Displayed when the speed reference is supplied from a remote source.
		LREF	Displayed when the speed reference is supplied from the operator keypad.
7	Function Key 1 (F1)	HELP	Pressing F1 displays the Help menu.
		←	Pressing F1 scrolls the cursor to the left.
		HOME	Pressing F1 returns to the top menu (Speed Reference).
		ESC	Pressing F1 returns to the previous display.
8	FWD/REV	FWD	During Up command
		REV	During Down command

No.	Name	Display	Content
9	Function Key 2 (F2)	FWD/REV	Pressing F1 switches between Up and Down when the Up/Down command is set from the digital operator.
		DATA	Pressing F1 scrolls to the next display.
		→	Pressing F1 scrolls the cursor to the right.
		RESET	Pressing F1 resets the existing drive fault or error.

<1> Displayed when in Drive Mode.
<2> Displayed when in Drive Mode and Monitor Mode.

■ Powering Up the Drive and Operation Status Display

Powering Up the Drive

Perform the following power-off checks before applying main power to the drive.

WARNING! *Electrical Shock Hazard. Do not contact live electrical parts. Failure to comply could result in death or serious injury. Never touch the output terminals directly with your hands or allow the output lines to come into contact with the drive case.*

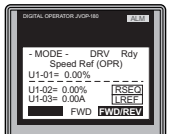
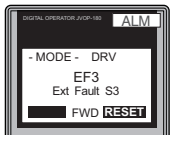
WARNING! *Sudden Movement Hazard. Operating a drive with untested emergency circuits could result in death or serious injury. Always check the operation of drive fast stop circuits and any additional emergency circuits after they are wired. Fast stop circuits are required to provide safe and quick shutdown of the drive.*

WARNING! *Sudden Movement Hazard. Ensure start/stop and safety circuits are wired properly and in the correct state before energizing the drive. Failure to comply could result in death or serious injury from moving equipment.*

Power-off Checks	Description
Power supply voltage	Ensure the power supply voltage is correct on the supply side of the disconnect, before applying power to the drive. 200 V class: 3-phase 200 to 240 Vac 50/60 Hz 400 V class: 3-phase 380 to 480 Vac 50/60 Hz 600 V Class: 3-phase 500 to 600 Vac 50/60 Hz
	Properly wire the power supply input terminals (R/L1, S/L2, T/L3). Check for correct wiring, terminals are tightened, and there are no loose wire strands.
	Check for proper grounding of drive and motor.
Drive output terminals and motor terminals	Properly wire drive output terminals U/T1, V/T2, and W/T3 with motor terminals U/T1, V/T2, and W/T3. Check for correct wiring, terminals are tightened, and there are no loose wire strands.
Control circuit terminals	Check control circuit terminal connections. Check that control circuit terminals are correctly wired, terminals are tightened, and there are no loose wire strands.
Drive control terminal status	Open all control circuits to the drive I/O terminal block.

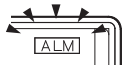
Status Display

When the power supply to the drive is turned on, the digital operator lights will appear as follows:

No.	Name	Description
Normal Operation		The data display area in the upper half of the display, displays the speed reference. DRV is displayed.
Fault	 External fault (example)	Data displayed varies by the type of fault. Refer to *Fault Displays, Causes, and Possible Solutions on page 130* for more information and possible solutions. ALM LED is lit and DRV displayed.

■ ALARM (ALM) LED Displays

Table 22 ALARM (ALM) LED Status and Contents

State	Content	Display
Illuminated	When the drive detects an alarm or error.	
Flashing	• When an alarm occurs. • When oPE is detected. • When a fault or error occurs during Auto-Tuning.	
Off	Normal operation (no fault or alarm).	

■ LO/RE LED and RUN LED Indications

Table 23 LO/RE LED and RUN LED Indications

LED	Lit	Flashing	Flashing Quickly	Off
	When source of the Up/Down command is assigned to the digital operator (LOCAL).	–	–	Up/Down command to be given from a device other than the digital operator (REMOTE).
	During run	• During deceleration to stop. • When an Up/Down command is input and speed reference is 0%.	• While the drive is set for LOCAL, an Up/Down command was entered to the input terminals after which the drive was then switched to REMOTE. • An Up/Down command was entered via the input terminals while not in the Drive Mode. • During deceleration when a Fast Stop command was entered. • The drive output is shut off by the Safe Disable function. • While the drive was running in the REMOTE mode, the STOP key was pushed.	During stop
Examples				

■ Menu Structure for Digital Operator

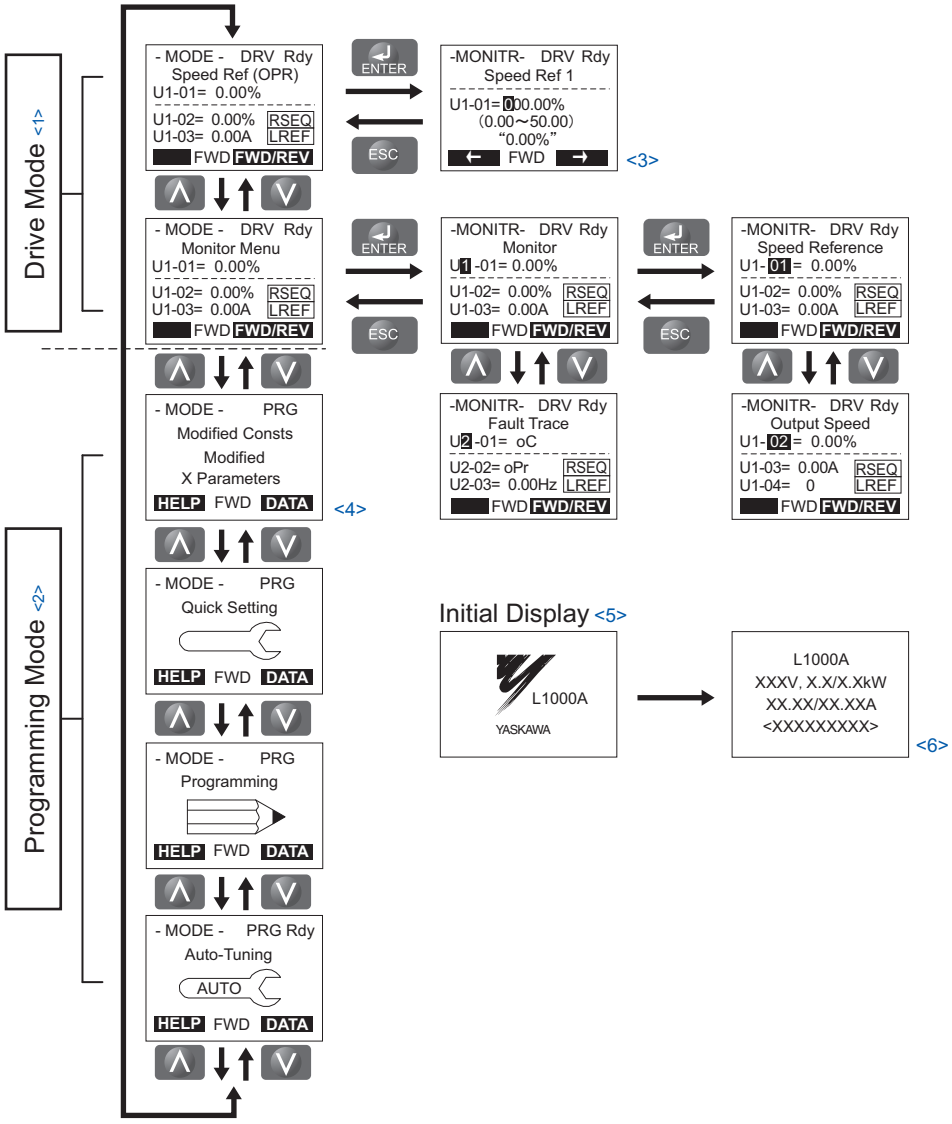


Figure 34 Digital Operator Menu and Screen Structure

<1> Pressing RUN will start the motor.

<2> Drive cannot operate the motor.

<3> Flashing characters are shown as 0.

<4> An "X" character is used as a placeholder for illustration purposes in this manual. The LCD Operator will display the actual setting values.

<5> The Speed Reference appears after the initial display which shows the product name.

<6> The information that appears on the display will vary depending on the drive.

◆ The Drive and Programming Modes

The drive has a Drive Mode to operate the motor and a Programming Mode to edit parameter settings.

Drive Mode: In Drive Mode the user can operate the motor and observe U Monitor parameters. Parameter settings cannot be edited or changed when in Drive Mode.

Programming Mode: In Programming Mode the user can edit and verify parameter settings and perform Auto-Tuning. The drive will not accept an Up/down command when the digital operator is in the Programming Mode unless parameter b1-08 is set to 1 to allow an Up/down command.

■ Changing Parameter Settings or Values

This example explains changing C1-02 (Deceleration Ramp 1) from 1.50 seconds (default) to 2.50 seconds.

Step			Display/Result
1.	Turn on the power to the drive. The initial display appears.	→	- MODE - DRV Rdy Speed Ref (OPR) U1-01= 0.00% U1-02= 0.00% RSEQ U1-03= 0.00A LREF FWD FWD/REV
2.	Press ∧ or ∨ until the Parameter Setting Mode screen appears.	→	- MODE - PRG Programming HELP FWD DATA
3.	Press ENTER to enter the parameter menu tree.	→	-PRMSET- PRG Initialization A1-00= 0 Select Language ← FWD →
4.	Press ∧ or ∨ to select the C parameter group.	→	-PRMSET- PRG Basic Setup C1-01 = 1.50 sec Accel Ramp 1 ← FWD →
5.	Press ENTER two times.	→	-PRMSET- PRG Accel/Decel C1-01= 1.50 sec Accel Ramp 1 ← FWD → → -PRMSET- PRG Accel Ramp 1 C1-01= 1.50 sec (0.0~600.00) "1.50 sec" ← FWD →
6.	Press ∧ or ∨ to select the parameter C1-02.	→	-PRMSET- PRG Decel Ramp 1 C1-02= 1.50 sec (0.0~600.00) "1.50 sec" ← FWD →
7.	Press ENTER to view the current setting value (1.5 s). The left most digit flashes.	→	-PRMSET- PRG Decel Ramp 1 C1-02= 01.50 sec (0.0~600.00) "1.50 sec" ← FWD →
8.	Press F1 (left), F2 (right) or RESET until the desired number is selected. "1" flashes.	→	-PRMSET- PRG Decel Ramp 1 C1-02=001.50 sec (0.0~600.00) "1.50 sec" ← FWD →
9.	Press ∧ and enter 0020.0.	→	-PRMSET- PRG Decel Ramp 1 C1-02=002.50 sec (0.0~600.00) "1.50 sec" ← FWD →

Step			Display/Result
10.	Press ENTER to confirm the change.	➡	Entry Accepted
11.	The display automatically returns to the screen shown in Step 4.	➡	-PRMSET- PRG Decel Ramp 1 C1-02= 2.50 sec (0.0~600.00) "1.50 sec" ← FWD →
12.	Press ESC as many times as necessary to return to the initial display.	➡	- MODE - DRV Rdy Speed Ref (OPR) U1-01= 0.00% U1-02= 0.00% RSEQ U1-03= 0.00A LREF FWD FWD/REV

■ Simplified Setup Using the Setup Group

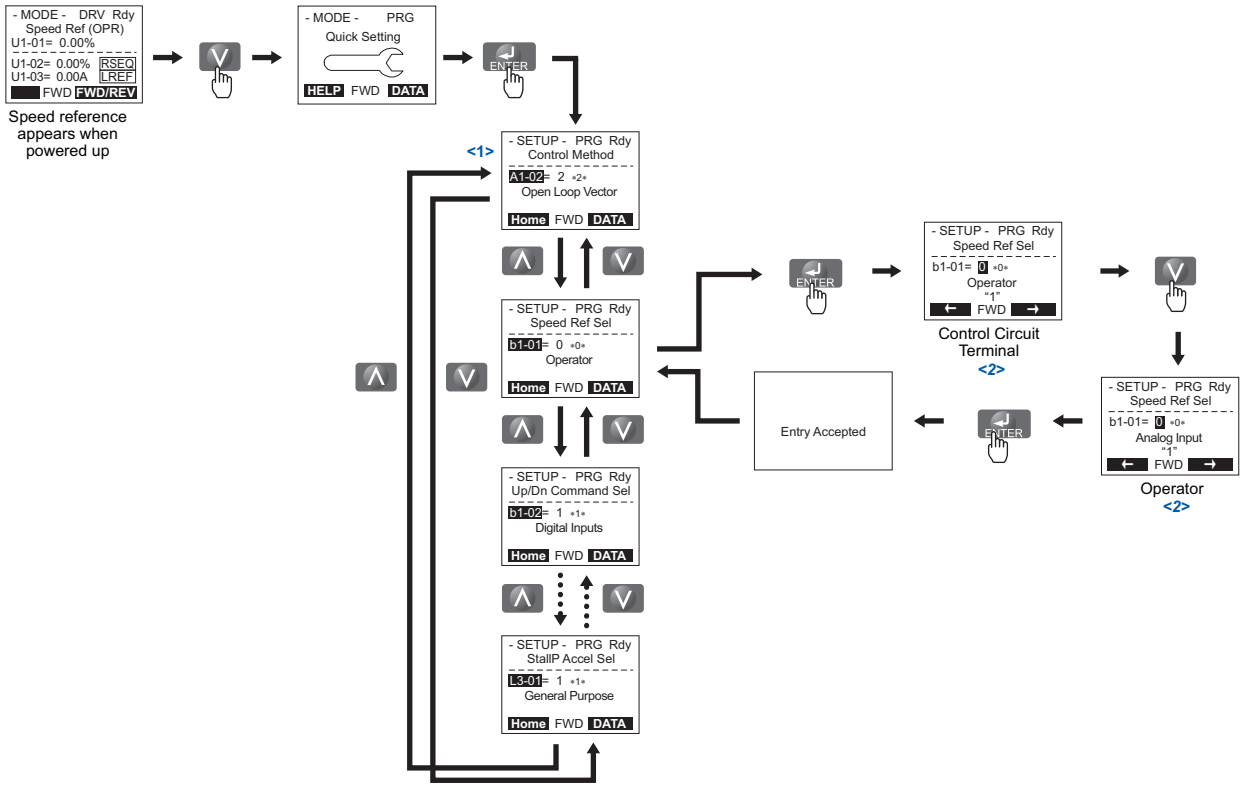
In the Setup Group, the drive lists the basic parameters needed to set up the drive for an elevator application. This group expedites the startup process for an elevator application by showing only the most important parameters for the application.

Using the Setup Group

Figure 35 illustrates how to enter and how to change parameters in the Setup Group.

The first display shown when entering the Setup Group is the Control Method menu. Skipping this display will keep the current Setup Group parameter selection. The default setting for the Setup Group is a group of parameters most commonly use in control methods.

In this example, the Setup Group is accessed to change b1-01 from 0 to 1. This changes the source of the speed reference from the digital operator to the control circuit terminals.



<1> Use the up and down arrow keys to scroll through the Setup Group. Press the ENTER key to view or change parameter settings.
<2> To return to the previous menu without saving changes, press the ESC key.

Figure 35 Setup Group Example

■ Switching Between LOCAL and REMOTE

LOCAL mode is when the drive is set to accept the Up/Down command from the digital operator keypad. REMOTE mode is when the drive is set to accept the Up/Down command from an external device (via the input terminals or serial communications, etc.).

Switch the operation between LOCAL and REMOTE using the LO/RE key on the digital operator or via a digital input. This key is disabled with default settings, but can be enabled by setting parameter o2-01 to 1.

Note: **1.** After selecting LOCAL, the LO/RE light will remain lit.
2. The drive will not allow the user to switch between LOCAL and REMOTE during run.

Using the LO/RE Key on the Digital Operator

Step			Display/Result
1.	Turn on the power to the drive. The initial display appears.	→	- MODE - DRV Rdy Speed Ref(A1/A2) U1-01= 0.00% U1-02= 0.00% RSEQ U1-03= 0.00A RREF FWD FWD/REV
2.	Press LO/RE. The LO/RE light will light up. The drive is now in LOCAL. To set the drive for REMOTE operation, press LO/RE again.	→	

◆ Start-Up Flowcharts

This section covers basic setup for the drive, including Auto-Tuning procedures and corresponding flowcharts. Follow the flowchart that matches the motor used in your application. Refer to *Types of Auto-Tuning on page 71* for details on the types of Auto-Tuning.

Flowchart	Purpose	Page
A	Installation, wiring, and basic steps required to setup the motor and elevator for operation	*65*
B	Auto-Tuning for induction motors	*68*
C	Auto-Tuning for PM motors	*69*
D	Encoder Offset Auto-Tuning	*70*

■ Flowchart A: Installation, Wiring, Basic Setup for Motor and Elevator

The flowchart below covers the basic procedure required to install the drive, motor, and elevator.

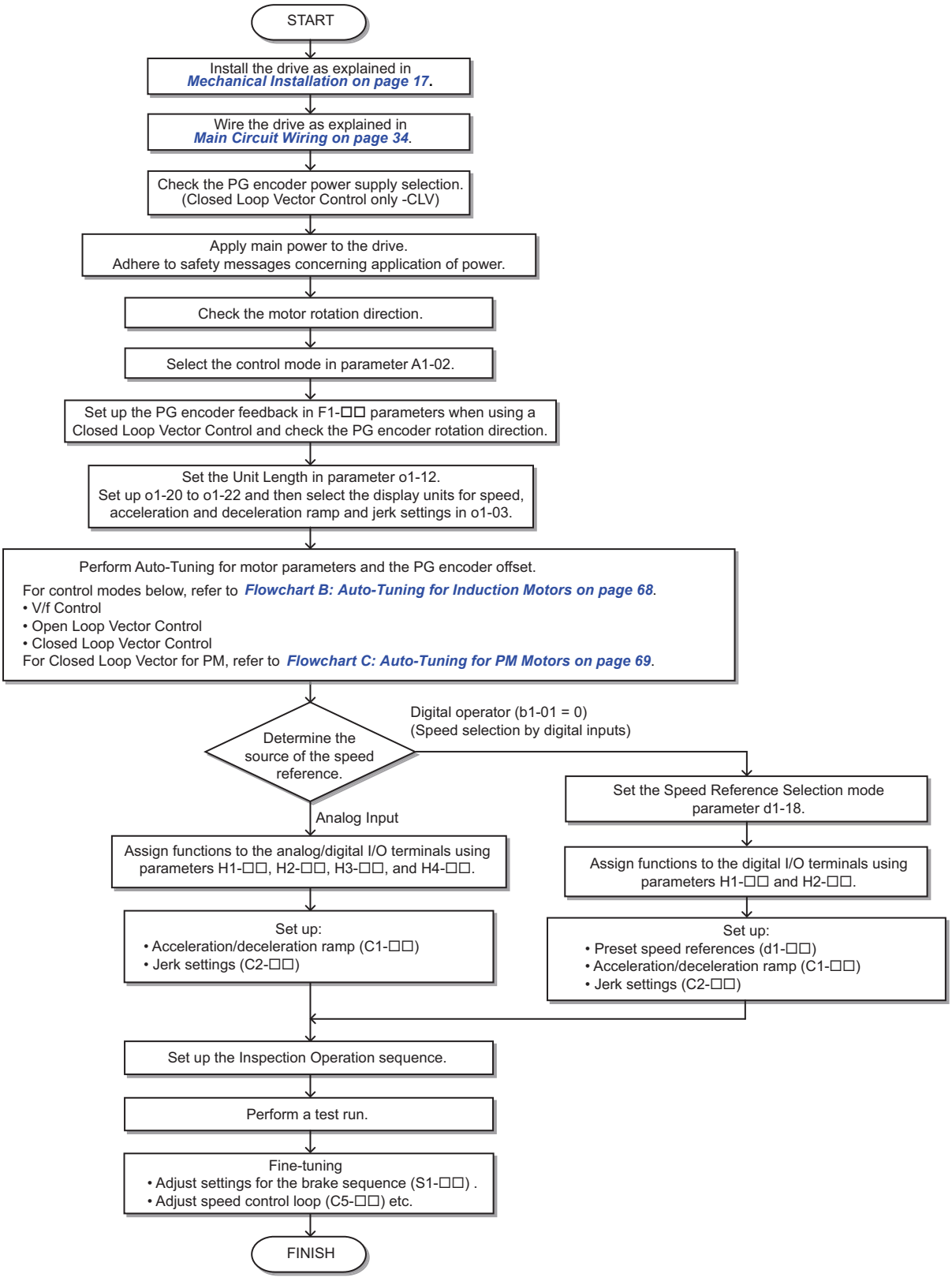


Figure 36 Installation, Wiring, Basic Setup for Motor and Elevator

Note: Set parameter H5-11 to 1 when setting parameters using MEMOBUS/Modbus communications.

■ Power On

Take the following precautions before applying main power to the drive:

WARNING! *Sudden Movement Hazard. Ensure start/stop, I/O and safety circuits are wired properly and in the correct state before energizing or running the drive. Failure to comply could result in death or serious injury from moving equipment.*

WARNING! *Fire Hazard. Do not use an improper voltage source. Failure to comply could result in death or serious injury by fire. Verify that the rated voltage of the drive matches the voltage of the incoming power supply before applying power.*

WARNING! *Fire Hazard. Loose electrical connections could result in death or serious injury by fire due to overheating of electrical connections. Tighten all terminal screws to the specified tightening torque.*

WARNING! *Fire Hazard. Do not connect the AC power line to the output motor terminals of the drive. Failure to comply could result in death or serious injury by fire as a result of drive damage from line voltage application to output terminals.*

- *Do not connect AC line power to output terminals U/T1, V/T2, and W/T3.*
- *Make sure that the power supply lines are connected to main circuit input terminals R/L1, S/L2, and T/L3 (or R/L1 and S/L2 for single-phase power).*

WARNING! *Sudden Movement Hazard. Clear personnel, secure equipment and check sequence and safety circuitry before starting the drive. Failure to comply could result in death or serious injury from moving equipment.*

- *Clear all personnel from the drive, motor, and machine area.*
- *Secure covers, couplings, shaft keys, and machine loads.*
- *Ensure start/stop and safety circuits are wired properly and in the correct state.*

WARNING! *Sudden Movement Hazard. Operating a drive with untested emergency circuits could result in death or serious injury. Always check the operation of drive fast stop circuits and any additional emergency circuits after they are wired. Fast stop circuits are required to provide safe and quick shutdown of the drive.*

NOTICE: *Equipment Hazard. Comply with proper wiring practices. The motor may run in reverse if the phase order is backward. Connect motor input terminals U/T1, V/T2, and W/T3 to drive output terminals U/T1,V/T2, and W/T3. The phase order for the drive and motor should match.*

NOTICE: *Equipment Hazard. Check all the wiring including the PG encoder wiring and PG option jumper settings, to ensure that all connections are correct after installing the drive and connecting any other devices. Failure to comply could result in damage to the drive.*

After applying the power, the drive mode display should appear and no fault or alarm should be displayed. In the event of a drive fault or error code, refer to ***Troubleshooting on page 130***.

■ Control Mode Selection

Select one of the four motor control modes after applying power to the drive. Note that Closed Loop Vector modes require PG encoder feedback cards. The table below indicates possible control modes depending on the motor type and shows the required encoder feedback card.

Machine Type	Control Mode	A1-02 setting	Encoder Option Card
Induction motor without encoder	V/f Control	0	No card required
	Open Loop Vector Control	2	No card required
Induction motor with incremental encoder	Closed Loop Vector Control	3	PG-B3 / PG-X3
Permanent magnet motor with EnDat 2.1/01, EnDat 2.2/01, or EnDat 2.2/22 encoder	Closed Loop Vector Control for PM motors	7	PG-F3
Permanent magnet motor with ERN1387 or ERN487 encoder	Closed Loop Vector Control for PM motors	7	PG-E3
Yaskawa IPM motor with incremental encoder	Closed Loop Vector Control for PM motors	7	PG-X3

■ Motor Rotation Direction Setup

Check the direction of motor rotation to verify the Up command causes the elevator to move in the upward direction. Perform the following checks to confirm proper motor and load direction:

- The drive outputs motor voltage in U/T1-V/T2-W/T3 phase sequence when an Up command is issued. Check the motor rotation with this phase sequence (for most motors clockwise is seen from the shaft side).
- If the motor drives the elevator in the up direction with a U/T1-V/T2-W/T3 sequence, make sure parameter b1-14 is set to 0.
- If the motor drives the elevator in the down direction with a U/T1-V/T2-W/T3 sequence, make sure parameter b1-14 is set to 1. Motor direction may also be changed by reversing two motor leads connected to U/T1, V/T2, W/T3 on the drive terminal block.

DANGER! *Electrical Shock Hazard. Do not connect or disconnect wiring while the power is on. Failure to comply will result in death or serious injury. Before servicing, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. The charge indicator LED will extinguish when the DC bus voltage is below 50 Vdc. To prevent electric shock, wait at least five minutes after all indicators are OFF and measure the DC bus voltage level to confirm safe level.*

Note: Always perform motor rotation direction setup prior to setting the encoder rotation direction.

■ PG Encoder Setup

PG Encoder Resolution Setup

Set the encoder resolution (incremental signal in the case of absolute encoders with Sin/Cos channels) in parameter F1-01.

PG Encoder Rotation Direction Setup

Perform the following steps to make sure the PG encoder rotation direction is set up correctly in the drive.

If information about the signal sequence of the PG encoder is available:

1. Check the sequence of PG encoder phases A and B when the motor drives the elevator in the up direction.
2. If the PG encoder A phase leads phase B, make sure F1-05 is set to 0.
3. If the PG encoder B phase leads phase A, make sure F1-05 is set to 1.

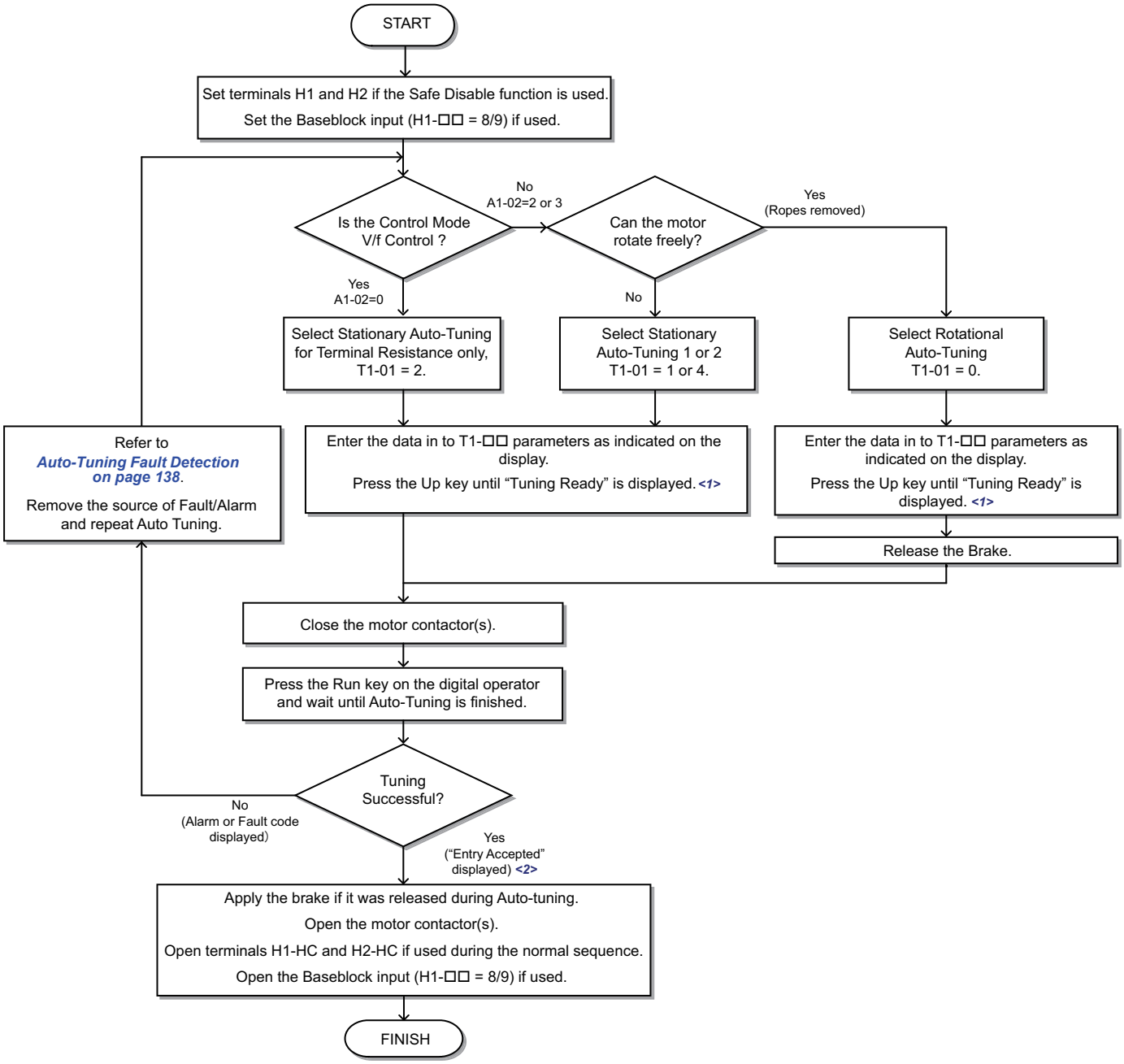
If no information about the signal sequence of the PG encoder is available:

1. Turn the motor manually in elevator up direction while checking the value of monitor U1-05.
2. If the value in U1-05 is positive, the set PG encoder direction is correct.
3. If the value in U1-05 is negative, alter the setting of parameter F1-05.

Note: Always set the motor rotation direction prior to the encoder rotation direction. Refer to *Motor Rotation Direction Setup on page 67*.

■ Flowchart B: Auto-Tuning for Induction Motors

The flowchart below covers Auto-Tuning for induction motors operating with V/f Control, Open Loop Vector Control, or Closed Loop Vector Control.

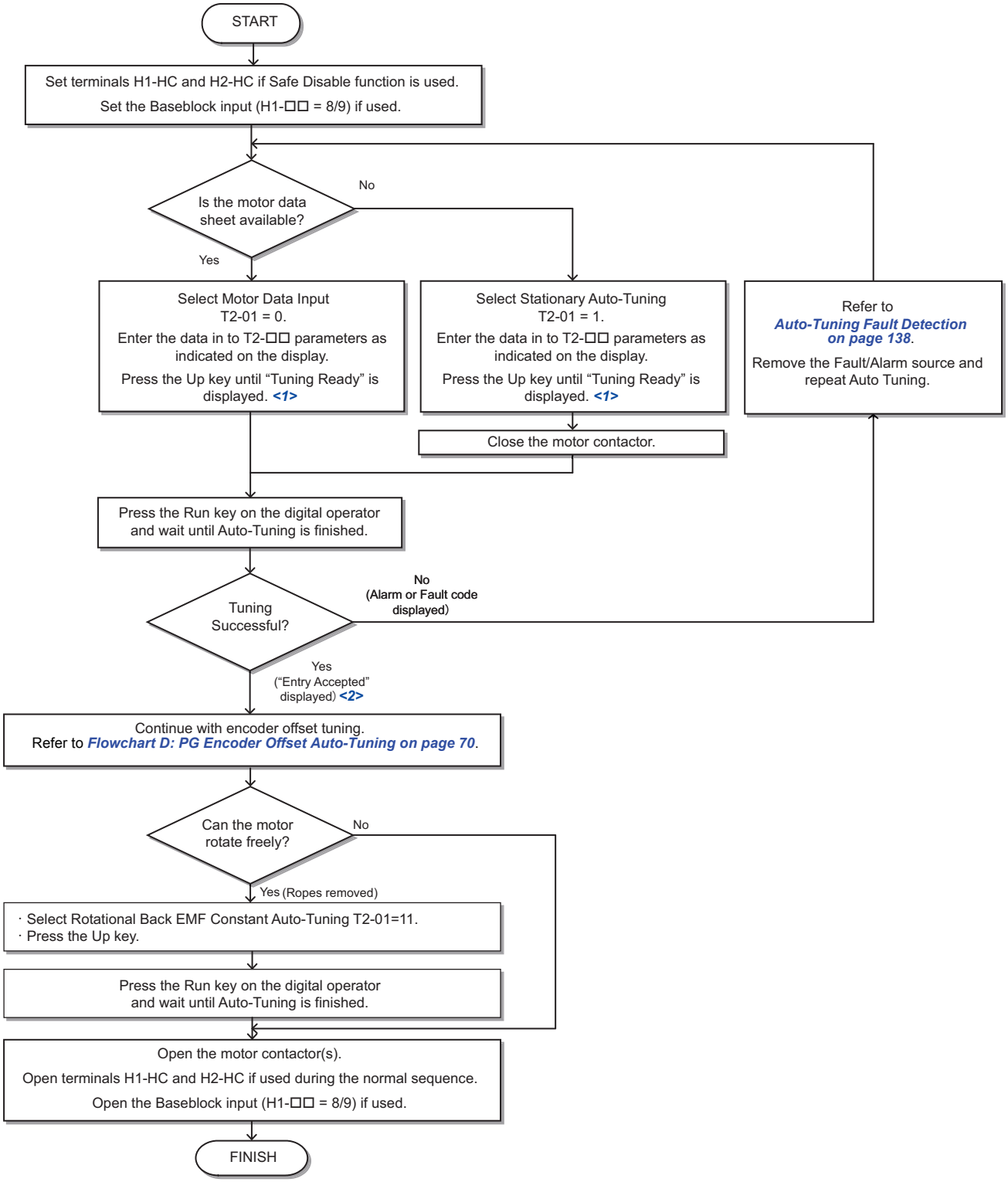


<1> If an LED operator is used, the display shows "TUn 10".
<2> If an LED operator is used, the display shows "End".

Figure 37 Auto-Tuning for Induction Motors

■ Flowchart C: Auto-Tuning for PM Motors

The flowchart below covers Auto-Tuning for permanent magnetic (PM) motors operating with Closed Loop Vector Control for PM motors.

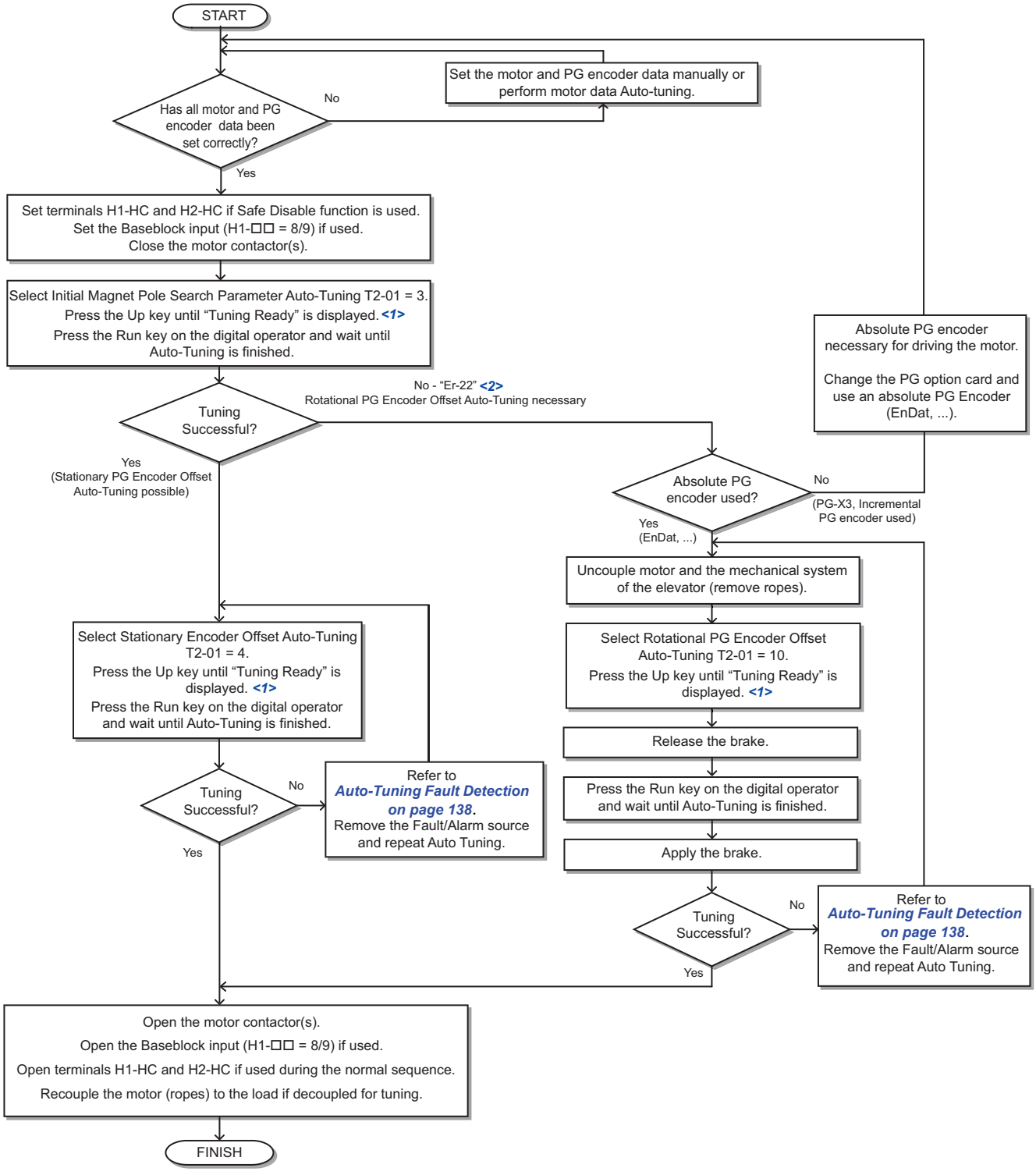


<1> If an LED operator is used, the display shows "TUn 10".
<2> If an LED operator is used, the display shows "End".

Figure 38 Auto-Tuning for PM Motors

■ Flowchart D: PG Encoder Offset Auto-Tuning

The flowchart below covers Rotational and Stationary Auto-Tuning procedures used to automatically set up the PG encoder offset. PG encoder Offset Tuning should be performed when the PG encoder offset (T2-17) is unknown, when a PG encoder offset value has been set but problems with the speed feedback occur, or when the PG encoder is replaced.



<1> If an LED operator is used, the display shows "TUn 10".
<2> If an LED operator is used, the display shows "Er-22".

Figure 39 PG Encoder Offset Auto-Tuning

■ Types of Auto-Tuning

The drive offers different types of Auto-Tuning for induction motors and permanent magnet motors. The type of Auto-Tuning used differs further based on the control mode and other operating conditions. Refer to the tables below to select the type of Auto-Tuning that bests suits the application. Directions for performing Auto-Tuning are listed in *Start-Up Flowcharts on page 64*.

Note: The drive will only show Auto-Tuning parameters that are valid for the control mode that has been set in A1-02. If the control mode is for an induction motor, the Auto-Tuning parameters for PM motors will not be available. If the control mode is for a PM motor, the Auto-Tuning parameters for induction motors will not be available. Inertia Tuning and ASR Gain Tuning parameters and setting options will be visible only when the drive is set for operation with CLV or CLV/PM.

Auto-Tuning for Induction Motors

Table 24 Types of Auto-Tuning for Induction Motors

Type	Setting	Requirements and Benefits	Control Mode (A1-02)		
			V/f (0)	OLV (2)	CLV (3)
Rotational Auto-Tuning	T1-01 = 0	• Rotational Auto-Tuning gives the most accurate results, and is recommended if possible. • Motor must run freely or with light load (<30%), i.e. ropes have to be removed.	No	Yes	Yes
Stationary Auto-Tuning 1	T1-01 = 1	• A motor test report listing motor data is not available. • Automatically calculates motor parameters needed for vector control. • Use if ropes cannot be removed. Note that the accuracy is less then with Rotational Auto-Tuning.	No	Yes	Yes
Stationary Auto-Tuning for Line-to-Line Resistance	T1-01 = 2	• Used for V/f Control or in vector control modes when the drive was previously set up properly and now the motor cable has changed. • Used in V/f control if drive and motor capacities differ. • Should not be used for any vector control modes unless the motor cable has changed.	Yes	Yes	Yes
Stationary Auto-Tuning 2	T1-01 = 4	• A motor test report is available. Once the no-load current and the rated slip have been entered, the drive calculates and sets all other motor-related parameters. • Use if ropes cannot be removed and if slip and no-load current data are available.	No	Yes	Yes

Auto-Tuning for Permanent Magnet Motors

Automatically sets the V/f pattern and motor parameters E1-☐☐, E5-☐☐, and some F1-☐☐ parameters for speed feedback detection.

Table 25 Types of Auto-Tuning for Permanent Magnet Motors

Type	Setting	Requirements and Benefits
Motor Data Input	T2-01 = 0	• Use if a motor test report is available. • Input motor data from the motor test report. Convert data into the correct unit before inputting data if necessary. • Motor does not rotate during Auto-Tuning.
Stationary Auto-Tuning	T2-01 = 1	• Use if a motor test report is not available. • Input motor data from the motor name plate. Make sure to convert data into the correct units. The drive automatically calculates the motor data.
Stationary Stator Resistance Auto-Tuning	T2-01 = 2	• Tunes stator resistance only. • Should be performed if the motor cabling has changed.
Rotational Back EMF Constant Auto-Tuning	T2-01 = 11	• Use if a motor test is not available. • Tunes the Motor Induction Voltage only. • Should be performed after Motor data are set and the encoder offset is adjusted. • The motor must be uncoupled from the mechanical system (remove ropes).
Auto-Tuning of PG-E3 Encoder Characteristics <1>	T2-01 = 12	Perform this Auto-Tuning to obtain accurate position data from the motor rotor for driving a PM motor.

<1> Available in drive software versions PRG: 7017 or later.
Auto-Tuning of PG-E3 encoder characteristics requires a PG-E3 option with software version 1102 or later. To identify the PG-E3 software version, refer to the PG-E3 labeling on the option, in the field designated "C/N" (S + four digit number).

Table 26 Auto-Tuning Input Data

Input Value	Input Parameter	Unit	Tuning Type (T2-01)							
			0 Motor Parameter Settings	1 Stationary	2 Stationary Stator Resistance	3 Initial Magnet Pole Search Parameters Auto-Tuning	4 Encoder Offset Stationary Auto-Tuning	10 Encoder offset rotational Auto-Tuning	11 Back EMF Constant	12 Auto-Tuning of PG-E3 Encoder Characteristics
Control Mode	**A1-02**	**–**	**7**	**7**	**7**	**7**	**7**	**7**	**7**	**7**
Motor Rated Power	T2-04	kW	Yes	Yes	N/A	N/A	N/A	N/A	N/A	N/A
Motor Rated Voltage	T2-05	V	Yes	Yes	N/A	N/A	N/A	N/A	N/A	N/A
Motor Rated Current	T2-06	A	Yes	Yes	Yes	N/A	N/A	N/A	N/A	N/A
Number of Motor Poles	T2-08	N/A	Yes	Yes	N/A	N/A	N/A	N/A	N/A	N/A
Motor Rated Speed	T2-09	r/min	Yes	Yes	N/A	N/A	N/A	N/A	N/A	N/A
Stator 1 Phase Resistance	T2-10	Ω	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A
d-Axis Inductance	T2-11	mH	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A
q-Axis Inductance	T2-12	mH	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Induced Voltage Constant Unit Selection	T2-13	N/A	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Voltage Constant	T2-14	<2>	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PG Number of Pulses per Revolution	T2-16	N/A	Yes	Yes	N/A	N/A	N/A	N/A	N/A	N/A
Z Pulse Offset	T2-17	deg (mech.)	Yes	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Speed Reference for Auto-Tuning of PG-E3 Encoder Characteristics <1>	T2-18	r/min	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes
Rotation Direction for Auto-Tuning of PG-E3 Encoder Characteristics <1>	T2-19	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes

<1> Available in drive software versions PRG: 7017 or later.
<2> Depends on T2-13 setting.

Properly set the motor and PG encoder data before performing PG Encoder Offset Tuning.

Table 27 Types of Auto-Tuning for PG Encoder Offset

Type	Setting	Requirements and Benefits
Initial Magnet Pole Search Parameters Auto-Tuning	T2-01 = 3	• Should be performed after motor Auto-Tuning in order to determine the PG encoder tuning method. • Attempts to detect the motor rotor position, determines whether PG encoder offset can be tuned using Stationary Encoder Offset Tuning and sets parameters needed for Initial Magnet Pole Search (n8-36, n8-37). • When using the Rescue Operation mode, perform this tuning to let the drive automatically set the parameters needed for Initial Magnet Pole Search with power supply from a battery or UPS (n8-81, n8-82). • Must be performed when using an incremental PG encoder. **Important:** If this tuning fails when using a PG-X3 card with an incremental PG encoder the motor cannot be driven using an incremental PG encoder. Change the PG encoder to an absolute PG encoder.
Stationary PG Encoder Offset Auto-Tuning	T2-01 = 4	• Tunes the PG encoder offset without rotating the motor. • If the PG encoder offset cannot be tuned properly by this method, try Rotating PG Encoder Offset Tuning.
Rotational PG Encoder Offset Auto-Tuning	T2-01 = 10	• Tunes the PG encoder offset while rotating the motor. • Motor and mechanical system must be uncoupled (ropes must be removed from traction sheave).

Auto-Tuning of PG-E3 Encoder Characteristics

This feature optimizes the drive settings for the characteristics of the PG-E3 speed-control option card for the ERN1387 encoder (manufactured by HEIDENHAIN) while rotating the motor. Perform Auto-Tuning to obtain accurate position data from the motor rotor for driving a PM motor. This type of Auto-Tuning automatically sets the characteristics of the PG-E3 option card for the ERN1387 encoder in parameters F1-66 to F1-81 (Encoder Adjust 1 to 16).

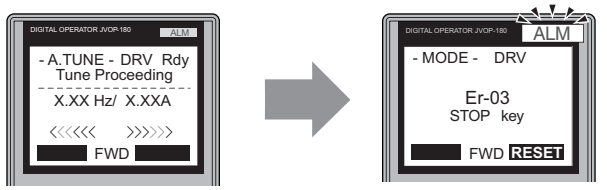
Note: The motor rotates during execution of Auto-Tuning of PG-E3 encoder characteristics. Before starting, refer to the drive technical manual.

Note: Auto-Tuning of PG-E3 encoder characteristics adjusts the unique characteristics of the ERN1387 encoder connected to the drive by using a PG-E3 option card. This type of tuning should be performed when setting up the drive or after replacing the encoder or drive. The signal lines between the PG-E3 option card and the ERN1387 encoder must be connected between the R+ and R- terminals while this type of tuning is performed.

Note: The setting values of parameters F1-66 to F1-81 are reset to factory default values when A1-03 is set to 2220. The setting values of parameters F1-66 to F1-81 are modified at completion of Auto-Tuning of PG-E3 encoder characteristics.

■ Auto-Tuning Interruption and Fault Codes

If tuning results are abnormal or the STOP key is pressed before completion, Auto-Tuning will be interrupted and a fault code will appear on the digital operator.



During Auto-Tuning **Auto-Tuning Aborted**

Figure 40 Auto-Tuning Aborted Display

■ Auto-Tuning Operation Example

The following example demonstrates Rotational Auto-Tuning when using OLV (A1-02 = 2).

Selecting the Type of Auto-Tuning

Step			Display/Result
1.	Turn on the power to the drive. The initial display appears.	→	- MODE - DRV Rdy Speed Ref (OPR) U1-01= 0.00% U1-02= 0.00% RSEQ U1-03= 0.00A LREF FWD FWD/REV
2.	Press ∧ or ∨ until the Auto-Tuning display appears.	→	- MODE - PRG Auto-Tuning AUTO HELP FWD DATA
3.	Press ENTER to begin setting parameters.	→	- A.TUNE - PRG Tuning Mode T1-01= 0 *0* Standard Tuning ESC FWD DATA
4.	Press ENTER to select the value for T1-01.	→	- A.TUNE - PRG Tuning Mode T1-01= 0 *0* Standard Tuning "0" ← FWD →
5.	Save the setting by pressing ENTER.	→	Entry Accepted

Step			Display/Result
6.	The display automatically returns to the display shown in Step 3.	→	- A.TUNE - PRG Tuning Mode T1-01= 0 *0* Standard Tuning ESC FWD DATA

Enter Data from the Motor Nameplate

After selecting the type of Auto-Tuning, enter the data required from the motor nameplate.

Note: These instructions continue from Step 6 in "Selecting the Type of Auto-Tuning".

Step			Display/Result
1.	Press ∧ to access the motor output power parameter T1-02.	→	- A.TUNE - PRG Mtr Rated Power T1-02= 3.70kW (0.00 ~ 650.00) "3.70kW" ESC FWD DATA
2.	Press ENTER to view the default setting.	→	- A.TUNE - PRG Mtr Rated Power T1-02= 003.70kW (0.00 ~ 650.00) "3.70kW" ← FWD →
3.	Press F1 (left), F2 (right), RESET, ∧ and ∨ to enter the motor power nameplate data in kW.	→	- A.TUNE - PRG Mtr Rated Power T1-02= 004.00kW (0.00 ~ 650.00) "3.70kW" ← FWD →
4.	Press ENTER to save the setting.	→	Entry Accepted
5.	The display automatically returns to the display in Step 1.	→	- A.TUNE - PRG Mtr Rated Power T1-02= 4.00kW (0.00 ~ 650.00) "3.70kW" ESC FWD DATA
6.	Repeat Steps 1 through 5 to set the following parameters: • T1-03, Motor Rated Voltage • T1-04, Motor Rated Current • T1-05, Motor Base Frequency • T1-06, Number of Motor Poles • T1-07, Motor Base Speed	→	- A.TUNE - PRG Mtr Rated Power T1-02= 4.00kW (0.00 ~ 650.00) "3.70kW" ESC FWD DATA ⋮ - A.TUNE - PRG Rated Speed T1-07= 1450RPM (0 ~ 24000) "1450RPM" ESC FWD DATA

Starting Auto-Tuning

WARNING! *Sudden Movement Hazard. The drive and motor may start unexpectedly during Auto-Tuning, which could result in death or serious injury. Ensure the areas surrounding the drive, motor and load are clear before proceeding with Auto-Tuning.*

WARNING! *Electrical Shock Hazard. High voltage will be supplied to the motor when Stationary Auto-Tuning is performed even with the motor stopped, which could result in death or serious injury. Do not touch the motor until Auto-Tuning has been completed.*

WARNING! *When performing Rotational Auto-Tuning for motor data or PG encoder offset, always uncouple the motor from the mechanical system (remove ropes from traction sheave). Performing Rotational Auto-Tuning with the mechanical system connected to the motor can cause hazardous situations, injury to personnel and damage to the equipment.*

NOTICE: *Rotational Auto-Tuning will not function properly if a holding brake is applied on the load. Ensure the motor can freely spin before beginning Auto-Tuning. Failure to comply could result in improper operation of the drive.*

Enter the required information from the motor nameplate. Press ENTER to proceed to the Auto-Tuning start display.

Note: These instructions continue from Step 6 in "Enter Data from the Motor Nameplate".

Step			Display/Result
1.	After entering the data listed on the motor nameplate, press ENTER to confirm.	→	- A.TUNE - DRV Auto-Tuning 0.00 Hz/ 0.00A Tuning Ready ? Press RUN key ESC FWD
2.	Press RUN to activate Auto-Tuning. The drive begins by injecting current into the motor for about 1 min, and then starts to rotate the motor. **Note:** The first digit on the display indicates which motor is undergoing Auto-Tuning (motor 1 or motor 2). The second digit indicates the type of Auto-Tuning being performed.	→	- A.TUNE - DRV Rdy Tune Proceeding X.XX Hz/ X.XXA <<<<<< >>>>>> FWD
3.	Auto-Tuning finishes in approximately one to two minutes.	→	- MODE - DRV End Tune Successful FWD RESET

■ Parameter Settings during Induction Motor Auto-Tuning: T1

The T1-☐☐ parameters are used to set the Auto-Tuning input data for induction motor tuning.

Note: For motors operating in the field weakening range, first perform the Auto-Tuning with the base data. After Auto-Tuning is complete, change E1-04, Maximum Output Frequency, to the desired value.

T1-01: Auto-Tuning Mode Selection

Sets the type of Auto-Tuning to be used. *Refer to Auto-Tuning for Induction Motors on page 71* for details on the different types of Auto-Tuning.

No.	Parameter Name	Setting Range	Default
T1-01	Auto-Tuning Mode Selection	2 (V/f) 0 to 2, 4 (OLV, CLV)	2 (V/f) 1 (OLV, CLV)

Setting 0: Rotational Auto-Tuning
Setting 1: Stationary Auto-Tuning 1
Setting 2: Stationary Auto-Tuning for Line-to-Line Resistance
Setting 4: Stationary Auto-Tuning 2

T1-02: Motor Rated Power

Sets the motor rated power according to the motor nameplate value.

No.	Parameter Name	Setting Range	Default
T1-02	Motor Rated Power	0.00 to 650.00 kW	Determined by o2-04

T1-03: Motor Rated Voltage

Sets the motor rated voltage according to the motor nameplate value. Enter the motor voltage at base speed here if the motor is operating above base speed.

Enter the voltage needed to operate the motor under no-load conditions at rated speed to T1-03 for better control precision around rated speed when using a vector control mode. The no-load voltage can usually be found in the motor test report available from the manufacturer. If the motor test report is not available, enter approximately 90% of the rated voltage printed on the motor nameplate. This may increase the output current and reduce the overload margin.

No.	Parameter Name	Setting Range	Default
T1-03	Motor Rated Voltage	0.0 to 255.5 V <1>	200.0 V <1>

<1> Values shown are specific to 200 V class drives. Double value for 400 V class drives. Multiply value by 2.875 for 600 V class drives.

T1-04: Motor Rated Current

Sets the motor rated current according to the motor nameplate value. Set the motor rated current between 50% and 100% of the drive rated current for optimal performance in OLV or CLV. Enter the current at the motor base speed.

No.	Parameter Name	Setting Range	Default
T1-04	Motor Rated Current	10 to 200% of drive rated current	Depending on o2-04

T1-05: Motor Base Frequency

Sets the motor rated frequency according to the motor nameplate value. If a motor with an extended speed range is used or if the motor is used in the field weakening area, enter the maximum frequency to E1-04 (E3-04 for motor 2) after Auto-Tuning is complete.

No.	Parameter Name	Setting Range	Default
T1-05	Motor Base Frequency	0.0 to 200.0 Hz	60.0 Hz

T1-06: Number of Motor Poles

Sets the number of motor poles according to the motor nameplate value.

No.	Parameter Name	Setting Range	Default
T1-06	Number of Motor Poles	2 to 48	4

T1-07: Motor Base Speed

Sets the motor rated speed according to the motor nameplate value. If a motor with an extended speed range is used or if the motor is used in the field weakening area, enter the speed at base frequency to T1-07.

No.	Parameter Name	Setting Range	Default
T1-07	Motor Base Speed	0 to 24000 r/min	1750 r/min

T1-08: PG Number of Pulses Per Revolution

Sets the number of pulses from the PG encoder. Set the actual number of pulses for one full motor rotation.

No.	Parameter Name	Setting Range	Default
T1-08	PG Number of Pulses Per Revolution	0 to 60000 ppr	1024 ppr

Note: T1-08 will only be displayed in CLV.

T1-09: Motor No-Load Current

Sets the no-load current for the motor. The default setting displayed is no-load current automatically calculated from the output power set in T1-02 and the motor rated current set to T1-04. Enter the data listed on the motor test report. Leave this data at the default setting if the motor test report is not available.

No.	Parameter Name	Setting Range	Default
T1-09 <1>	Motor No-Load Current	0 to [T1-04] A (Max: 0 to 2999.9)	–

<1> The value will have two decimal places (0.01 A) in the drive models 2A0008 to 2A0033,4A0005 to 4A0018 and 5A0003 to 5A0013 (refer to *Table 55*, *Table 56* and *Table 57*), and one decimal place (0.1 A) in the drive models 2A0047 to 2A0415, 4A0024 to 4A0605 and 5A0017 to 5A0200.

T1-10: Motor Rated Slip

Sets the rated slip for the motor.

The default setting displayed is the motor rated slip for a Yaskawa motor calculated from the output power set in T1-02. Enter the data listed on the motor test report.

No.	Parameter Name	Setting Range	Default
T1-10	Motor Rated Slip	0.00 to 20.00 Hz	–

■ Parameter Settings during PM Motor Auto-Tuning: T2

The T2-☐☐ parameters are used to set the Auto-Tuning input data for PM motor tuning.

T2-01: PM Auto-Tuning Mode Selection

Selects the type of Auto-Tuning to be performed. *Refer to Auto-Tuning for Permanent Magnet Motors on page 71* for details on different types of Auto-Tuning.

No.	Parameter Name	Setting Range	Default
T2-01	PM Auto-Tuning Mode Selection	0 to 4, 10 to 12 <1>	0

<1> Setting 12 is available in drive software versions PRG: 7017 or later.
Auto-Tuning of PG-E3 encoder characteristics requires a PG-E3 option with software version 1102 or later. To identify the PG-E3 software version, refer to the PG-E3 labeling on the option, in the field designated "C/N" (S + four digit number).

Setting 0: Motor Data Input
Setting 1: PM Stationary Auto-Tuning
Setting 2: PM Stationary Stator Resistance Auto-Tuning
Setting 3: Initial Magnet Pole Search Parameters Auto-Tuning
Setting 4: Stationary PG Encoder Offset Auto-Tuning
Setting 10: Rotational PG Encoder Offset Auto-Tuning
Setting 11: Rotational Back EMF Constant Auto-Tuning
Setting 12: Auto-Tuning of PG-E3 Encoder Characteristics

T2-04: PM Motor Rated Power

Specifies the PM motor rated power in kilowatts.

No.	Parameter Name	Setting Range	Default
T2-04	PM Motor Rated Power	0.00 to 650.00 kW	Depending on o2-04

T2-05: PM Motor Rated Voltage

Sets the PM motor rated voltage.

No.	Parameter Name	Setting Range	Default
T2-05	PM Motor Rated Voltage	0.0 to 255.0 V <1>	200.0 V <1>

<1> Values shown are specific to 200 V class drives. Double value for 400 V class drives. Multiply value by 2.875 for 600 V class drives.

T2-06: PM Motor Rated Current

Enter the PM motor rated current in amps.

No.	Parameter Name	Setting Range	Default
T2-06	PM Motor Rated Current	10% to 200% of the drive rated current.	Depending on o2-04

T2-08: Number of PM Motor Poles

Enter the number of motor poles.

No.	Parameter Name	Setting Range	Default
T2-08	Number of PM Motor Poles	2 to 120 <1>	6

<1> When PG-E3 option connected: Max setting = 48

T2-09: PM Motor Base Speed

Enter the motor rated speed in r/min.

Note: T2-09 will be displayed when in CLV/PM.

No.	Parameter Name	Setting Range	Default
T2-09	PM Motor Base Speed	0 to 24000 r/min	150 r/min

T2-10: PM Motor Stator Resistance

Enter the motor stator resistance per motor phase.

No.	Parameter Name	Setting Range	Default
T2-10	PM Motor Stator Resistance	0.000 to 65.000 Ω	–

T2-11: PM Motor d-Axis Inductance

Enter the d axis inductance per motor phase.

No.	Parameter Name	Setting Range	Default
T2-11	PM Motor d-Axis Inductance	0.00 to 600.00 mH	–

T2-12: PM Motor q-Axis Inductance

Enter the q axis inductance per motor phase.

No.	Parameter Name	Setting Range	Default
T2-12	PM Motor q-Axis Inductance	0.00 to 600.00 mH	–

T2-13: Induced Voltage Constant Unit Selection

Selects the units used for setting the induced voltage coefficient.

No.	Parameter Name	Setting Range	Default
T2-13	Induced Voltage Constant Unit Selection	0, 1	1

Setting 0: mV (r/min)
Setting 1: mV (rad/sec)

Note: If T2-13 is set to 0, then the drive will use E5-24 (Motor Induction Voltage Constant 2), and will automatically set E5-09 (Motor Induction Voltage Constant 1) to 0.0. If T2-13 is set to 1, then the drive will use E5-09 and will automatically set E5-24 to 0.0.

T2-14: PM Motor Induced Voltage Constant

Enter the motor induced voltage constant.

No.	Parameter Name	Setting Range	Default
T2-14	PM Motor Induced Voltage Constant	0.0 to 2000.0	Depending on T2-02

T2-16: PG Number of Pulses Per Revolution for PM Motor Tuning

Enter the number of pulses from the PG encoder per motor rotation.

No.	Parameter Name	Setting Range	Default
T2-16	Encoder Resolution (Pulses Per Revolution)	1 to 15000 ppr	1024 ppr

T2-17: PG Encoder Z-pulse Offset

Sets the offset between the rotor magnet axis and the PG encoder zero position. If the PG encoder offset value is unknown or if the PG encoder is replaced, perform PG Encoder Offset Auto-Tuning.

No.	Parameter Name	Setting Range	Default
T2-17	PG Encoder Z-pulse Offset	-180.0 to 180.0 deg	0.0 deg

T2-18: Speed Reference for Auto-Tuning of PG-E3 Encoder Characteristics

Note: Available in drive software PRG: 7017 or later.

Sets the speed reference for execution of Auto-Tuning of PG-E3 encoder characteristics (T2-01 = 12).

No.	Parameter Name	Setting Range	Default
T2-18	Speed Reference for Auto-Tuning of PG-E3 Encoder Characteristics	1 to 30 r/min	10 r/min

T2-19: Rotation Direction for Auto-Tuning of PG-E3 Encoder Characteristics

Note: Available in drive software PRG: 7017 or later.

Sets the direction of motor rotation for execution of Auto-Tuning of PG-E3 encoder characteristics (T2-01 = 12).

No.	Parameter Name	Setting Range	Default
T2-19	Rotation Direction for Auto-Tuning of PG-E3 Encoder Characteristic	0, 1	0

Setting 0: Forward (Up)
Setting 1: Reverse (Down)

◆ Setup Procedure for Elevator Applications

■ Up and Down Commands and Speed Reference Selection

WARNING! *Sudden Movement Hazard. Remove the Up/Down Command before resetting alarms and faults. Failure to comply can result in death or serious injury.*

WARNING! *Sudden Movement Hazard. Verify drive parameter b1-03 Stopping Method is set to 0:Ramp to Stop before starting the drive. Failure to comply may cause the elevator to free-fall when the Up/Down command is removed.*

WARNING! *Sudden Movement Hazard. The drive is capable of running the motor at high speed. Verify the maximum drive output frequency before starting the drive. Failure to comply may cause injury or death due to inadvertent high speed operation.*

WARNING! *Sudden Movement Hazard. Use the Initial Pole Search Status Signal (H2-☐☐ = 61) to interlock the brake to ensure the brake is not released before the Initial Magnetic Pole Search is completed. Failure to comply may cause inadvertent elevator movement resulting in serious injury.*

NOTICE: *Always turn off the RUN command before changing the setting of parameters d1-18 (Speed Reference Selection Mode), b1-01 (Speed Reference Selection), or H1-☐☐ (Multi-Function Digital Inputs). If the RUN command is on when changing any of these settings, the motor may unexpectedly start running, and could result in injury.*

Speed Reference Selection

Parameter b1-01 determines the source of the speed reference.

b1-01	Reference source	Speed reference input
0 (default)	Digital operator keypad	Set the speed references in the d1-☐☐ parameters and use digital inputs to switch between different reference values.
1	Analog input <1>	Apply the speed reference signal to terminal A1 or A2.
2	Serial Communication <2>	Serial Communications using the RS422/485 port
3	Option Board <2>	Communications option card

<1> If source of the speed reference is assigned to the control terminals (b1-01 = 1), then d1-18 will automatically be set to 0 (so that the drive uses multi-speed references d1-01 to d1-08).
<2> If the speed reference selection in d1-18 is set so that either the high speed reference has priority (d1-18 = 1), or so that the leveling speed has priority (d1-18 = 2), then the drive will look to the multi-function input terminals for the speed reference.

Up/Down Command Source Selection

The input source for the Up and Down command can be selected using parameter b1-02.

b1-02	Up/Down source	Up/Down command input
0	Operator keypad	RUN and STOP keys on the operator
1 (default)	Digital inputs	Terminal S1: Run in the Up direction Terminal S2: Run in the Down direction
2	Serial Communication	Serial Communications using the RS422/485 port
3	Option Board	Communications option card

Travel Start and Stop

Travel Start

To start the elevator in the up or down direction, the following conditions must be fulfilled:

- A speed reference greater than zero must be provided.
- The Safe Disable signals at terminals H1 and H2 must both be closed (drive output enabled).
- If a multi-function digital input is programmed for Baseblock (H1-☐☐=8 or 9), this input must be set so the drive is not in a baseblock condition.
- An Up or Down Signal must be set at the source specified in b1-02.
- If a multifunction input is programmed for output contactor feedback (H1-☐☐=56), then the output contactor must be closed.

Travel Stop

The drive stops under the following conditions:

- The Up or Down command is removed.
- d1-18 is set to 1 or 2 and the Up/Down or Leveling Speed signal (H1-☐☐ = 53) is removed.
- d1-18 is set to 3 and all speed inputs are removed.
- A fault occurs. The stopping method depends on the specific fault that occurred, in combination with certain parameter settings.
- The Safe Disable inputs are opened or a Base Block signal is input. In this case, the brake is applied immediately and the drive output shuts off.

■ Speed Selection Using Digital Inputs (b1-01 = 0)

Set parameter b1-01 = 0 to enable the speed selection using the drive digital inputs. Use parameter d1-18 to determine different travel speeds selected by the digital inputs.

NOTICE: *Always turn off the RUN command before changing the setting of parameters d1-18 (Speed Reference Selection Mode), b1-01 (Speed Reference Selection), or H1-☐☐ (Multi-Function Digital Inputs). If the RUN command is on when changing any of these settings, the motor may unexpectedly start running, and could result in injury.*

d1-18	Speed Selection
0 (default)	Multi-speed inputs 1, Speed references are set in d1-01 to d1-08
1	Separate speed inputs, Speed references are set in d1-19 to d1-24 and d1-26, Higher speed has priority
2	Separate speed inputs, Speed references are set in d1-19 to d1-24 and d1-26, Leveling speed has priority
3	Multi speed inputs 2, Speed references are set in d1-02 to d1-08, Stop if no speed selection input is enabled

Multi-Speed Inputs 1, 2 (d1-18 = 0 or 3)

Speed Selection

When d1-18 = 0 or 3, multi-function digital inputs are preset as shown below.

Terminal	Parameter Number	Set Value	Details
S5	H1-05	3	Multi-Speed Reference 1
S6	H1-06	4	Multi-Speed Reference 2
S7	H1-07	5	Multi-Speed Reference 3

Different speed reference settings can be selected by combining the three digital inputs as shown in the table below.

Note: Parameters d1-19 through d1-26 are displayed only if d1-18 is set to 1 or 2.

Digital Inputs			Selected Speed	
Multi-Speed Reference 1	**Multi-Speed Reference 2**	**Multi-Speed Reference 3**	**d1-18 = 0**	**d1-18 = 3**
0	0	0	Speed reference 1 (d1-01)	Stop
1	0	0	Speed reference 2 (d1-02 or terminal A1, A2 input value if H3-02 or H3-10 is set to 2)	
0	1	0	Speed reference 3 (d1-03 or terminal A1, A2 input value if H3-02 or H3-10 is set to 3)	
1	1	0	Speed reference 4 (d1-04)	
0	0	1	Speed reference 5 (d1-05)	
1	0	1	Speed reference 6 (d1-06)	
0	1	1	Speed reference 7 (d1-07)	
1	1	1	Speed reference 8 (d1-08)	

0 = Off, 1 = On

Setting d1-18 = 0

Up to eight speed references can be set using parameters d1-01 to d1-08. The drive starts with an Up or Down command, and stops when the Up or Down command is removed. When d1-18 = 0, parameters d1-19 through d1-23 will not be displayed.

Setting d1-18 = 3

Allows seven speed references to be set using parameters d1-02 to d1-08. The drive starts with an Up or Down command, and stops either when all three input terminals that set the speed reference are released, or when the Up/Down command is released. When d1-18 = 0, parameters d1-19 through d1-23 will not be displayed.

Separate Speed Inputs (d1-18 = 1 or 2)

Six different speed settings (defined in the parameters d1-19 to d1-24 and d1-26) can be set and selected using four digital inputs.

Speed Selection

When d1-18 = 1 or 2, multi-function digital inputs are preset as shown below.

Terminal	Parameter Number	Set Value	Details
S3	H1-03	50	Nominal speed (d1-19)
S5	H1-05	51	Intermediate speed
S6	H1-06	53	Leveling speed (d1-26)

Different speed settings can be selected depending on the assignment of the speed selection digital inputs (H1-□□) as shown in the table below.

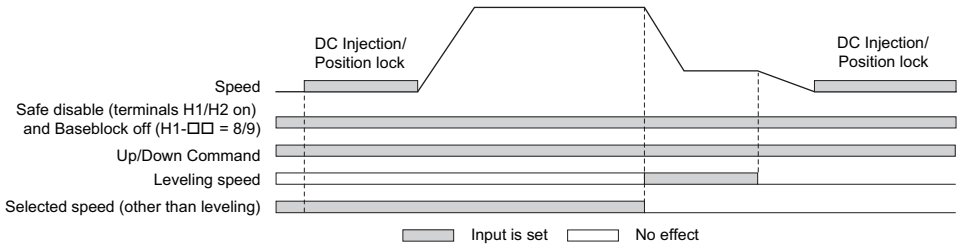
Note: Parameters d1-19 through d1-26 are displayed only if d1-18 is set to 1 or 2.

Selected Speed	Leveling and Nominal Speed assigned (H1-□□ = 50 and H1-□□ = 53)				Leveling speed not assigned (H1-□□ ≠ 53)			Nominal Speed not assigned (H1-□□ ≠ 50)		
	50	51	52	53	50	51	52	51	52	53
Nominal Speed (d1-19)	1	0	0	A	1	0	0	0	0	0
Intermediate Speed 1 (d1-20)	0	1	0	A	0	1	0	1	0	0
Intermediate Speed 2 (d1-21)	1	1	1	A	1	1	1	N/A	N/A	N/A
Intermediate Speed 3 (d1-22)	0	1	1	A	0	1	1	1	1	0
Releveling Speed (d1-23)	0	0	1	A	0	0	1	0	1	0
Leveling Speed (d1-26)	0	0	0	1	0	0	0	B	B	B
Zero Speed	0	0	0	0	N/A	N/A	N/A	N/A	N/A	N/A

0 = Off, 1 = On, A = 0 when d1-18 = 2 and no influence when d1-18=1, B = no influence, N/A = Not available

Higher Speed has Priority and the Leveling Speed Input is Assigned (d1-18 = 1 and H1-□□ = 53) (Default)

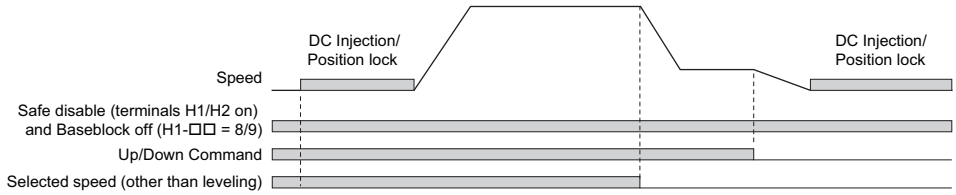
The higher speed has priority over the leveling speed. The leveling signal is disregarded as long as any other speed selection input is active. The drive decelerates to the leveling speed (d1-26) when the selected speed reference signal is removed.



Higher Speed Priority is Selected and the Leveling Speed Input is Not Assigned (d1-18 = 1 and H1-☐☐ ≠ 53)

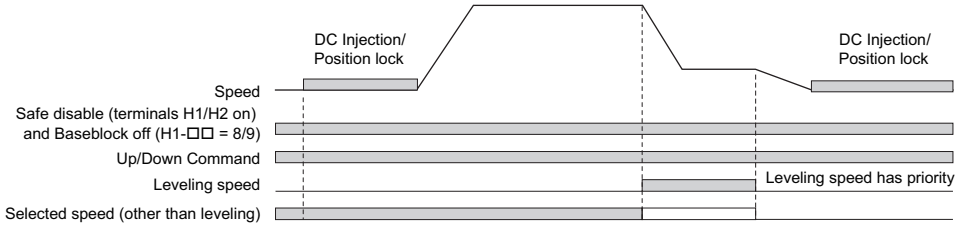
The drive decelerates to the leveling speed (d1-26) when the selected speed reference signal is removed.

If no speed reference is selected at start, the drive will trigger an "FrL" fault. Set parameter S6-15 to 0 to disable Speed Reference Missing (FrL) detection. With this setting the drive starts using leveling speed if no other speed reference is selected.



Leveling Speed has Priority and the Leveling Speed Input is Assigned (d1-18 = 2, H1-☐☐ = 53)

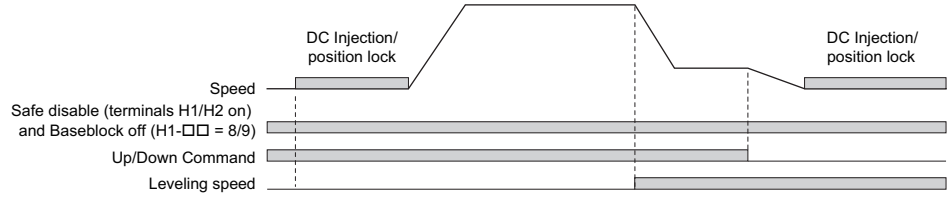
The leveling signal has priority over other speed references. The drive decelerates to the leveling speed (d1-26) when the leveling speed selection input is activated. The drive stops when either the leveling input or the Up/Down command is released.



Leveling Speed Priority is Selected and the Nominal Speed Input is Not Assigned (d1-18 = 2, H1-☐☐ ≠ 50)

The drive runs at nominal speed (d1-19) when no speed selection input is set. When the leveling speed signal is set, the drive decelerates to the leveling speed. The leveling speed signal has priority over all other speed signals.

NOTICE: *Equipment Hazard. This function may not work properly if a broken wire connection to the drive I/O causes improper elevator speed selection. Properly tighten wire connections at the drive terminals before enabling this function.*



■ Multi-Function Terminal Setup

Multi-Function Digital Input (Terminals S3 to S8)

The H1 parameters assign functions to digital input terminals S3 to S8 digital input terminal functions, refer to *H1: Multi-Function Digital Inputs on page 182*.

Multi-Function Digital Outputs

The H2 parameters assign functions to digital output terminals M1-M2, M3-M4, M5-M6, P1-C1, and P2-PC digital input terminal functions, refer to *H2: Multi-Function Digital Outputs on page 184*.

Multi-Function Analog Inputs

The H3 parameters assign functions to analog input terminals A1 and A2 analog input functions, refer to *H3: Multi-Function Analog Inputs on page 186*.

Multi-Function Analog Outputs

The H4 parameters assign functions to analog output terminals FM and AM. Select the function for these terminals by entering the last three digits of the desired U monitor. For a list of analog output functions, refer to *U: Monitors on page 206*.

■ Accel/Decel Ramp and Jerk Settings

Acceleration and deceleration ramps are set using the C1-☐☐ parameters. Use the C2-☐☐ parameters to adjust the jerk at the start of acceleration or deceleration.

Figure 41 explains how accel/decel ride and jerk settings can be used to adjust the ride profile.

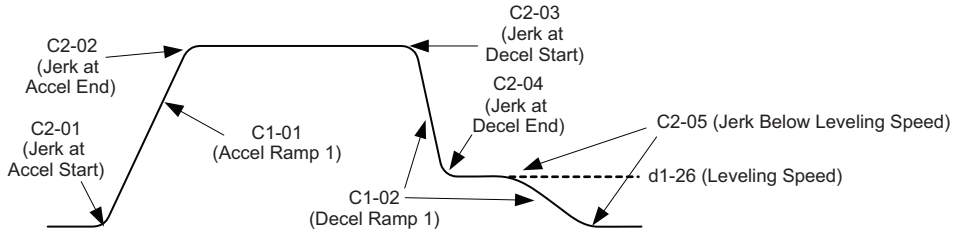


Figure 41 Accel/Decel Ramp and the Jerk Function

Units used to set the acceleration and deceleration ramp as well as the Jerk function change with the setting of parameter o1-03.

■ Elevator Emergency Stop

Start condition for Elevator Emergency Coast to Stop

An emergency coast to stop is performed when the Up or Down command is cleared and all of the following conditions are met.

- Parameter b1-03 (Stopping Method Selection) is set to 4.
- Parameter d1-18 (Speed Reference Selection Mode) is set to 0 or 3.
- Parameter b1-01 (Speed Reference Selection) is set to 1.
- The Up/Down command is cleared and U1-05 (Speed Feedback) is equal to or greater than S1-26 (Emergency Stop Start Level).

Elevator Emergency Stop Timing Chart

A timing chart for Elevator Emergency Coast to Stop and normal Ramp to Stop appears in *Figure 42* and *Figure 43*.

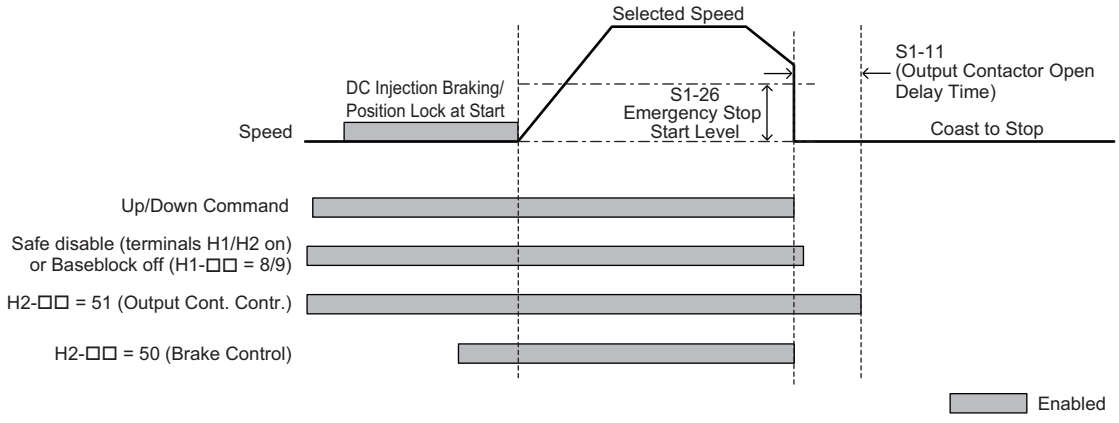


Figure 42 With Up/Down command cleared and U1-05 ≥ S1-26

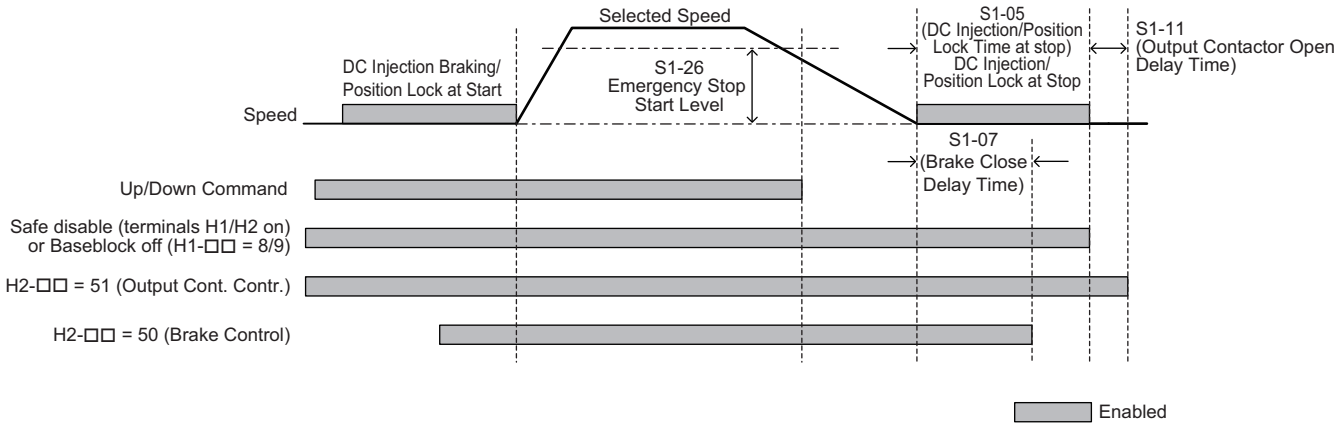


Figure 43 With Up/Down command cleared and U1-05 < S1-26

■ Inspection Operation

Start Condition in Inspection Operation

NOTICE: *Always turn off the RUN command before changing the setting of parameters d1-18 (Speed Reference Selection Mode), b1-01 (Speed Reference Selection), or H1-□□ (Multi-Function Digital Inputs). If the RUN command is on when changing any of these settings, the motor may unexpectedly start running, and could result in injury.*

Inspection operation is performed when an Up or Down signal is input while one of the following conditions is true:

- Parameter d1-18 is set to 0 or 3 and the selected speed is higher than d1-28 but lower than d1-29.
- Parameter d1-18 is set to 1 or 2 and a digital input programmed for Inspection Operation Speed (H1-□□ = 54) is enabled.

Inspection Operation uses the same acceleration characteristics and brake sequence at start as normal operation.

The carrier frequency is set to 2 kHz during Inspection Operation, but can be changed using parameter C6-21.

Stop Condition in Inspection Operation

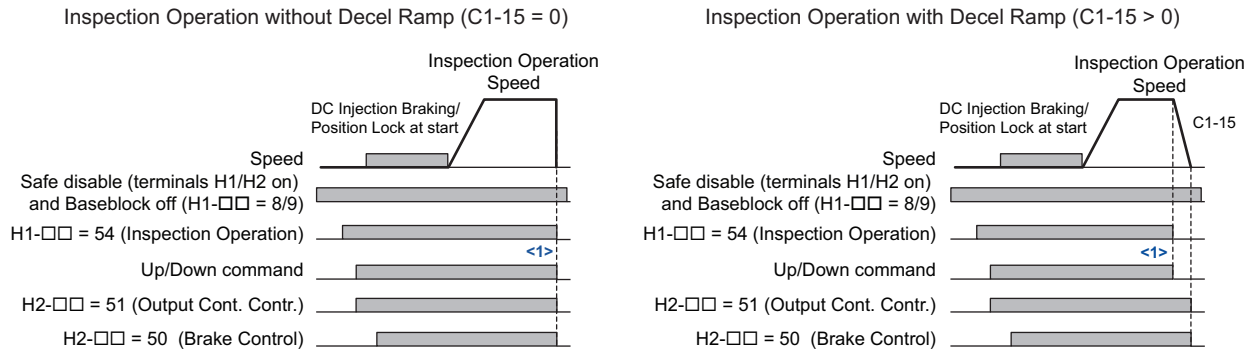
To stop the drive during Inspection Operation, either remove the Up or Down command or reset the input terminal for Inspection Operation.

A deceleration ramp can be set for Inspection Operation using parameter C1-15.

- If C1-15 = 0.00, the drive immediately applies the brake, shuts off the drive output, and opens the motor contactor, i.e., the multi-function output terminals set for “Brake Control” (H2-□□ = 50) and “Output Contactor Control” (H2-□□ = 51) are cleared.
- If C1-15 > 0.00, the drive decelerates to stop at the rate set to C1-15, then applies the brake, shuts the output off, and opens the motor contactor.

Inspection Operation Timing Chart

A timing chart for Inspection Operation appears in *Figure 44*.



<1> The drive stops if either the Up/Down command or Inspection Operation signals are removed.

Figure 44 Inspection Operation Sequence

■ Brake Sequence

WARNING! *Sudden Movement Hazard. Rapid deceleration may cause the drive to fault on an overvoltage condition, resulting in death or serious injury due to an uncontrolled motor state. Be sure to set an acceptable deceleration time in parameter C1-09, Fast Stop Ramp, when using the fast-stop feature.*

NOTICE: *Always turn off the RUN command before changing the setting of parameters d1-18 (Speed Reference Selection Mode), b1-01 (Speed Reference Selection), or H1-□□ (Multi-Function Digital Inputs). If the RUN command is on when changing any of these settings, the motor may unexpectedly start running, and could result in injury.*

The drive supports two types of brake sequences, one with torque compensation at start using an analog input terminal (H3-□□ = 14) and the other without torque compensation at start.

Brake Sequence without Torque Compensation

To configure the brake sequence operation without torque compensation, do not set any analog input terminals for "Torque compensation" (H3-□□ = 14).

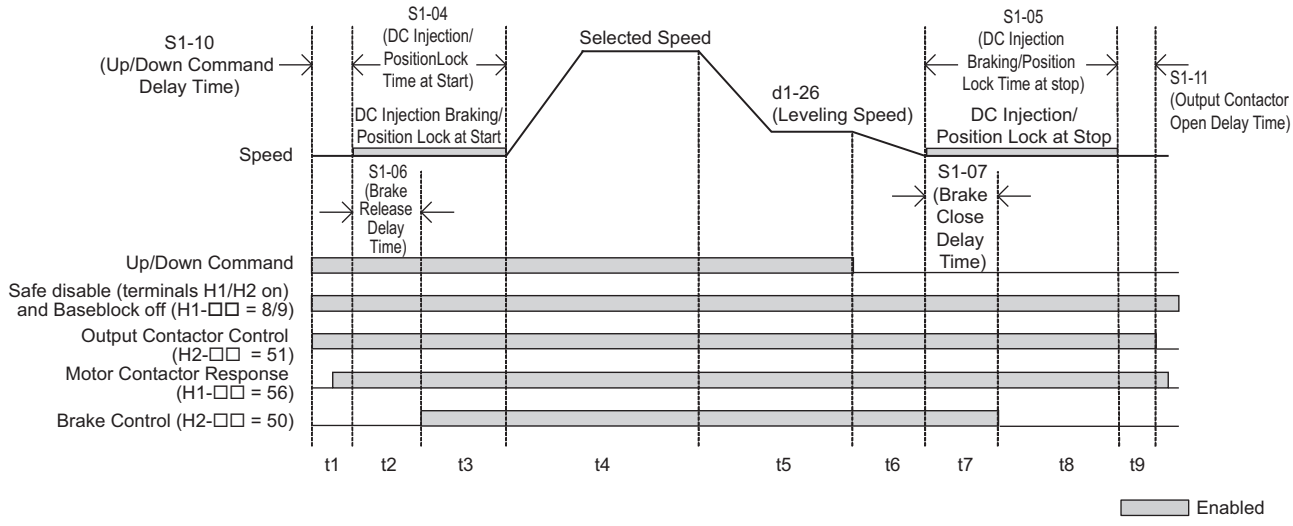


Figure 45 Brake Sequence without Torque Compensation at Start

Figure 45 is divided into time zones.

Table 28 explains the sequence in each time zone.

Table 28 Time Zones for Brake Sequence without Torque Compensation at Start

Time Zone	Description
t1	Up or Down command is issued.
	Safe Disable terminals H1-HC and H2-HC must be set and Baseblock must be disabled (digital inputs set to H1-☐☐ = 8/9).
	Speed reference must be selected by multi-function input terminals.
	Output contactor control signal is set (H2-☐☐ = 51) by the drive.
	Drive waits for the "Motor Contactor Feedback" signal (H1-☐☐ = 56) to be issued. If the motor contactor feedback is not received within t1, or if the feedback signal is on before the contactor control command has been issued, an SE1 fault is triggered. If the motor contactor feedback signal is not used, then the drive waits for the operation start delay time set in S1-10 to pass, then proceeds to the next step.
t2	After the delay time set in S1-10 has passed, the drive outputs current to the motor. DC Injection Braking or Position Lock begins.
	After the brake release delay time set in S1-06 has passed, the drive sets the "Brake Control" output (H2-☐☐ = 50) in order to release the brake.
t3	DC Injection Braking or Position Lock will continue until: the time S1-04 has elapsed, or the time S1-06 has elapsed if S1-06 > S1-04 (this setting should be avoided since the motor could be driven against the applied brake).
t4	The drive accelerates up to the selected speed. The speed is kept constant until the leveling speed is selected.
t5	Leveling speed is selected. The drive decelerates to the leveling speed and maintains that speed until the Up or Down command is removed.
t6	The Up or Down signal is cleared. The drive decelerates to zero speed.
t7	The motor speed reaches the zero speed level (S1-01). DC Injection Braking or Position Lock is then executed for the time set in S1-05.
	After the delay time to close the brake set in S1-07 has passed, the drive clears the "Brake Control" output (H2-☐☐ = 50). The brake applies.
t8	The drive continues DC Injection or Position Lock until the time S1-05 has passed. When S1-05 has passed the drive output is shut off.
t9	After the delay for the magnetic contactor set in S1-11 has passed, the drive resets the output terminal set for "Output Contactor Control" (H2-☐☐ = 51). The Safe Disable Inputs can be cleared and Baseblock can be enabled.

Brake Sequence Using Torque Compensation

If a load measuring device is installed in the elevator, an analog input can be used to input a torque compensation value to the drive. This function requires one of the closed loop control modes (CLV or CLV/PM). To use torque compensation, one of the analog input terminals must be configured to provide the torque compensation signal (H3-☐☐ = 14).

Figure 46 is a timing chart for a brake sequence using torque compensation.

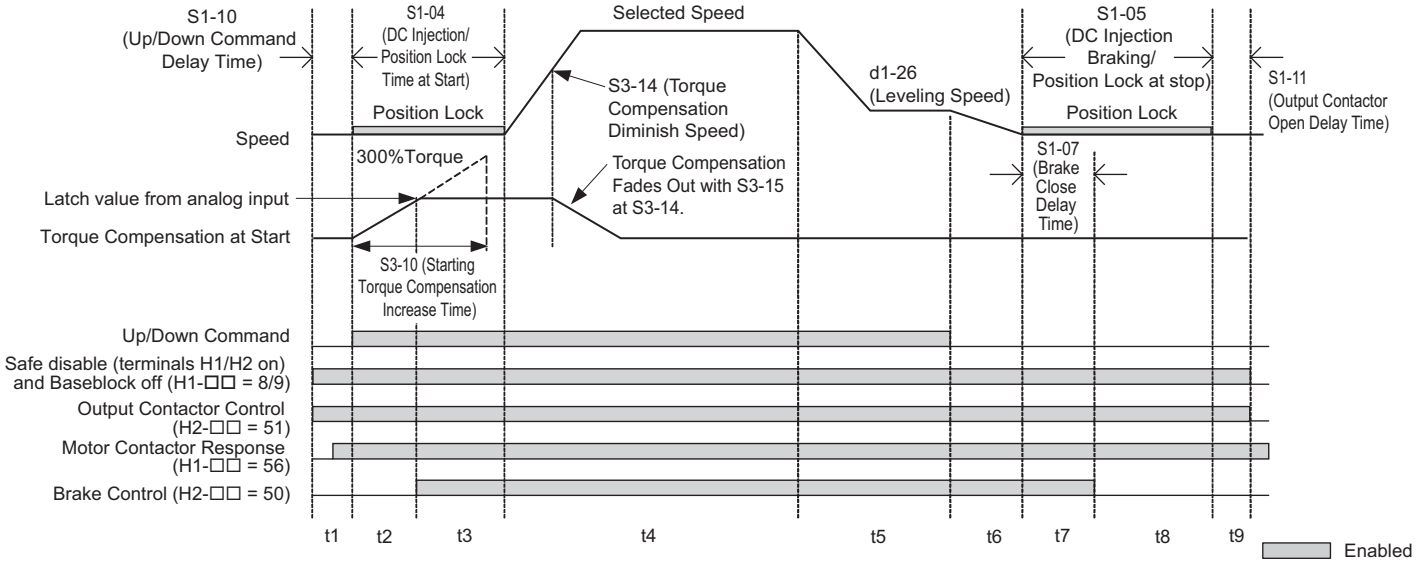


Figure 46 Brake Sequence Using Torque Compensation at Start

Figure 46 is divided into time zones. *Table 29* explains the sequence in each time zone.

Table 29 Time Zones for Brake Sequence Using Torque Compensation at Start

Time Zone	Description
t1	Up or Down command is issued.
	Safe Disable terminals H1-HC and H2-HC must be set and Baseblock must be disabled (digital inputs set to H1-☐☐ = 8/9).
	Speed reference must be selected by multi-function input terminals.
	Output contactor control signal is set (H2-☐☐ = 51) by the drive.
	Drive waits for the "Motor Contactor Feedback" signal (H1-☐☐ = 56) to be issued. If the motor contactor feedback is not received within t1, or if the feedback signal is on before the contactor control command has been issued, an SE1 fault is triggered. If the motor contactor feedback signal is not used, then the drive waits for the operation start delay time set in S1-10 to pass, then proceeds to the next step.
	The drive reads the torque value from the analog input (load cell).
t2	After the delay time set in S1-10 has passed, the drive outputs current to the motor. Position Lock begins.
	The torque value from the analog input is latched and internal torque compensation value is increased from zero to the latched value using the time constant set in S3-10.
	After the internal torque compensation level reaches the latched value, the drive sets the "Brake Control" output (H2-☐☐ = 50) in order to release the brake.
t3	The brake is released and the drive executes Position Lock until the time set in S1-04 has passed.
t4	The drive accelerates up to the selected speed. After the torque compensation diminish speed level (S3-14) is reached during acceleration, the internal torque compensation value is reduced in accordance with the time constant set in S3-10.
t5	Leveling speed is selected. The drive decelerates to the leveling speed and maintains that speed until the Up or Down command is removed.
t6	The Up or Down signal is cleared. The drive decelerates to zero speed.
t7	The motor speed reaches the zero speed level (S1-01). DC Injection Braking or Position Lock is then executed for the time set in S1-05.
	After the delay time to close the brake set in S1-07 has passed, the drive clears the "Brake Control" output (H2-☐☐ = 50). The brake applies.
t8	The drive continues DC Injection or Position Lock until the time S1-05 has passed. When S1-05 has passed the drive output is shut off.
t9	After the delay for the magnetic contactor set in S1-11 has passed, the drive resets the output terminal set for "Output Contactor Control" (H2-☐☐ = 51). The Safe Disable Inputs can be cleared and Baseblock can be enabled.

Adjusting the Torque Compensation at Start

CAUTION! *Set all motor-related parameters (the E☐-☐☐ parameters) and perform a test run before fine-tuning the torque compensation at start. Adjusting the torque compensation prematurely may result in faulty performance.*

To use torque compensation at start, apply at least 50% of the maximum weight to the elevator car and set the drive according to the Load Condition 2 procedure below. If using a voltage signal to the analog input terminals as a load sensor, then that input signal will determine the rate of torque compensation applied according to S3-27 and S3-28.

Before the torque compensation function can be used, the analog input scaling must be adjusted to the load sensor output. This can be done by bringing the elevator into two different load conditions and teaching the corresponding analog input value and torque reference value to the drive.

Note: **1.** This torque compensation requires a closed loop control mode (CLV, CLV/PM).
2. The torque compensation value is limited to 120%.

Set an analog input terminal for torque compensation (H3-☐☐ = 14) and proceed with the steps below.

Procedure for Load Condition 1 (S3-27, S3-29)

1. Make sure the drive is wired properly. For instructions, refer to *Standard Connection Diagram on page 25*.
2. Set the speed reference to 0%.
3. Apply no weight to the elevator car.
4. Note the value of the analog input monitor for the load signal input is connected to (U1-13 for terminal A1, U1-14 for terminal A2).
5. Provide an elevator Up or Down command, using Inspection Operation or normal operation mode. The car should be held in place when the brake releases.
6. Note the drives internal torque reference monitor U1-09.
7. Stop the drive.
8. Set the value noted in step 4 to parameter S3-29. Set the value noted in step 6 to parameter S3-27.

Procedure for Load Condition 2 (S3-28, S3-30)

1. Set the speed reference to 0%.
2. Apply load to the car has much as possible (at least 50% of the maximum weight).
3. Note the value of the analog input monitor for the load signal input connected to (U1-13 for terminal A1, U1-14 for terminal A2).
4. Provide an elevator Up or Down command, using Inspection Operation or normal operation mode. The car should be held in place when the brake releases.
5. Note the drives internal torque reference monitor U1-09.
6. Stop the drive.
7. Set the value noted in step 3 to parameter S3-30. Set the value noted in step 5 to parameter S3-28.

Figure 47 shows the Torque Compensation at Start settings with parameters S3-27 to S3-30.
The solid line in *Figure 47* indicates the torque compensation at start when the elevator moves up or down.

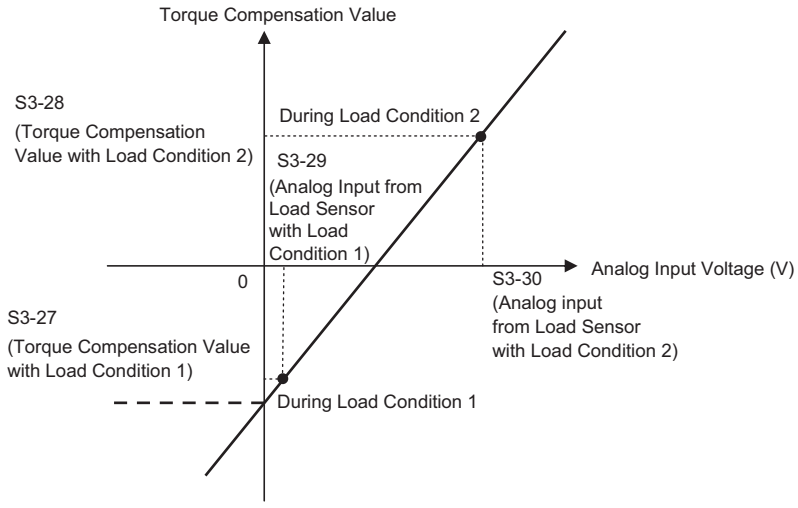


Figure 47 Torque Compensation at start for the Elevator in Up and Down Direction

Note: PRG: 7015 or earlier will apply a limit at 0 V torque compensation input value.
PRG: 7016 or later have no torque compensation limit when adding negative voltage to analog input voltage (see *Figure 47*).

After setting load conditions 1 and 2, perform a trial run. If required, parameter S3-12 can be set up to add a bias to the load sensor input when riding in a Down direction (default: 0.0%, same torque compensation characteristics in up and down direction). ***Figure 48*** illustrates the effect of torque compensation on the settings of S3-12 and S3-27 through S3-30.

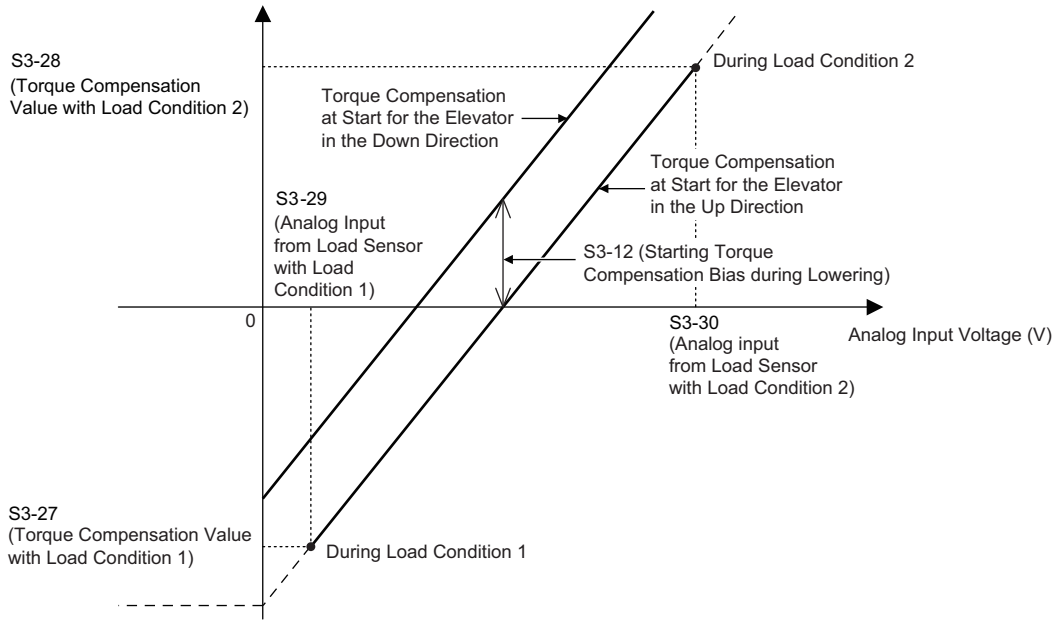


Figure 48 Torque Compensation at start for the Elevator in Up and Down Direction

◆ S: Elevator Parameters

This section describes various functions and faults needed to operate an elevator application: braking sequence, slip compensation, optimal adjustments at start and stop, Rescue Operation, and elevator-related faults.

■ S1-01: Zero Speed Level at Stop

Determines the speed to begin applying DC Injection (or Position Lock) when the drive is ramping to stop (b1-03 = 0). Set as a percentage of the maximum output frequency (E1-04).

No.	Parameter Name	Setting Range	Default
S1-01	Zero Speed Level at Stop	0.000 to 9.999%	Determined by A1-02

The function set by S1-01 changes depending on the control mode:

- V/f Control or OLV Control (A1-02 = 0, 2)
  For these control modes, parameter S1-01 sets the starting speed for DC Injection Braking at stop. Once the output speed falls below the setting of S1-01, the amount of DC Injection Braking current set in S1-03 is injected into the motor for the time set in parameter S1-05.
- CLV Control or CLV/PM Control (A1-02 = 3, 7)
  For these control modes, parameter S1-01 sets the starting speed for Position Lock at stop. Once the motor speed falls below the setting of S1-01, Position Lock is enabled for the time set in parameter S1-05.

■ S1-02: DC Injection Current at Start

Determines the amount of current to use for DC Injection at start. Set as a percentage of the drive rated current.

No.	Parameter Name	Setting Range	Default
S1-02	DC Injection Current at Start	0 to 100%	50%

■ S1-03: DC Injection Current at Stop

Determines the amount of current to use for DC Injection at stop. Set as a percentage of the drive rated current. When using OLV Control, the DC injection current is determined by multiplying S1-03 by S3-25 or S3-26.

No.	Parameter Name	Setting Range	Default
S1-03	DC Injection Current at Stop	0 to 100%	50%

■ S1-04: DC Injection / Position Lock Time at Start

Determines how long the drive should perform DC Injection at start. In CLV and CLV/PM, S1-04 determines how long Position Lock should be performed. During this time, the drive allows motor flux to develop, which is essential for applying torque quickly once the brake is released. A setting of 0.00 disables S1-04.

No.	Parameter Name	Setting Range	Default
S1-04	DC Injection / Position Lock Time at Start	0.00 to 10.00 s	0.40 s

■ S1-05: DC Injection / Position Lock Time at Stop

Determines how long the drive should perform DC Injection at stop. In CLV and CLV/PM, S1-05 determines how long Position Lock should be performed. A setting of 0.00 disables S1-05.

No.	Parameter Name	Setting Range	Default
S1-05	DC Injection / Position Lock Time at Stop	0.00 to 10.00 s	0.60 s

■ S1-06: Brake Release Delay Time

Determines the time that must pass after an Up/Down command is entered before the output terminal set for "Brake control" (H2-☐☐ = 50) is triggered.
Adjusting this delay time can help when there is not enough time to develop the appropriate amount of motor flux. Be sure to also increase the time S1-04 when setting S1-06 to relatively long delay time.

No.	Parameter Name	Setting Range	Default
S1-06	Brake Release Delay Time	0.00 to 10.00 s	0.20 s

■ S1-07: Brake Close Delay Time

Determines the time that must pass after zero speed is reached before the output terminal set for "Brake control" (H2-☐☐ = 50) is released.

No.	Parameter Name	Setting Range	Default
S1-07	Brake Close Delay Time	0.00 to [S1-05]	0.10 s

■ S1-10: Run Command Delay Time

Sets the time the drive waits after receiving an Up/Down command before starting operation. The time set should give the motor contactor enough time to close.

No.	Parameter Name	Setting Range	Default
S1-10	Run Command Delay Time	0.00 to 1.00 s	0.10 s

■ S1-11: Output Contactor Open Delay Time

Determines the time that must pass for an output terminal set for “Output contactor control” (H2-☐☐ = 51) to be released after the drive has stopped and drive output has been shut off.

No.	Parameter Name	Setting Range	Default
S1-11	Output Contactor Open Delay Time	0.00 to 1.00 s	0.10 s

■ S1-12: Motor Contactor Control During Auto-Tuning Selection

Note: Available in drive software PRG: 7016 or later.

Determines the state of the output contactor control command (H2-☐☐ = 51) during Auto-Tuning. The contactor closes as soon as the Enter key is pressed in the Auto-Tuning start menu.

No.	Parameter Name	Setting Range	Default
S1-12	Motor Contactor Control during Auto-Tuning	0 to 2 <1> <2>	0

<1> Setting 2 is available in drive software versions PRG: 7017 or later.

<2> Setting 4 is available in the control mode CLV or CLV/PM for drives with software versions PRG: 7017 or later. The setting is 0 or 1 for software version PRG: 7016.

Setting 0: Disabled
Setting 1: Enabled
Setting 2: Enabled during Auto-Tuning and HBB

WARNING! *Sudden Movement Hazard. Use parameter S1-12 to enable/disable automatic switching of the Motor Contactor Control output signal during Auto-Tuning. When using setting S1-12 = 1 or 2, ensure that the multi-function output terminals are properly wired and in the correct state before setting parameter S1-12. Failure to comply could result in damage to the drive, serious injury or death.*

■ S1-26: Emergency Stop Start Level

Note: Available in drive software PRG: 7017 or later.

Sets the Emergency Stop Start Level as a percentage of the Maximum Output Frequency. This setting is available when the control mode is set to Closed Loop Vector Control (A1-02 = 3) or Closed Loop Vector Control for PM Motors (A1-02 = 7) and the stopping method is set to Elevator Emergency Stop (b1-03 = 4).
The drive coasts to a stop after the Up/Down command is cleared and when the value of U1-05 (Speed Feedback) is equal to or greater than the value of S1-26 (Emergency Stop Start Level).
The drive ramps to a stop after the Up/Down command is cleared and when the value of U1-05 (Speed Feedback) is lower than the value of S1-26 (Emergency Stop Start Level).

No.	Parameter Name	Setting Range	Default
S1-26	Emergency Stop Start Level	0.0 to 100.0%	10.0%

■ S2-01: Motor Rated Speed

Sets the rated speed of the motor.

No.	Parameter Name	Setting Range	Default
S2-01	Motor Rated Speed	300 to 1800 rpm	1380 rpm

■ S2-02/S2-03: Slip Compensation Gain in Motoring Mode / Regenerative Mode

Slip compensation for leveling speed can be set separately for motoring and regenerative states to help improve the accuracy of leveling.

No.	Parameter Name	Setting Range	Default
S2-02	Slip Compensation Gain in Motoring Mode	0.0 to 5.0	0.7
S2-03	Slip Compensation Gain in Regenerative Mode	0.0 to 5.0	1.0

■ S2-05: Slip Compensation Torque Detection Delay Time

Sets a delay time before detecting torque for slip compensation.

No.	Parameter Name	Setting Range	Default
S2-05	Slip Compensation Torque Detection Delay Time	0 to 10000 ms	1000 ms

■ S2-06: Slip Compensation Torque Detection Filter Time Constant

Sets the filter time constant applied to the torque signal used for the slip compensation value calculation.

No.	Parameter Name	Setting Range	Default
S2-06	Slip Compensation Torque Detection Filter Time Constant	0 to 2000 ms	500 ms

■ S3-01 / S3-02: Position Lock Gain at Start 1 / 2

Sets gain levels 1 and 2 for the Position Lock at start function. Position Lock at start adjusts the internal torque reference value depending on the position deviation to hold the car in place when the brake is released. S3-01 sets the gain used to adjust the speed reference During Position Lock. S3-02 sets gain to adjust the internal torque reference directly (Anti-Rollback function).

Increase S3-01 and S3-02 if there is a problem with rollback when the brake is released. Decrease S3-01 and S3-02 if motor oscillation occurs during Position Lock.

No.	Parameter Name	Setting Range	Default
S3-01	Position Lock Gain at Start 1	0 to 100	5
S3-02	Position Lock Gain at Start 2 (Anti-Rollback Gain)	0.00 to 100.00	0.00

Note: **1.** Check the C5-☐☐ parameters to make sure the speed control loop settings are correct before making any adjustments to the Position Lock gain.
2. Sometimes a fault may occur with detecting the direction of motor rotation (dv4) when using Closed Loop Vector for PM motors. To correct this, either increase the settings of S3-01 and S3-02, or increase the number of pulses needed to trigger dv4 (F1-19).

■ S3-03: Position Lock Gain at Stop

Sets the gain used by the Position Lock control loop at stop to hold the car in place while the brake is applied.

Setting S3-03 to a high value will increase the ability of the drive to hold the car in place. Setting S3-03 too high can cause motor oscillation and car vibration.

No.	Parameter Name	Setting Range	Default
S3-03	Position Lock Gain at Stop	0 to 100	5

Note: **1.** Check the C5-☐☐ parameters to make sure the speed control loop settings are correct before making any adjustments to the Position Lock gain.
2. Faults may occur when detecting the direction of motor rotation (dv4) when using CLV/PM. To correct this, either increase the settings of S3-01 and S3-02, or increase the number of pulses required to trigger dv4 (F1-19).

■ S3-04: Position Lock Bandwidth

Determines the bandwidth around the locked position to enable a digital output set for H2-☐☐ = 33 (within position lock bandwidth). The output will be triggered when the car moves from the Position Lock start point to plus or minus the number of pulses set to S3-04.

No.	Parameter Name	Setting Range	Default
S3-04	Position Lock Bandwidth	0 to 16383	10

■ S3-10: Starting Torque Compensation Increase Time

Sets a time constant for the torque reference to reach 300%. Enabled by setting an analog input terminal for torque compensation (H3-☐☐ = 14).

No.	Parameter Name	Setting Range	Default
S3-10	Starting Torque Compensation Increase Time	0 to 5000 ms	500 ms

■ S3-12: Starting Torque Compensation Bias in Down Direction

Adds a bias to torque compensation in the Down direction.

Refer to *Adjusting the Torque Compensation at Start on page 88* for details.

No.	Parameter Name	Setting Range	Default
S3-12	Starting Torque Compensation Bias in Down Direction	–40.0 to 40.0%	0.00%

■ S3-14: Torque Compensation Diminish Speed

Sets the speed level for torque compensation to diminish during the time determined by S3-15. Set as a percentage of the maximum output frequency (E1-04). A setting of 0.0% disables this function.

No.	Parameter Name	Setting Range	Default
S3-14	Torque Compensation Diminish Speed	0.0 to 200.0%	0.0%

■ S3-15: Torque Compensation Diminish Time

Sets the time for torque compensation to diminish when motor speed reaches the level set in S3-14.

No.	Parameter Name	Setting Range	Default
S3-15	Torque Compensation Diminish Time	0 to 5000 ms	1000 ms

■ S3-16: Torque Limit Reduction Time

After Position Lock at stop, S3-16 determines the length of time to reduce the torque limit rate = $\frac{\text{Torque 300\%}}{\text{S3-16}}$

No.	Parameter Name	Setting Range	Default
S3-16	Torque Limit Reduction Time	0 to 10000 ms	100 ms

■ S3-20: Dwell 2 Speed Reference

Sets the speed reference for the Dwell 2 function.

Note: Setting this parameter to 0.00 disables the Dwell 2 function.

No.	Parameter Name	Setting Range	Default
S3-20	Dwell 2 Speed Reference	0.00 to 100.00%	0.00%

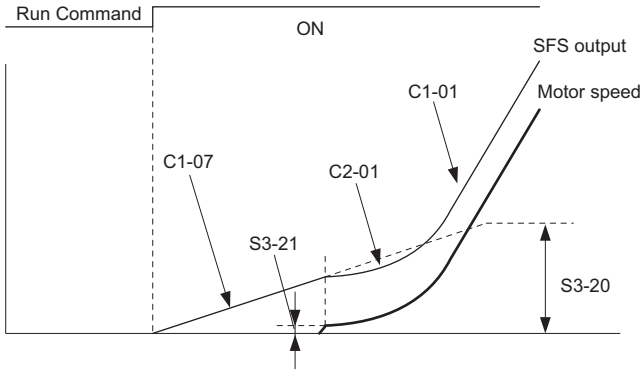


Figure 49 Dwell Speed Reference at Start

■ S3-21: Dwell 2 End Speed

The Dwell 2 function will end when the drive reaches this speed. A setting of 0.00 will disable the acceleration rate switch that occurs at the end of Dwell 2.

No.	Parameter Name	Setting Range	Default
S3-21	Dwell 2 End Speed	0.00 to 100.00%	0.00%

■ S3-25: DC Injection Gain in Regenerative Operation

In OLV Control, S3-25 sets a gain level for DC Injection at stop (S1-03) for when the regenerative load reaches 100%. At that time, the current applied during DC Injection at stop is determined as S1-03 × S3-25.

No.	Parameter Name	Setting Range	Default
S3-25	DC Injection Gain in Regenerative Operation	0 to 400%	100%

■ S3-26: DC Injection Gain in Motoring Operation

In OLV Control, S3-26 sets a gain level for DC Injection at stop (S1-03) when the motoring load reaches 100%. At that time, the current applied during DC Injection at stop is determined as S1-03 × S3-26.

No.	Parameter Name	Setting Range	Default
S3-26	DC Injection Gain in Motoring Operation	0 to 400%	20%

■ S3-27: Torque Compensation Value with Load Condition 1

Adjusts the analog signal from a load sensor for torque compensation. Refer to *Adjusting the Torque Compensation at Start on page 88* for details.

No.	Parameter Name	Setting Range	Default
S3-27	Torque Compensation Value with Load Condition 1	-100.0 to 100.0%	-50.0%

■ S3-28: Torque Compensation Value with Load Condition 2

Adjusts the analog signal from a load sensor for torque compensation. Refer to *Adjusting the Torque Compensation at Start on page 88* for details.

No.	Parameter Name	Setting Range	Default
S3-28	Torque Compensation Value with Load Condition 2	-100.0 to 100.0%	50.0%

■ S3-29: Analog Input from Load Sensor with Load Condition 1

Adjusts the analog signal from a load sensor for torque compensation. Refer to *Adjusting the Torque Compensation at Start on page 88* for details.

No.	Parameter Name	Setting Range	Default
S3-29	Analog Input from Load Sensor with Load Condition 1	-100.0 to 100.0%	0.0%

■ S3-30: Analog Input from Load Sensor with Load Condition 2

Adjusts the analog signal from a load sensor for torque compensation. Refer to *Adjusting the Torque Compensation at Start on page 88* for details.

No.	Parameter Name	Setting Range	Default
S3-30	Analog Input from Load Sensor with Load Condition 2	-100.0 to 100.0%	100.0%

■ S3-34: Anti-Rollback Torque Bias 1

Sets an intermediary value for the torque bias used for Anti-Rollback when Position Lock at start is performed. This setting rarely needs to be changed.

No.	Parameter Name	Setting Range	Default
S3-34	Anti-Rollback Torque Bias 1	0.0 to 100.0%	0.0%

■ S3-35: Anti-Rollback Torque Bias 2

Sets a maximum value for the torque bias used for Anti-Rollback when Position Lock at start is performed. This setting rarely needs to be changed.

No.	Parameter Name	Setting Range	Default
S3-35	Anti-Rollback Torque Bias 2	0.0 to 100.0%	0.0%

■ S3-37: Position Deviation Level to Apply Anti-Rollback Torque Bias 1

Sets the position deviation level to activate at Anti-Rollback Torque Bias 1 (S3-34). This setting rarely needs to be changed.

No.	Parameter Name	Setting Range	Default
S3-37	Position Deviation Level to Apply Anti-Rollback Torque Bias 1	0 to 32767	0

■ S3-38: Position Deviation Level to Apply Anti-Rollback Torque Bias 2

Determines the position deviation level when the drive should switch from the Anti-Rollback torque bias set in S3-34 to the torque bias set in S3-35. This setting rarely needs to be changed.

No.	Parameter Name	Setting Range	Default
S3-38	Position Deviation Level to Apply Anti-Rollback Torque Bias 2	0 to 32767	0

■ S3-39: Anti-Rollback Integral Gain

Determines the drive responsiveness for Anti-Rollback during Position Lock.

Increasing the value set to S3-39 may help if there is still too much deviation from the Position Lock start position after Position Lock gain 1 and gain 2 have already been adjusted. Lower S3-39 if oscillation occurs. This parameter rarely needs to be changed.

No.	Parameter Name	Setting Range	Default
S3-39	Anti-Rollback Integral Gain	-30.00 to 30.00	0.00

■ S3-40: Anti-Rollback Movement Detection

Sets the amount of speed feedback signal pulses to detect a movement of the rotor.

No.	Parameter Name	Setting Range	Default
S3-40	Anti-Rollback Movement Detection	0 to 100 pulses	1 pulse

■ S3-41: Position Lock Gain at Start 2 Reduction

Sets a reduction factor for the Position Lock Gain at Start 2 (Anti Rollback Gain) set in parameter S3-02.

If the motor rotation (i.e., car movement) is below the movement detection level set to S3-40, the drive will reduce the Anti-Rollback gain according to the gain reduction level set in S3-41.

No.	Parameter Name	Setting Range	Default
S3-41	Position Lock Gain at Start 2 Reduction	0.00 to 1.00	0.50

■ S4-01: Light Load Direction Search Selection

Enables and disables the Light Load Direction Search.

No.	Parameter Name	Setting Range	Default
S4-01	Light Load Direction Search Selection	0 to 2	0

Setting 0: Disabled
Setting 1: Enabled
Setting 2: Enabled for motor 1 only

■ S4-02: Light Load Direction Search Method

Determines the method used to perform Light Load Direction Search.

No.	Parameter Name	Setting Range	Default
S4-02	Light Load Direction Search Method	0 or 1	1

Setting 0: Output current
Setting 1: Detect direction of regeneration

■ S4-03: Light Load Direction Search Time

Sets the time to perform Light Load Direction Search.

No.	Parameter Name	Setting Range	Default
S4-03	Light Load Direction Search Time	0.0 to 5.0 s	1.0 s

■ S4-04: Light Load Direction Search Speed Reference

Sets the speed reference to use during Light Load Direction Search.

No.	Parameter Name	Setting Range	Default
S4-04	Light Load Direction Search Speed Reference	0.00 to 20.00%	Determined by A-02

■ S4-05: Rescue Operation Torque Limit

Sets the torque limit used during Rescue Operation.

No.	Parameter Name	Setting Range	Default
S4-05	Rescue Operation Torque Limit	0 to 300%	100%

■ S4-06: Rescue Operation Power Supply Selection

Specifies the type of backup power supply the drive should switch to when the power goes out.

No.	Parameter Name	Setting Range	Default
S4-06	Rescue Operation Power Supply Selection	0 to 2	0

Setting 0: Battery
Setting 1: UPS (single-phase)
Setting 2: UPS (three-phase)

■ S4-07: UPS Power

Sets the capacity of the UPS.

No.	Parameter Name	Setting Range	Default
S4-07	UPS Power	0.0 to 100.0 kVA	0.0 kVA

■ S4-08: UPS Operation Speed Limit Selection

Determines how a speed limit should be applied to the Rescue Operation speed (S4-15) when operating from a UPS. The drive calculates the appropriate speed limit based on the UPS capacity set in S4-07. This speed limit helps prevent voltage saturation and motor stall during Rescue Operation.

No.	Parameter Name	Setting Range	Default
S4-08	UPS Operation Speed Limit Selection	0 to 2	2

Setting 0: Disabled
Setting 1: Enabled until Light Load Direction Search is complete
Setting 2: Enabled until stop

■ S4-12: DC Bus Voltage during Rescue Operation

Sets the DC bus voltage during Rescue Operation.

No.	Parameter Name	Setting Range	Default
S4-12	DC Bus Voltage during Rescue Operation	0 to 1150 V	0 V

■ S4-13: Rescue Operation Power Supply Deterioration Detection Level

Determines at which level of backup power supply deterioration a PF5 fault is triggered. The following conditions will trigger PF5:

- During Rescue Operation, DC bus voltage < [S4-12 × (S4-13 - 10%)]
- 100 ms after Rescue Operation has been triggered, the DC bus voltage does not rise above S4-12 × S4-13 before the motor starts

No.	Parameter Name	Setting Range	Default
S4-13	Rescue Operation Power Supply Deterioration Detection Level	10 to 100%	80%

■ S4-15: Speed Reference Selection at Rescue Operation

Note: Available in drive software PRG: 7016 or later.

Selects the speed reference used for Rescue Operation.

No.	Parameter Name	Setting Range	Default
S4-15	Speed Reference Selection for Rescue Operation	0, 1	0

Setting 0: The setting of parameter d1-25 is used as speed reference for Rescue Operation
Setting 1: The speed selected by digital inputs is used as speed reference

■ Short Floor Function

Short Floor automatically adjusts the speed in order to reduce the leveling time if leveling speed was activated before the selected speed was reached. Short Floor is enabled setting S5-01 = 1. The drive calculates the distance to decelerate from rated speed to the leveling speed, then controls the stop so that the stopping time is shortened. In ***Figure 50*** below, area S indicates the distance for a stop from nominal speed.

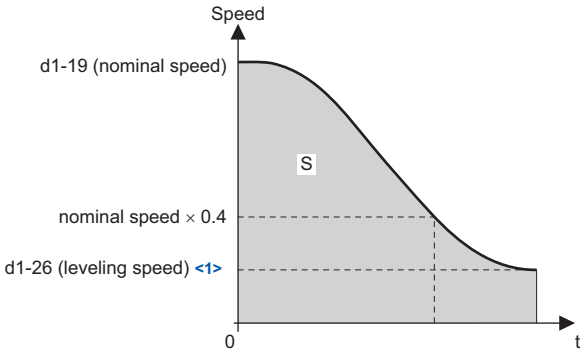


Figure 50 Speed During Normal Operation

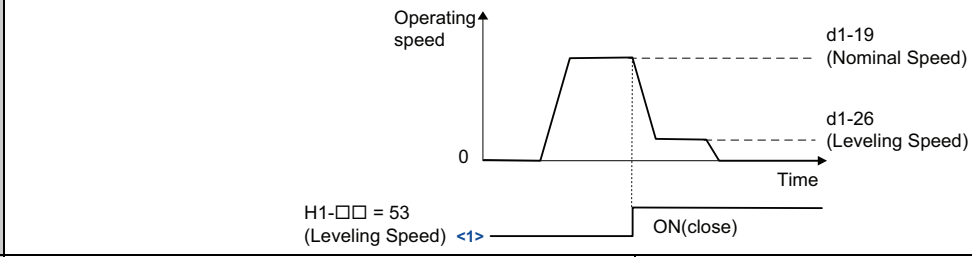
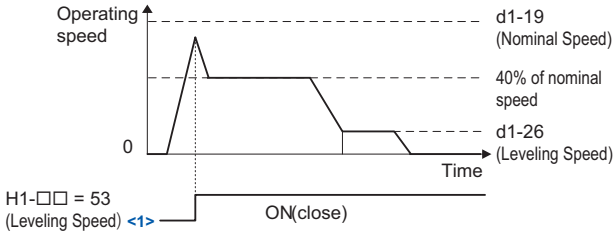
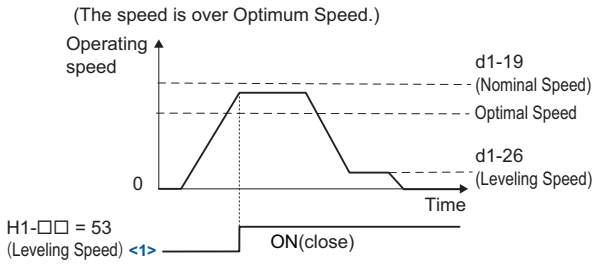
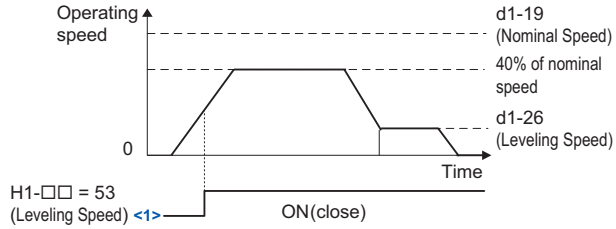
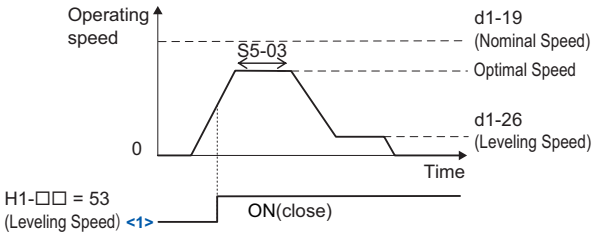
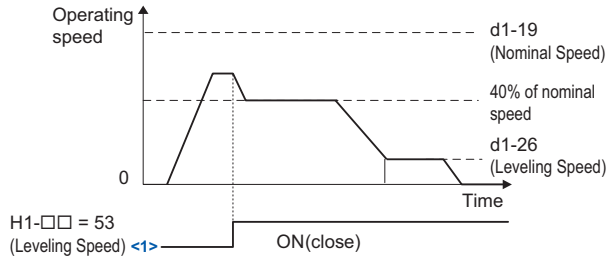
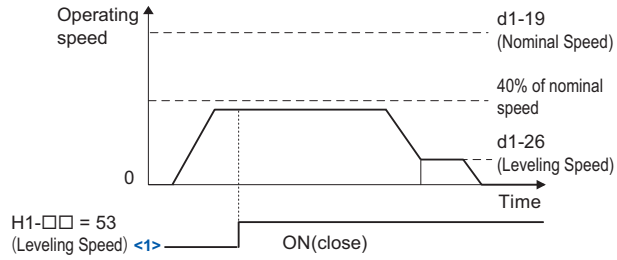
<1> The drive will recognize the speed reference that is lower than the Leveling Speed Detection Level (d1-28) as the leveling speed if the speed priority is set for multi-step speed reference (d1-18 = 0 or 3).

Advance Short Floor

Advanced Short Floor minimizes the operation time to arrive at a designated floor. It uses the leveling speed once the leveling speed command is entered via one of the multi-function inputs (H1-☐☐ = 53). Advance Short Floor calculates optimal speed based on the Short Floor Minimum Constant Speed Time (S5-03) and the currently selected deceleration rate.

Table 30 explains the Short Floor and Advance Short Floor functions.

Table 30 Short Floor Operation Example

Leveling Speed Input Timing	Short Floor	Advanced Short Floor
Constant speed operation at rated speed (normal stop sequence)		
During acceleration	(The speed is 40% of the nominal speed or more.) 	(The speed is over Optimum Speed.) 
	(The speed is less than 40% of the nominal speed.) 	(The speed is optimal speed or less.) 
Constant speed operation at less than the rated speed	(The speed is 40% of the nominal speed or more.) 	Not Available.
	(The speed is less than 40% of the nominal speed.) 	
Before start	Operates at the leveling speed.	

<1> The drive will recognize the speed reference that is lower than the Leveling Speed Detection Level (d1-28) as the leveling speed if the speed priority is set for multi-step speed reference (d1-18 = 0 or 3).

■ S5-01: Short Floor Operation Selection

Enables and disables the Short Floor function.

Note: **1.** The Short Floor and Advanced Short Floor functions cannot be used during Rescue Operation.
2. Do not use Short Floor or Advanced Short Floor when the analog input terminals are configured to supply the speed reference.
3. The drive will accelerate or decelerate to the specified speed reference at the specified Accel/Decel rate if the speed priority is set for multi-step speed reference (d1-18 = 0 or 3) and the leveling speed reference is selected during Short Floor or Advanced Short Floor.

No.	Parameter Name	Setting Range	Default
S5-01	Short Floor Operation Selection	0 to 2	0

Setting 0: Disabled
Setting 1: Enabled (Short Floor Operation)
Setting 2: Enabled (Advanced Short Floor Operation)

■ S5-02: Nominal Speed for Short Floor Calculation

Determines the rated speed used to calculate the distance for the Short Floor function when speed priority is set for Multi-step Speed Reference (d1-18 = 0 or 3).

No.	Parameter Name	Setting Range	Default
S5-02	Nominal Speed for Short Floor Calculation	0.0 to 100.0%	0.0%

■ S5-03: Short Floor Minimum Constant Speed Time

Sets the minimum time of the constant speed operation when the Advanced Short Floor function is enabled (S5-01 = 2).

No.	Parameter Name	Setting Range	Default
S5-03	Short Floor Minimum Constant Speed Time	0 to 2.0 s	0.0 s

■ S5-04: Distance Calculation Acceleration Time Gain

Sets the gain used to adjust the jerk at acceleration for an optimum speed calculation when Short Floor Operation Selection (S5-01) is set to 2.

- Increase the gain level set to S5-04 and S5-05 if the leveling time is too short or if the optimum speed calculated by the drive is too fast.
- Decrease the gain level set to S5-04 and S5-05 if the leveling time is too long or if the optimum speed calculated by the drive is too slow.

No.	Parameter Name	Setting Range	Default
S5-04	Distance Calculation Acceleration Time Gain	50.0 to 200.0%	150.0%

Note: Setting S5-04 too low may trigger an overrun due to faster optimum speeds and shortened leveling times. Avoid setting this gain less than 100%.

■ S5-05: Distance Calculation Deceleration Time Gain

Sets the gain used to adjust the jerk at deceleration and optimum speed calculation when Short Floor Operation Selection (S5-01) is set to 2.

- Increase the gain level set to S5-04 and S5-05 if the leveling time is too short or if the optimum speed calculated by the drive is too fast.
- Decrease the gain level set to S5-04 and S5-05 if the leveling time is too long or if the optimum speed calculated by the drive is too slow.

No.	Parameter Name	Setting Range	Default
S5-05	Distance Calculation Deceleration Time Gain	50.0 to 200.0%	150.0%

Note: Setting S5-05 too low may trigger an overrun due to faster optimum speeds and shortened leveling times. Avoid setting this gain less than 100%.

■ Leveling Distance Control

Leveling Distance Control uses the accel/decel rate, jerk settings, and stopping distance to automatically calculate a speed sequence and arrive at the designated floor with increased accuracy. Two types of Leveling Distance Control are available that allow the user to select the Stopping Method (S5-10).

WARNING! *Inadvertent Movement Hazard. The elevator will not stop at the designated location and an overrun will occur which may cause injury to personnel if parameters o1-20, S5-11, and S5-12 are set incorrectly. Before using Leveling Distance Control, make sure that parameters for Traction Sheave Diameter (o1-20), Deceleration Distance (S5-11) and the Stop Distance (S5-12) are set to the correct units.*

Note: Leveling Distance Control should be used only for elevators with a constant stopping distance. Do not use Leveling Distance Control in elevators where the stopping distance changes frequently.

The following functions are disabled when Leveling Distance Control is selected:

- Switching between deceleration times
- Droop Control (b7 parameters)
- Shoot Floor, Advanced Short Floor (S5-01 = 1, 2)

Leveling Distance Control is disabled when any one of the following functions are selected:

- Analog frequency reference
- Rescue Operation
- Inspection Operation
- During Motor 2 selection

Direct Landing

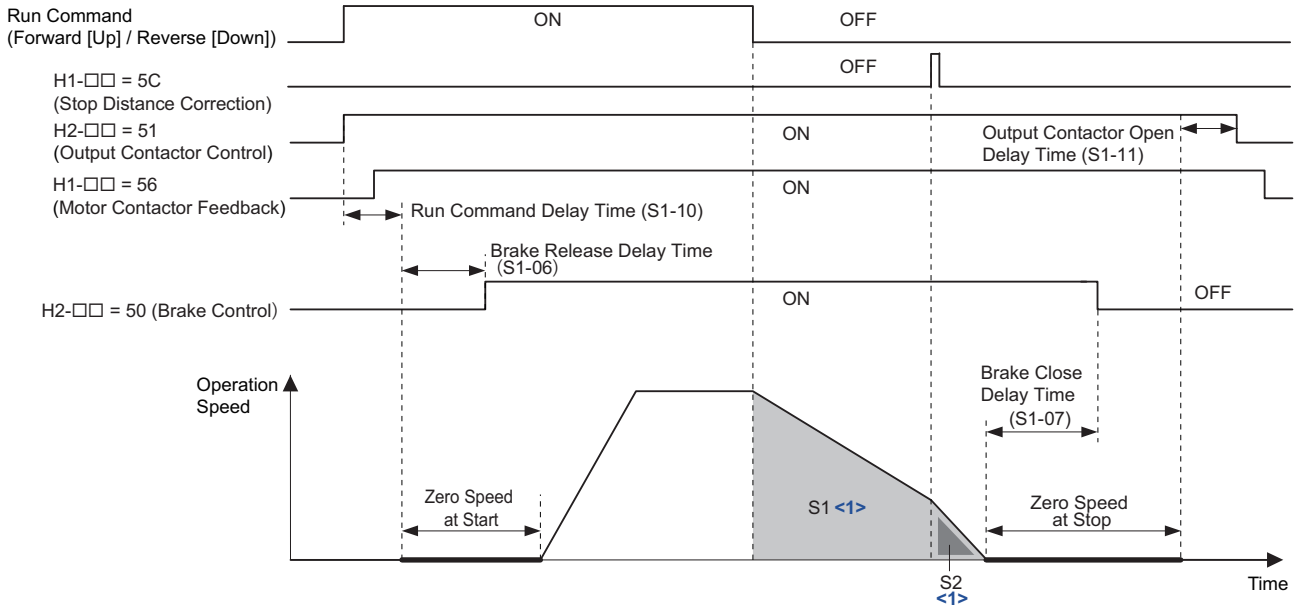
Direct Landing (S5-10 = 1) is activated at the start of deceleration, and brings the elevator car to the designated floor without the use of the leveling speed.

Direct Landing disables Leveling Distance Control, and uses a speed reference calculated by multiplying E1-04 times S5-13. If a Stop distance correction command (H1-☐☐ = 5C) is triggered during Direct Landing, then the drive will switch to the stop distance set in S5-12 for the remaining distance. Direct Landing will end once data from the encoder indicates that the stopping distance is 0.

Figure 51 illustrates a Direct Landing Operation example.

Table 31 Conditions for Direct Landing

Speed Priority	Direct Landing Start Conditions
Multi-step speed sequence (d1-18 = 0, 3)	Speed reference ≥ E1-04 × S5-13 and the Up/Down command is not active or the speed reference is 0.
High speed reference has priority (d1-18 = 1)	The Up/Down command is not active, the speed reference is 0, or the leveling speed reference has been selected by one of the multi-function input terminals (H1-☐☐).
Leveling speed reference has priority (d1-18 = 2)	



<1> Area S1 is the deceleration distance (S5-11) from the start of deceleration to stop. Area S2 is the stopping distance (S5-12) from the point at which the stopping distance compensation signal is entered to when the car arrives at the designated floor.

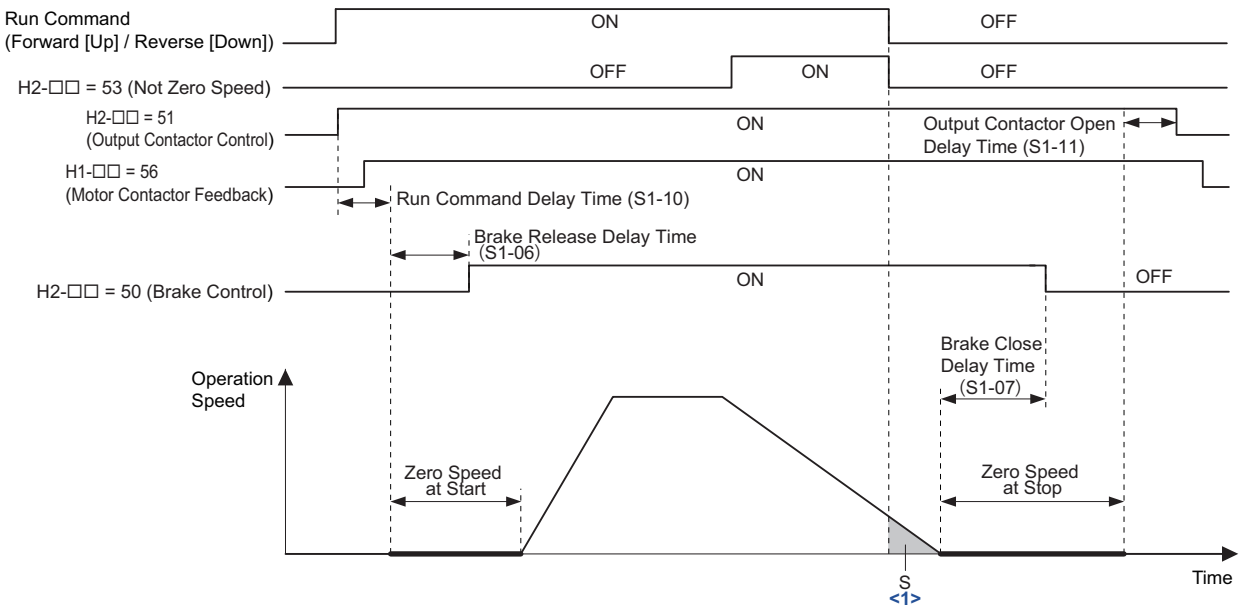
Figure 51 Direct Landing Operation Example

Leveling Distance Control

Leveling Distance Control (S5-10 = 2) uses the leveling speed reference for the remaining distance to arrive at the designated floor. Leveling Distance Control is activated when the conditions listed in ***Table 32*** are met.

Table 32 Leveling Distance Control Operation

Speed Priority Selection	Multi-Function Input Terminal Settings	Leveling Distance Control Start Conditions
Multi-step speed sequence (d1-18 = 0, 3)	–	The Up/Down command is not active or the speed reference is 0.
High speed reference has priority (d1-18 = 1)	Leveling speed reference is selected (H1-□□ = 53).	The Up/Down command is not active, or all input terminals set for H1-□□ = 50 to 53 are open.
	Leveling speed reference is not selected (H1-□□ ≠ 53).	Up/Down command is not active.
Multi-step speed sequence (d1-18 = 2)	Rated speed reference is selected (H1-□□ = 50).	The Up/Down command is not active, or all input terminals set for H1-□□ = 50 to 53 are open.
	Rated speed reference is not selected (H1-□□ ≠ 50).	Up/Down command is not active.



<1> Area S is the stopping distance (S5-12) from the point at which leveling operation is complete to when the car arrives at the designated floor.

Figure 52 Operation Sequence Example for Leveling Distance Control

■ S5-10: Stopping Method Selection

Selects the stopping method.

No.	Parameter Name	Setting Range	Default
S5-10	Stopping Method Selection	0 to 2	0

Setting 0: Disable
Setting 1: Direct Landing
Setting 2: Leveling Distance Control

■ S5-11: Deceleration Distance

Sets the deceleration distance when Stop Distance Control is enabled. *Refer to Direct Landing on page 103* for details.

No.	Parameter Name	Setting Range	Default
S5-11	Deceleration Distance	0 to 32767 mm <1>	0 mm

<1> The setting range becomes 0.00 to 650.00 inches when the length units are set for inches (o1-12 = 1).

■ S5-12: Stop Distance

Sets the stopping distance when Stop Distance Control is enabled. Refer to *Direct Landing on page 103* and *Leveling Distance Control on page 104* for details.

No.	Parameter Name	Setting Range	Default
S5-12	Stop Distance	0 to 10000 mm <1>	0 mm

<1> The setting range becomes 0.00 to 393.00 inches when the length units are set for inches (o1-12 = 1).

■ S5-13: Direct Landing Minimum Speed Level

Sets the speed level for the start of Direct Landing. Direct Landing is disabled if the starting speed for Direct Landing is less than the maximum output speed multiplied by this parameter (E1-04 × S5-13).

No.	Parameter Name	Setting Range	Default
S5-13	Direct Landing Minimum Speed Level	0 to 100%	20%

■ S6-01: Motor Contactor Response Error (SE1) Detection/Reset Selection

Determines when the drive should detect a motor contactor response error (SE1). SE1 is triggered if there is no response from the motor contactor within the time set in S6-10 after the contactor control output has been set.

No.	Parameter Name	Setting Range	Default
S6-01	Motor Contactor Response Error (SE1) Detection/Reset Selection	0 to 2	0

Setting 0: Detect during stop, SE1 must be manually reset
Setting 1: Detect during stop, SE1 can be automatically reset
Setting 2: No SE1 detection

■ S6-02: Starting Current Error (SE2) Detection Delay Time

Sets a delay time for starting current error (SE2). SE2 is detected when the drive output current is below 25% after the Up/Down command has been entered and the brake release time and the time set to S6-02 have both passed. The brake control command will not be issued (brake stays applied).

No.	Parameter Name	Setting Range	Default
S6-02	Starting Current Error (SE2) Detection Delay Time	0.00 to [S1-04 - S1-06]	200 ms

■ S6-03: SE2 Detect Current Level

Note: Available in drive software PRG: 7017 or later.

Sets the level of current applied to the motor when the Brake Control command is activated, as a percentage of the Motor No-load Current (E2-03). A Starting Current Error (SE2) occurs when the drive's output current is less than the value in S6-03 after both the Brake Release Delay Time (S1-06) and the SE2 Detection Delay Time (S6-02) have passed after a RUN command.

No.	Parameter Name	Setting Range	Default
S6-03	SE2 Detect Current Level	0 to 100%	25%

■ S6-04: Output Current Error (SE3) Detection Delay Time

Sets a delay time for detecting an output current fault (SE3). SE3 is detected when the drive output current drops below 25% after the brake has released.

No.	Parameter Name	Setting Range	Default
S6-04	Output Current Error (SE3) Detection Delay Time	0 to 5000 ms	200 ms

■ S6-05: Brake Response Error (SE4) Detection Time

Sets a delay time for detecting a brake response error (SE4). SE4 is detected when an output terminal set for "Brake release" (H2-☐☐ = 50) and an input terminal set for "Brake feedback" (H1-☐☐ = 79) do not match for the time set to S6-05.

No.	Parameter Name	Setting Range	Default
S6-05	Brake Response Error (SE4) Detection Time	0 to 10000 ms	500 ms

■ S6-10: Overacceleration Detection Level

If the elevator car accelerates at an abnormal rate, the drive triggers an overacceleration fault (dv6) and the motor coasts to stop. Parameter S6-10 determines the acceleration rate that triggers the dv6 fault. A setting of 0.0 m/s^2 disables overacceleration detection.

No.	Parameter Name	Setting Range	Default
S6-10	Overacceleration Detection Level	0.0 to 20.0 m/s^2	1.5 m/s^2 <1>

<1> Default setting is determined by parameter o1-03. If o1-03 is set to 0 through 5, the default is 1.5 m/s2. If o1-03 is set to 6, the default is 5.0 ft/s^2 (setting range: 0.0 to 50.0 ft/s^2).

■ S6-11: Overacceleration Detection Time

Sets the time that the acceleration must exceed the overacceleration detection level before as fault is triggered.

No.	Parameter Name	Setting Range	Default
S6-11	Overacceleration Detection Time	0 to 5000 ms	50 ms

■ S6-12: Overacceleration Detection Selection

Determines the conditions for detecting an overacceleration situation.

No.	Parameter Name	Setting Range	Default
S6-12	Overacceleration Detection Selection	0 or 1	0

Setting 0: Always enabled
Setting 1: During run only

■ S6-15: Speed Reference Loss Detection

Enabled or disables detection for missing speed reference (FrL).

No.	Parameter Name	Setting Range	Default
S6-15	Speed Reference Loss Detection	0 or 1	1

Setting 0: Disabled
Setting 1: Enabled

■ S6-16: Restart after Baseblock Selection

Allows the drive to restart the motor after returning to normal operation from Baseblock state (H1-☐☐ = 8/9) or from Safe Torque-Off state (Safe Disable inputs H1 and H2 enabled) while the Up/Down command is still active.

No.	Parameter Name	Setting Range	Default
S6-16	Restart after Baseblock Selection	0 or 1	0

Setting 0: No restart after Baseblock or Safe Torque-Off

Do not restart the motor when leaving the Baseblock or Safe Torque-Off state even if an Up/Down command is still active.

Setting 1: Restart after Baseblock or Safe Torque-Off

Restart when the Up/Down command is still active while the Baseblock or Safe Torque-Off state is left. To use this function with the Safe Disable function, parameter L8-88 must be set to 1.

■ Rescue Operation

In the event of a power outage, Rescue Operation allows the elevator to travel to the nearest floor by switching to a backup battery or UPS (Uninterruptable Power Supply) for power.

An input terminal set for Rescue Operation (H1-□□ = 55) can be used to initiate Rescue Operation. During Rescue Operation, the drive uses the speed reference set in S4-15 to travel to the nearest floor.

NOTICE: *Equipment Hazard. Do not use the Rescue Operation feature for extended periods. Failure to comply may result in drive heat sink overtemperature alarms (oH).*

NOTICE: *When changing parameters while the drive is supplied from the rescue operation power supply, wait at least 5 s after entering parameters before switching off the power supply. Instantly switching off the power can cause parameter settings corruption that can only be resolved by initializing the drive. This may cause erroneous drive performance.*

NOTICE: *Always turn off the RUN command before changing the setting of parameters d1-18 (Speed Reference Selection Mode), b1-01 (Speed Reference Selection), or H1-□□ (Multi-Function Digital Inputs). If the RUN command is on when changing any of these settings, the motor may unexpectedly start running, and could result in injury.*

Drive Power Supply for Rescue Operation

There are various methods of supplying power to the drive for rescue operation. Independent of the chosen method, the voltage in the DC bus of the drive and the voltage supplied to the drive control circuit must meet the specifications provided in ***Table 33***.

The DC bus voltage can either be supplied by a battery connected to the DC bus terminals of the drive or by a UPS connected to drive terminals L1 and L2. The control circuit voltage can be supplied directly from the drives DC bus (no external wiring required), from an external battery (connection to CN19), or by using an optional 24 Vdc control power backup unit.

When using a single-phase AC power supply for rescue operation such as a single-phase UPS, the ripple in the DC bus voltage will be higher than with a three-phase or battery supply. Make sure that the DC bus voltage never falls below the minimum value listed in ***Table 33***.

When using a PM motor with an incremental PG encoder and a PG-X3 option card, always perform Initial Magnet Pole Search Parameters Auto-Tuning (T2-01=3) with the normal power supply connected. The tuning function will prepare the drive for Rescue Operation by automatically setting certain parameters. If the tuning ends with an “End8” to “End10” fault, then rescue operation will require a battery or UPS that supplies the drive DC bus with at least 280 Vdc for 200 V class drives, 560 Vdc for 400 V class drives, and 700 Vdc for 600 V class drives. Alternatively utilize to an absolute PG encoder and a PG-E3 or PG-F3 option card.

If the DC bus voltage is low, the overload protection level (oL2 fault detection level) will be reduced due to the low speed run and the drive overload (oL2) will be triggered. If oL2 is detected, select the battery or UPS so that the output speed is equal to or greater than 6 Hz.
The upper speed limit during rescue operation can be monitored by U4-40.

Table 33 Power Supply Ratings for Rescue Operation

Motor Type	Speed Feedback	DC Bus Voltage	Control Circuit Voltage
Induction Motor	Without PG Encoder or Incremental PG Encoder with PG-B3 or PG-X3 option card	200 V class drives: 48 to 340 Vdc 400 V class drives: 48 to 680 Vdc 600 V class drives: 48 to 850 Vdc	When supplied from a battery or the drive DC bus: 200 V class drives: 250 to 340 Vdc 400 V class drives: 280 to 680 V (recommended: 500 to 680 Vdc) 600 V class drives: 280 to 850 V (recommended: 720 to 850 Vdc) When supplied via a 24 Vdc control power backup unit: 200 V, 400 V and 600 V class drives: 24 Vdc
Permanent Magnet Motor	Incremental PG Encoder with PG-X3 option card "End8" to "End10" error occurs during Initial Magnet Pole Search Auto-Tuning.	200 V class drives: 280 to 340 Vdc 400 V class drives: 560 to 680 Vdc 600 V class drives: 700 to 850 Vdc	
	Incremental PG Encoder with PG-X3 option card No error occurs during Initial Magnet Pole Search Auto-Tuning.	200 V class drives: 72 to 340 Vdc 400 V class drives: 144 to 680 Vdc 600 V class drives: 207 to 850 Vdc	
	Absolute PG Encoder with PG-F3 or PG-E3 option card	200 V class drives: 48 to 340 Vdc 400 V class drives: 48 to 680 Vdc 600 V class drives: 48 to 850 Vdc	

Parameter Setup

Adjust drive parameters as described below when using Rescue Operation.

- Select the type of Rescue Operation power supply for the drives main circuit in parameter S4-06.
- When using a UPS, set the UPS power value to parameter S4-07. Use parameter S4-08 to decide if the Rescue Operation speed shall be limited automatically depending on the UPS power.
- If deterioration of the battery or UPS shall be detected, also set up parameters S4-12 and S4-13. Measure the DC bus voltage during operation using the rescue power supply and set the measured value to parameter S4-12. Set the deterioration detection level to parameter S4-13.
- Set parameters S4-01 to S4-04 if light load direction search shall be automatically performed when Rescue Operation is started.

Wiring Examples

Switching the main power supply to a battery or UPS requires magnetic contactors that must be controlled by an external controller. Wiring methods and the sequence used for the magnetic contactors depend on the application. This instruction manual describes the following configurations:

- A single-phase, 230 V UPS is used as backup power supply for a 200 V, 400 V or 600 V class drive.
- Two separate batteries for the main power and control power supplies. Main power battery voltage is below 250 Vdc for 200 V class drives, 500 Vdc for 400 V class drives, or 720 Vdc for 600 V class drives.
- Two separate batteries. One is used for the main power supply, a second battery supplies the controller via an optional 24 V Backup Power Supply Unit.
- A single battery with minimum 250 Vdc for 200 V class drives, 500 Vdc for 400 V class drives, or 720 Vdc for 600 V class drives is used for the main and control power supply.

Select the configuration that matches your application. Follow the corresponding instructions for wiring and drive settings. For configurations not covered in the list above, contact your Yaskawa representative or our sales office directly for consultation.

WARNING! *Electrical Shock Hazard. Do not connect or disconnect wiring while the power is on. Never remove or install option cards or attempt to replace the cooling fan while the drive is switched on. Make sure that the drive and all devices connected to the drive have been shut off prior to performing and type of maintenance or wiring. After shutting off the power, wait for at least the amount of time specified on the drive before touching any components or perform wiring. The internal capacitor remains charged even after the power supply is turned off.*

NOTICE: *Be sure to thoroughly read the instructions for wiring and magnetic contactor sequence described in this section before setting up the drive for Rescue Operation. Failure to follow these instructions can damage the drive.*

NOTICE: *Refrain from using Rescue Operation for extend periods of time. Rescue Operation uses a low DC bus voltage, which can cause the cooling fan to shut off temporarily during Rescue Operation. Continuing to operate under these conditions can trigger an overheat fault and damage the drive.*

NOTICE: *Install the inrush current suppression circuit outside the drive if the DC bus battery voltage is lower than 190 Vdc for 200 V*

NOTICE: *Install the inrush current suppression circuit outside the drive if the DC bus battery voltage is lower than 190 Vdc for 200 V class drives of models CIMR-LU2A0215 to 2A0415, 380 Vdc for 400 V class drives of models CIMR-LU4A0150 to 4A0605, and 500 Vdc for 600 V class drives of models CIMR-LU5A0099 to 5A0200. Failure to comply will cause the soft-charge bypass relay to remain open and result in damage to the drive.*

Using a Single-Phase, 230 Vac UPS (Uninterruptable Power Supply)

Follow the instructions when using a single-phase 230 V UPS for Rescue Operation. A 230 V UPS can be used for 200 V, 400 V and 600 V class drives.

Wiring

Refer to ***Figure 53*** for a wiring diagram.

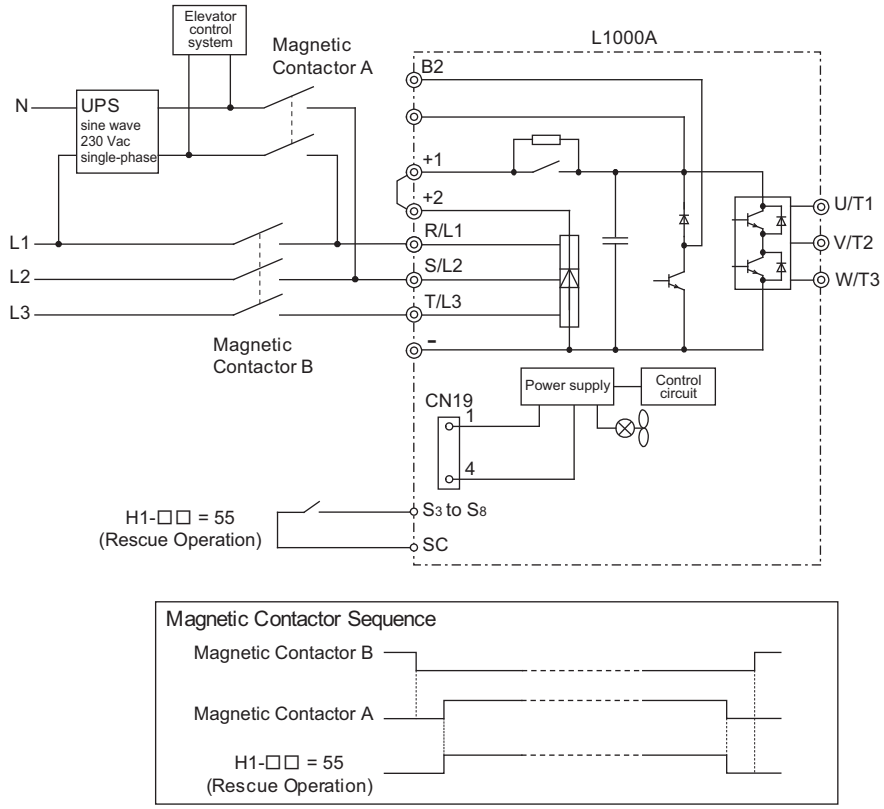


Figure 53 Using a Single-Phase 230 V UPS

Operation Sequence

Starting Rescue Operation

1. Open contactor B.
2. Set the input terminal programmed for Rescue Operation (H1-□□ = 55).
3. Close contactor A.
4. Set the Up/Down command.

Ending Rescue Operation

1. After the car has stopped open contactor A.
2. Clear the input terminal set for Rescue Operation (H1-□□ = 55).
3. Close contactor B to return to operation with normal power supply.

Application Precautions

The drive may fault on a control power supply fault (Uv2) if the UPS can't provide enough voltage, or if the Light Load Direction Search is not set properly. If this problem occurs, take the following corrective actions:

Corrective Action:

- Use a separate battery for the controller power supply.
- Use a battery with a voltage higher than 250 Vdc for 200 V class drives, 500 Vdc for 400 V class drives, or 720 Vdc for 600 V class drives and connect it to the control power supply input (CN19). Alternatively use a 24 Vdc battery and an optional 24 V Backup Power Supply Unit.
- Enable Light Load Direction Search (S4-01 = 1).

Using Separate Batteries for DC Bus and Control Power Supply, DC Bus Battery under 250 Vdc (500 Vdc, 720 Vdc)

Follow these instructions when using separate batteries for Rescue Operation with the battery for the DC bus having a lower voltage than 250 Vdc for 200 V class drives, 500 Vdc for 400 V class drives, or 720 Vdc for 600 V class drives.

Follow the wiring diagram shown in ***Figure 54*** to ***Figure 56***. When connecting the battery for the control power supply to the L1000A, use the 1.1 m cable packaged with the product. The connector cover must first be removed in order to access connection port CN19 for the battery. Refer to ***Connecting the Drive and Battery on page 120*** for details.

Wiring for CIMR-LU2A0008 to 2A0180, 4A0005 to 4A0112, and 5A0003 to 5A0077

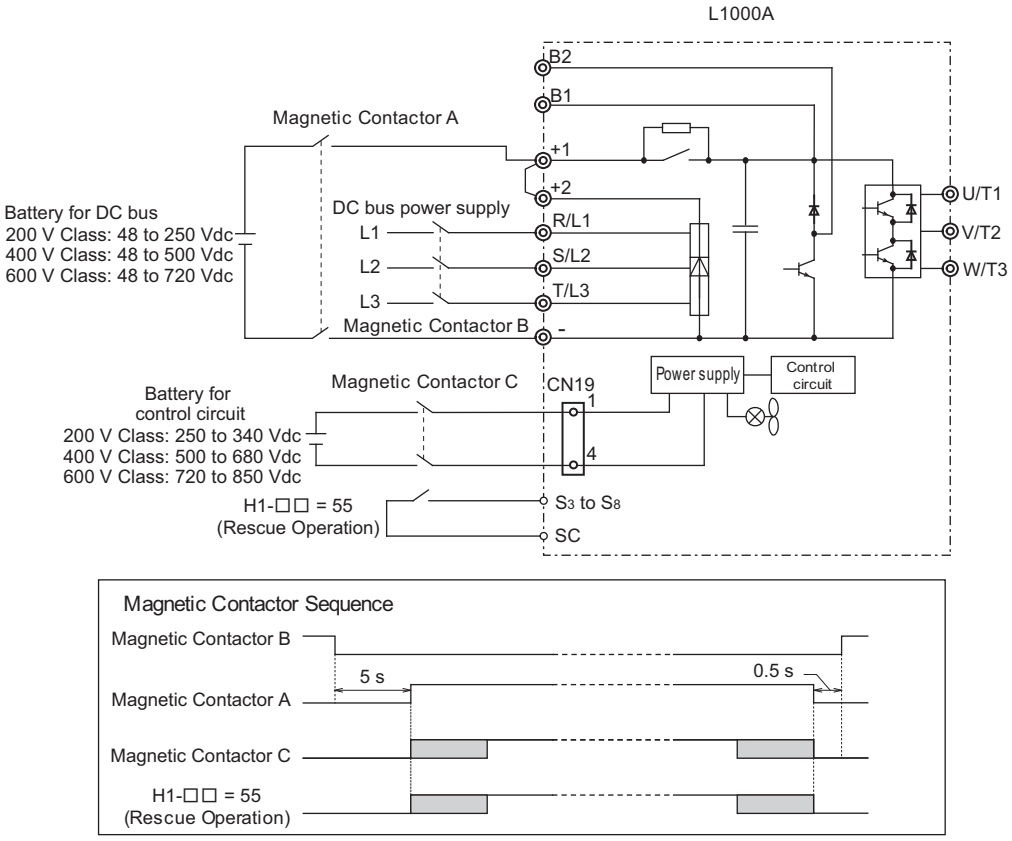


Figure 54 Wiring Two Batteries for DC Bus and Control Power Supply (DC Bus Battery is less than 250 Vdc (500 Vdc, 720 Vdc))

Operation Sequence

Starting Rescue Operation

1. Open contactor B and wait at least 5 seconds.
2. Set the input terminal programmed for Rescue Operation (H1-☐☐ = 55).
3. Close contactors A and C.
4. Set the Up/Down command.

Ending Rescue Operation

1. After the car has stopped, open contactors A and C.
2. Clear the input terminal set for Rescue Operation (H1-☐☐ = 55).
3. Wait at least 0.5 s and then close contactor B to return to operation with normal power supply.

Wiring for CIMR-LU2A0215 to 2A0415, 4A0150 to 4A0605, and 5A0099 to 5A0200

- Voltage Lower Than 48 to 190 Vdc for 200 V Class Drives, 48 to 380 Vdc for 400 V Class Drives, and 48 to 500 Vdc for 600 V Class Drives

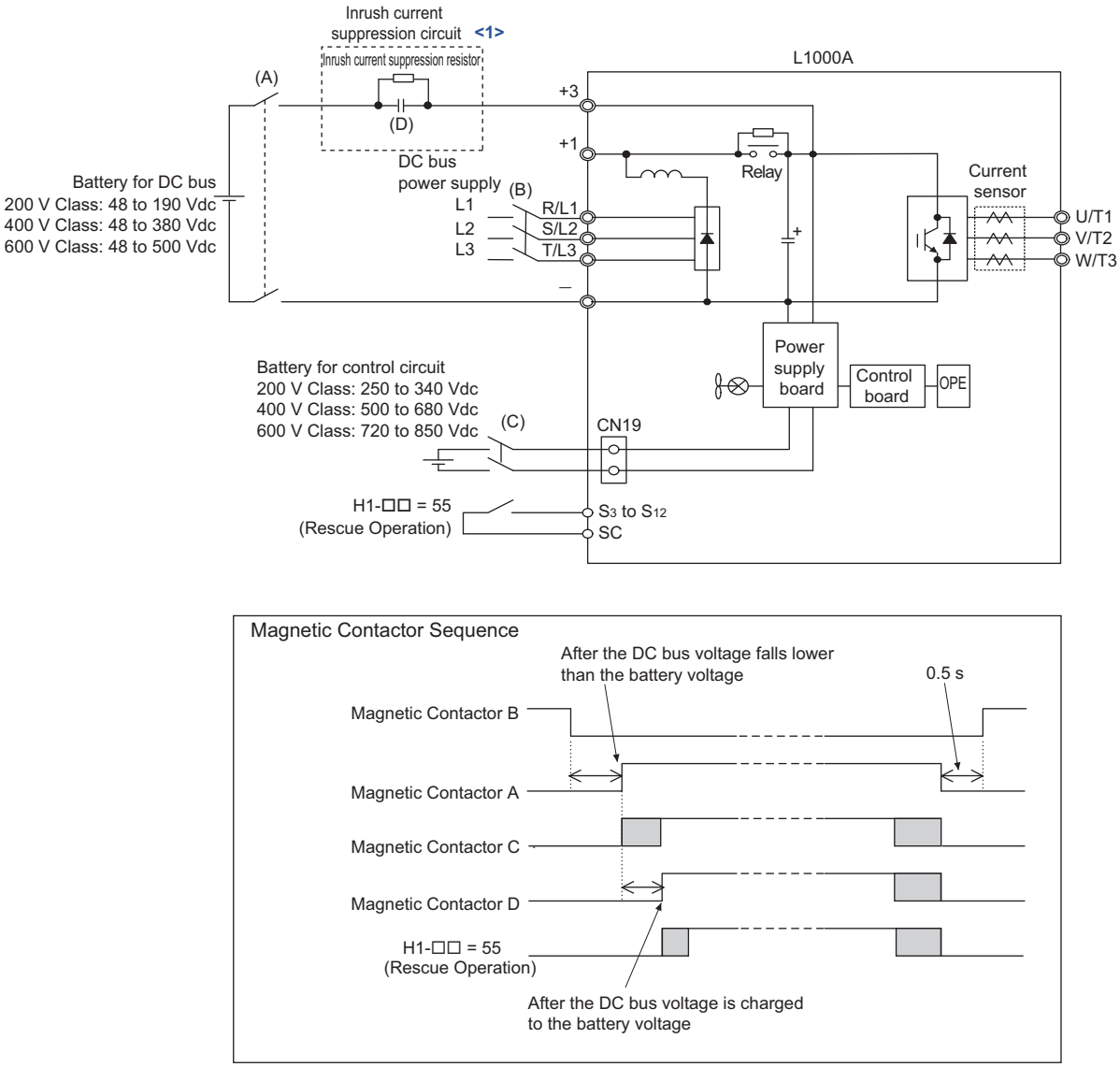


Figure 55 Voltage Lower Than 48 to 190 Vdc for 200 V Class Drives, 48 to 380 Vdc for 400 V Class Drives, and 48 to 500 Vdc for 600 V Class Drives

<1> Install the inrush current suppression circuit outside the drive if the DC bus battery voltage is lower than 190 Vdc for 200 V class drives and 380 Vdc for 400 V class drives. Failure to comply will cause the soft-charge bypass relay to remain open and result in damage to the drive.

Refer to the following table to install the inrush current suppression circuit for battery.

Table 34 Installation of the Inrush Current Suppression Circuit for Battery

Voltage	Drive Model CIMR-LU	Resistor	Relay
200 V	2A0215	1.0 Ω, 80 W	<1>
	2A0283	1.0 Ω, 80 W	
	2A0346	1.0 Ω, 80 W	
	2A0415	1.0 Ω, 80 W	
400 V	4A0150	1.0 Ω, 120 W	
	4A0180	1.0 Ω, 220 W	
	4A0216	1.0 Ω, 220 W	
	4A0260	1.0 Ω, 220 W	
	4A0304	1.0 Ω, 220 W	
	4A0370	1.0 Ω, 500 W	
	4A0450	2.0 Ω, 1000 W	
	4A0605	2.0 Ω, 1000 W	
575V	5A0099	2.0 Ω, 220 W	
	5A0130	2.0 Ω, 220 W	
	5A0172	2.0 Ω, 440 W	
	5A0200	2.0 Ω, 440 W	

<1> Select the appropriate relay referring to the following calculation even if the battery voltage or main power current is applied.

$$\text{Load current of battery (A)} = \frac{\text{Motor rated power (kW)} \times \text{Operation frequency when running battery (Hz)} \times 2 \times 1000}{\text{Battery voltage (Vdc)} \times 0.6\ \text{(Motor efficiency)} \times \text{Motor rated frequency (Hz)}}$$

• Voltage Lower Than 190 to 340 Vdc for 200 V Class Drives, 380 to 680 Vdc for 400 V Class Drives, and 500 to 850 Vdc for 600 V Class Drives

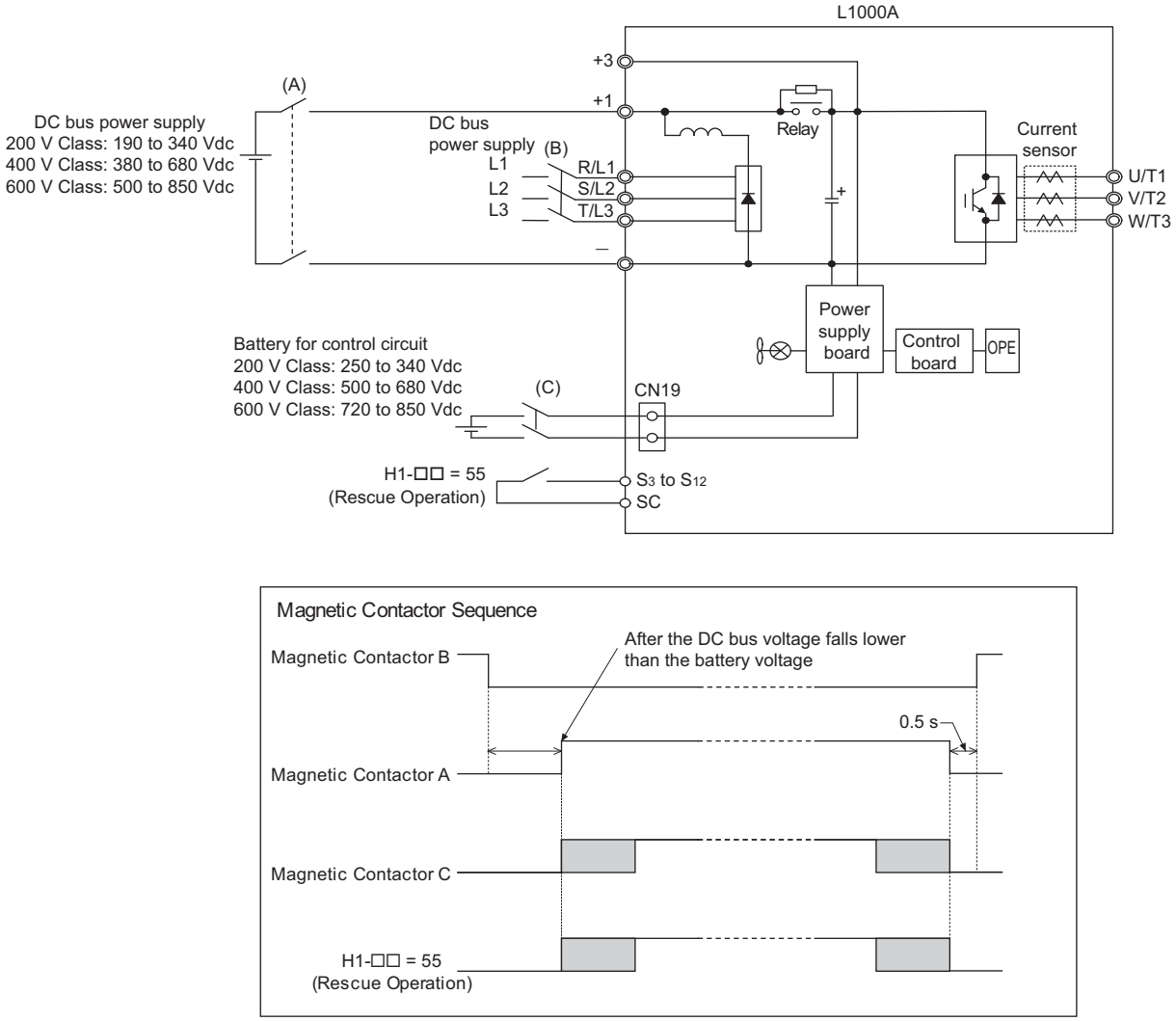


Figure 56 Voltage Lower Than 190 to 340 Vdc for 200 V Class Drives, 380 to 680 Vdc for 400 V Class Drives, and 500 to 850 Vdc for 600 V Class Drives

Using a Battery for the DC Bus and 24 V Power Supply Unit Option for the Control Circuit

Follow the instructions when using a 24 V Power Supply Unit option for the control circuit and a battery for the main circuit. The main circuit battery voltage must be higher than 48 Vdc for 200 V, 400 V, and 600 V class drives.

Yaskawa offers a 24 V Power Supply Option for the control circuit that is useful in applications unable to connect to a backup battery greater than 250 V. Wiring instructions can be found in ***Figure 57*** to ***Figure 59***. For a more detailed explanation of the 24 V Power Supply Option, refer to the manual provided with the option.

Wiring for CIMR-LU2A0008 to 2A0180, 4A0005 to 4A0112, and 5A0003 to 5A0077

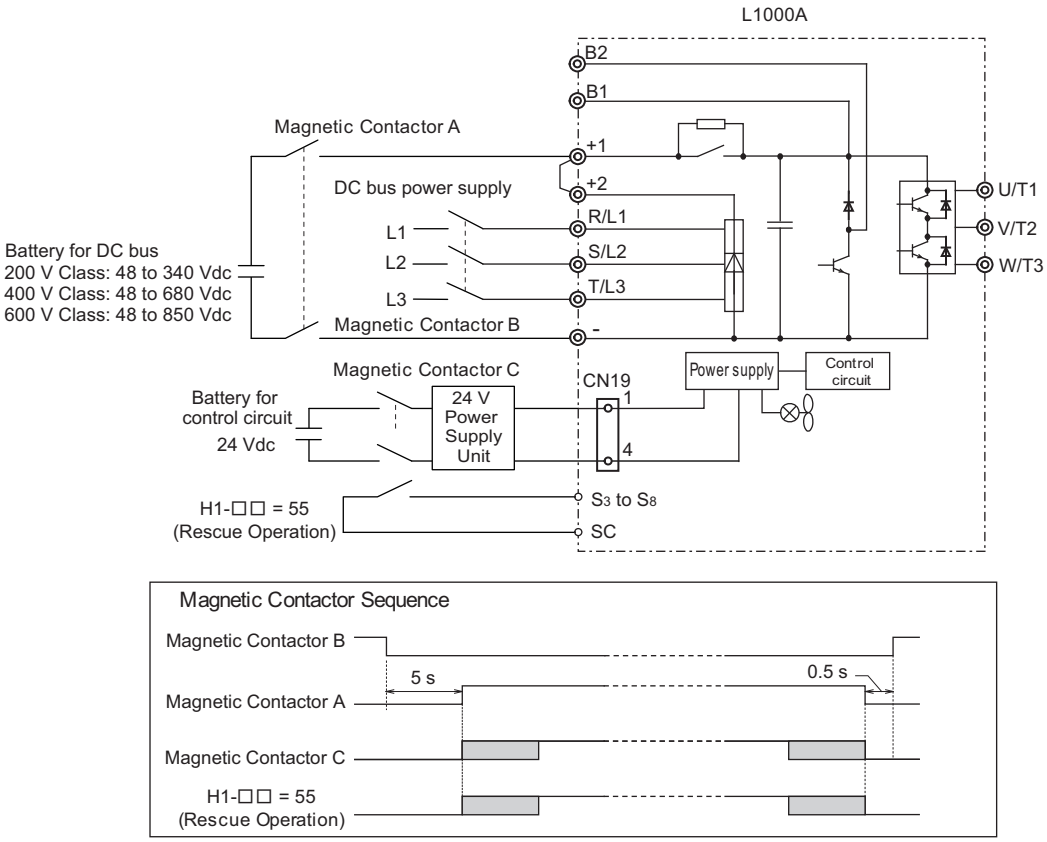


Figure 57 Using a Battery for the DC Bus and 24 V Power Supply Unit Option for the Control Circuit

Operation Sequence

Starting Rescued Operation

1. Open contactor B and wait at least 5 seconds.
2. Set the input terminal programmed for Rescue Operation (H1-☐☐ = 55).
3. Close contactors A and C.
4. Set the Up/Down command.

Ending Rescue Operation

1. After the car has stopped, open contactors A and C.
2. Clear the input terminal set for Rescue Operation (H1-☐☐ = 55).
3. Wait at least 0.5 s and then close contactor B to return to operation with normal power supply.

Wiring for CIMR-LU2A0215 to 2A0415, 4A0150 to 4A0605, and 5A0099 to 5A0200

- Voltage Lower Than 48 to 190 Vdc for 200 V Class Drives, 48 to 380 Vdc for 400 V Class Drives, and 48 to 500 Vdc for 600 V Class Drives

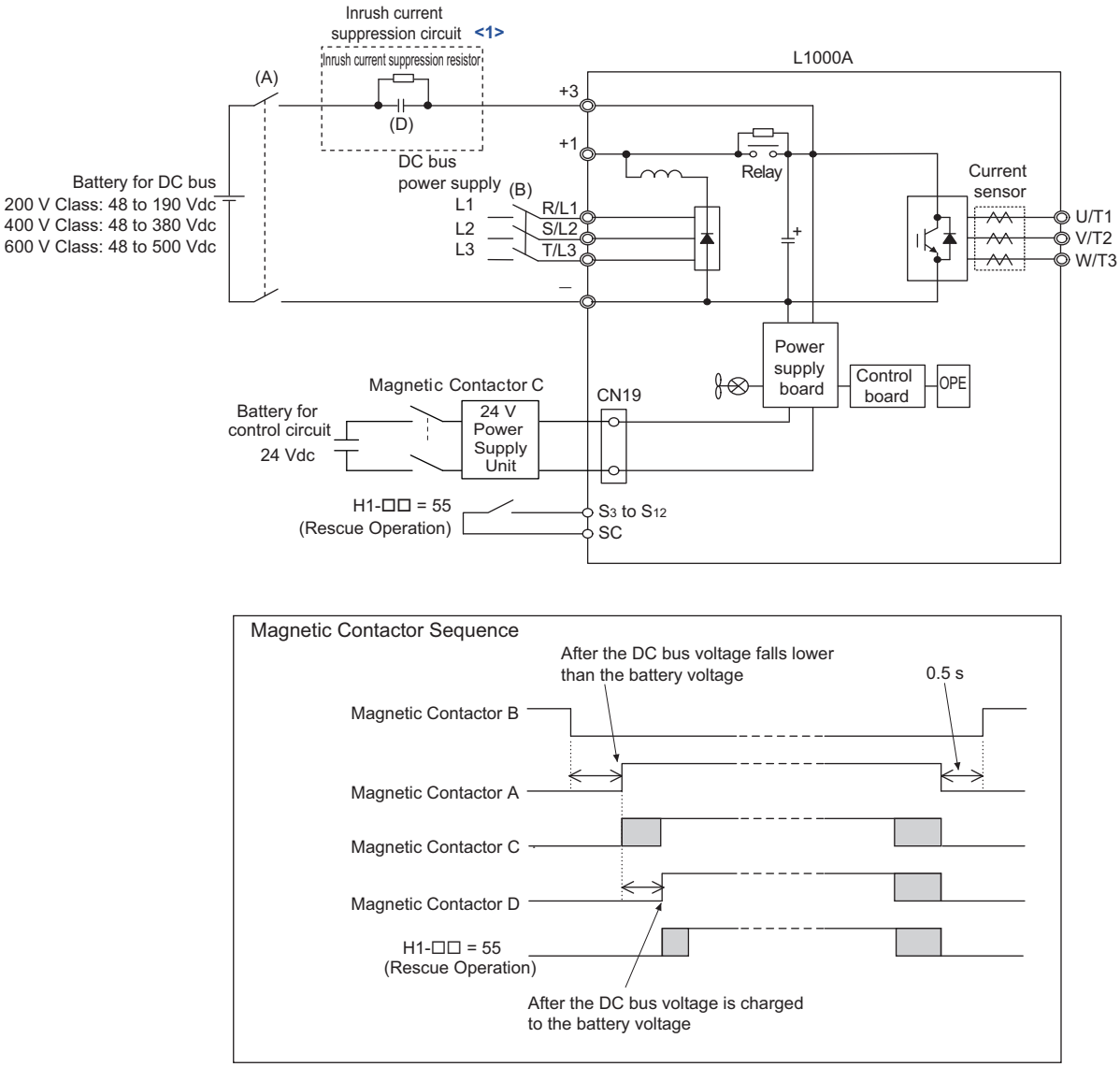


Figure 58 Using a Battery for the DC Bus and 24 V Power Supply Unit Option for the Control Circuit (CIMR-LU2A0215 to 2A0415, 4A0150 to 4A0605, and 5A0099 to 5A0200)

<1> Install the inrush current suppression circuit outside the drive if the DC bus battery voltage is lower than 190 Vdc for 200 V class drives and 380 Vdc for 400 V class drives. Failure to comply will cause the soft-charge bypass relay to remain open and result in damage to the drive.

Refer to *Table 34* for the installation of the inrush current suppression circuit for battery.

• Voltage Lower Than 190 to 340 Vdc for 200 V Class Drives, 380 to 680 Vdc for 400 V Class Drives, and 500 to 850 Vdc for 600 V Class Drives

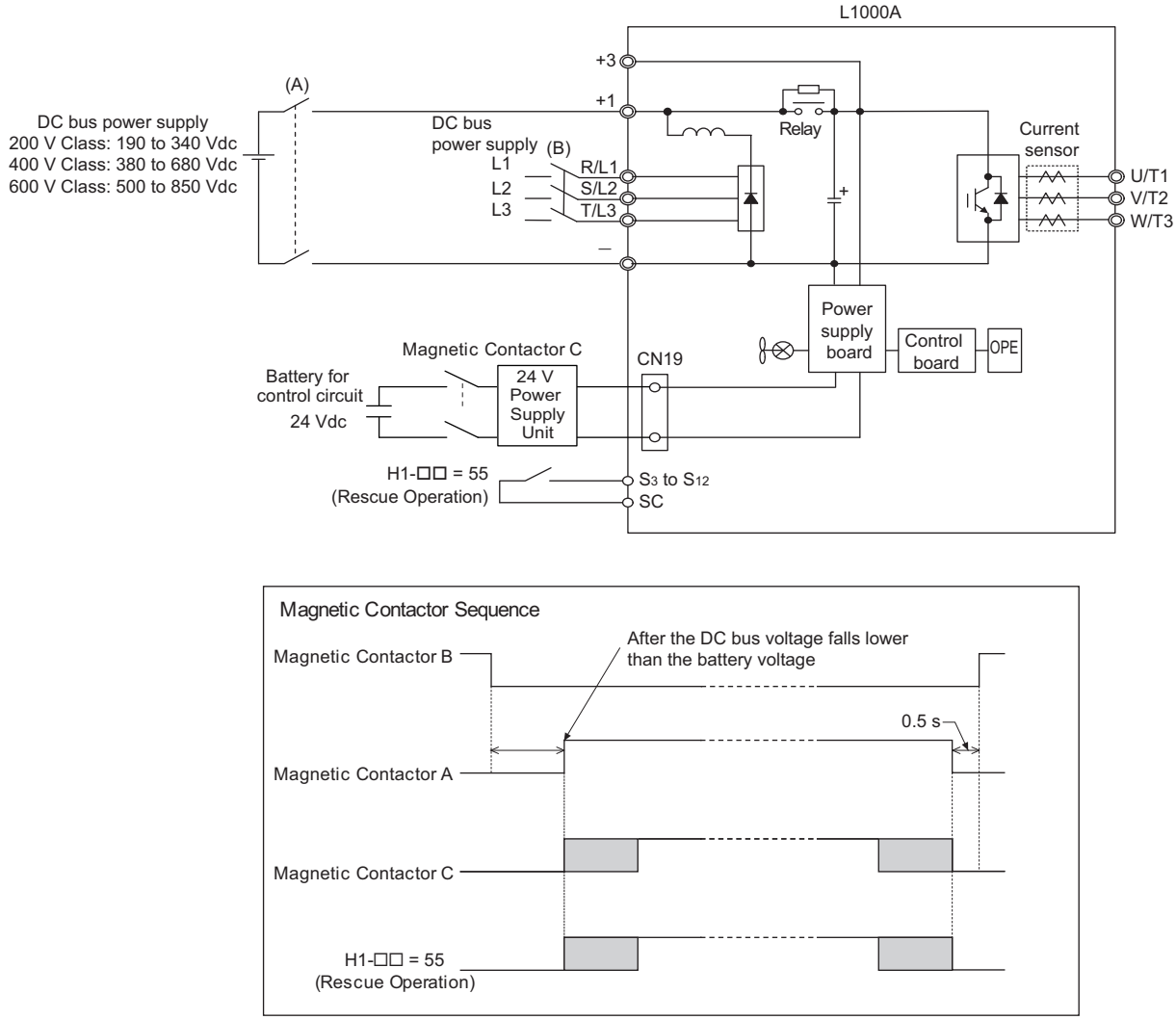


Figure 59 Voltage Lower Than 190 to 340 Vdc for 200 V Class Drives, 380 to 680 Vdc for 400 V Class Drives, and 500 to 850 Vdc for 600 V Class Drives

Using a Single Battery with Minimum 250 Vdc (500 Vdc, 720 Vdc)

Follow the instructions when using one battery to supply both, main circuit and controller. The battery voltage must be at least 250 Vdc for 200 V class drives, 500 Vdc for 400 V class drives, or 720 Vdc for 600 V class drives.

Wiring

Following the wiring diagram show in ***Figure 60***.

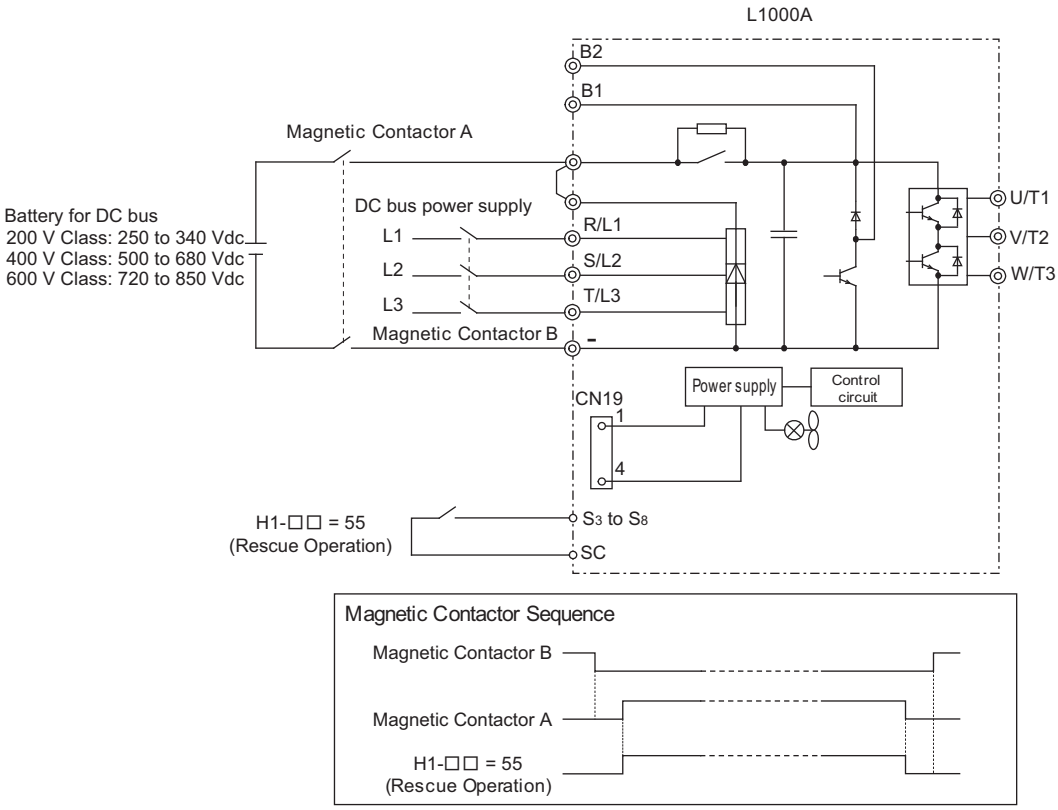


Figure 60 Using a Backup Battery With Minimum 250 Vdc (500 Vdc, 720 Vdc)

Operation Sequence

Starting Rescue Operation

1. Open contactor B.
2. Set the input terminal programmed for Rescue Operation (H1-☐☐ = 55).
3. Close contactor A.
4. Set the Up/Down command.

Ending Rescue Operation

1. After the car has stopped, open contactor A.
2. Clear the input terminal set for Rescue Operation (H1-☐☐ = 55).
3. Close contactor B to return to operation with normal power supply.

Connecting the Drive and Battery

Use the 1.1 m cable packaged with the drive to connect the battery. Remove the connector covering port CN19 before connecting the cable to CN19.

Information on battery power ratings can be found in ***Table 33***.

Note: The connector port location and angle vary by drive model.

DANGER! *Switch off the power supply before wiring and connecting the battery cable. Failure to comply will lead to death or serious injury from electric shock.*

Battery Connections for CIMR-LU2A0008 to 2A0075, CIMR-LU4A0005 to 4A0039, and CIMR-LU5A0003 to 5A0027

1. Insert the tip of a screwdriver into the opening on the edge of the CN19 connector cover. Slide the cover off the drive as indicated in ***Figure 61***.

NOTICE: *A straight-edge screwdriver should be inserted into the opening provided on the connector cover at the proper angle. Attempting to insert the screwdriver blade at a different angle could damage the drive.*

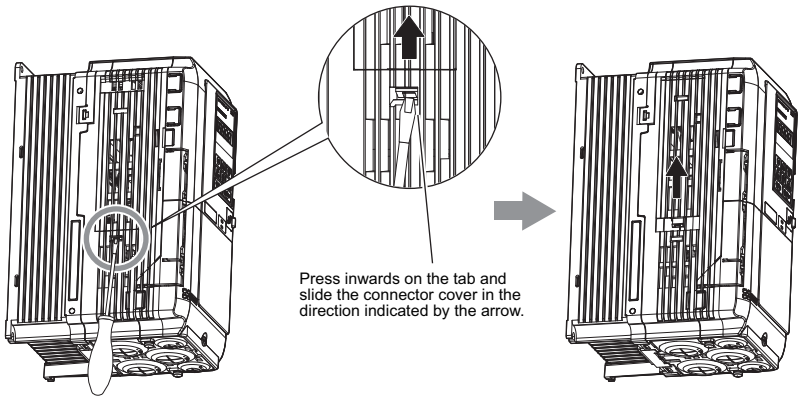


Figure 61 Removing the Connector Cover

2. Connect the cable provided to the CN19 port.

NOTICE: *Be sure that the connector fastens at the correct angle to the drive port. The incorrect angle could damage the battery, cable, or connector.*

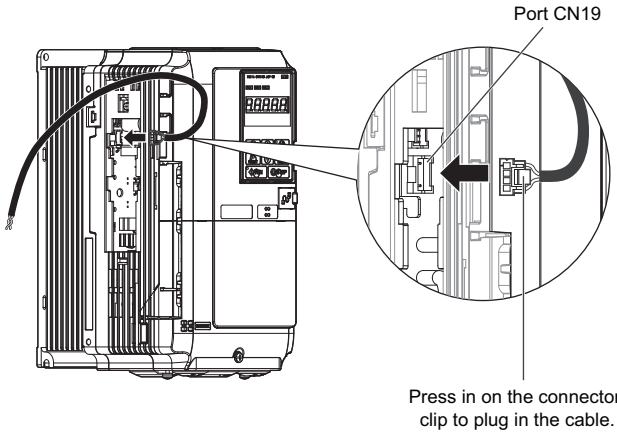


Figure 62 Connecting the Cable

3. Use a pair of diagonal cutters to cut an opening in the connector cover that allows the cable to pass through. The cable should pass through the connector cover with the cover fastened to the drive.

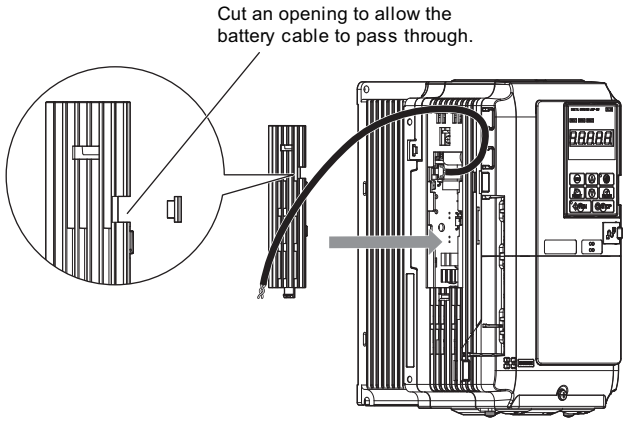


Figure 63 Reattaching the Connector Cover (1)

4. Slide the connector cover back into place as shown in ***Figure 64***.

NOTICE: *Make sure the cable does not get pinched between the drive and the connector cover, as this could damage the cable.*

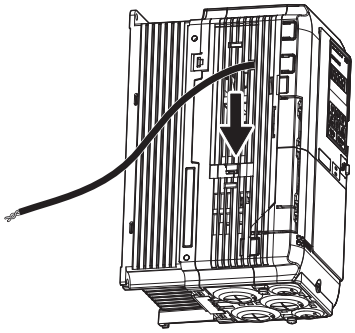


Figure 64 Reattaching the Connector Cover (2)

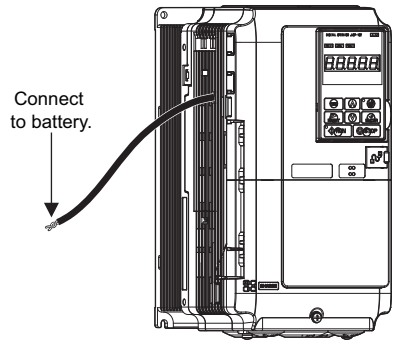


Figure 65 Drive and Battery Connection Complete

Models CIMR-LU2A0085 to 2A0415, CIMR-LU4A0045 to 4A0370, 5A0003 to 5A0200, and 5A0032 to 5A0200

1. Use a Phillips screwdriver to loosen the screw holding the CN19 connector cover in place.

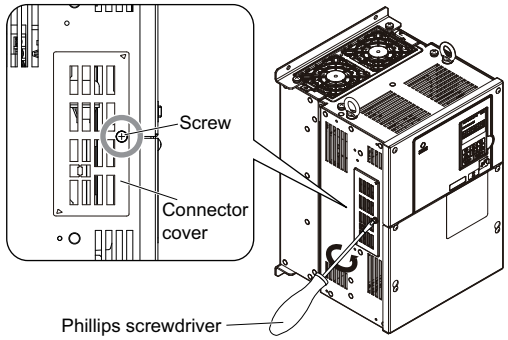


Figure 66 Removing the CN19 Connector Cover

2. Slide the CN19 connector cover from the drive as shown in ***Figure 67***.

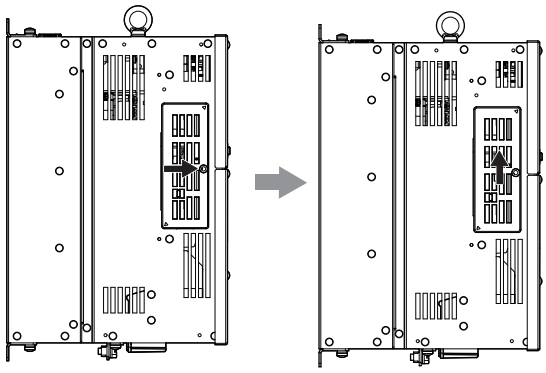


Figure 67 Sliding the CN19 Connector Cover

3. Insert a straight-edge screwdriver into the opening as shown in ***Figure 68***, then remove the CN19 connector cover by sliding it as shown in ***Figure 68***.

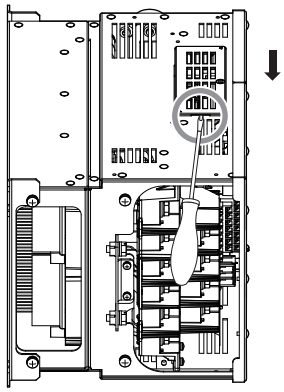


Figure 68 Removing the CN19 Connector Cover

4. Connect the cable to the CN19 connector port on the drive.

Note: The connector port location and angle vary by drive model.

NOTICE: *Be sure that the connector fastens at the correct angle to the CN19 connector port. The incorrect angle could damage the battery, cable, or connector.*

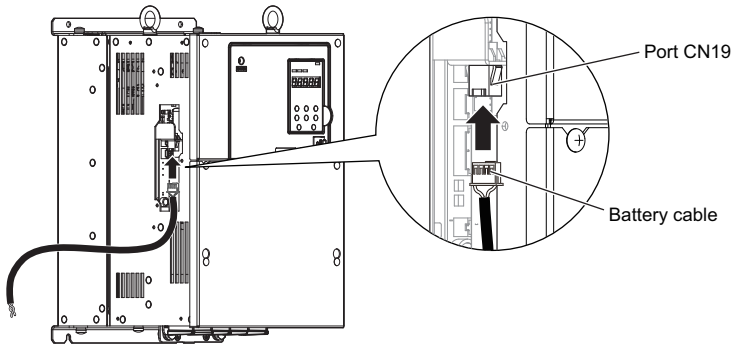


Figure 69 Connecting the Cable

5. The cable should pass through the connector cover with the cover fastened to the drive.

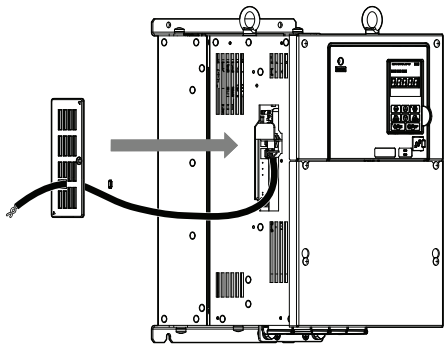


Figure 70 Reattaching the CN19 Connector Cover

6. Slide the CN19 connector cover back into place as shown in ***Figure 71***.

NOTICE: *Make sure the cable does not get pinched between the drive and the CN19 connector cover, as this could damage the cable.*

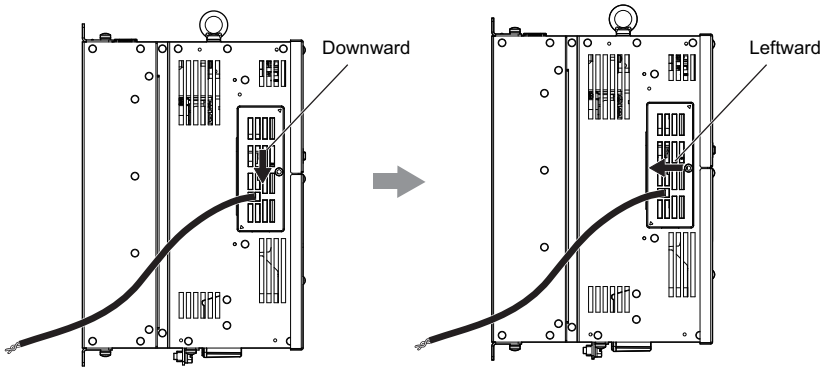


Figure 71 Sliding the CN19 Connector Cover into Place

7. Use a Phillips screwdriver to fasten the screw that holds the CN19 connector cover in place.

NOTICE: *Use the screw provided to fasten the connector cover into place. Using a different screw may damage the internal drive components.*

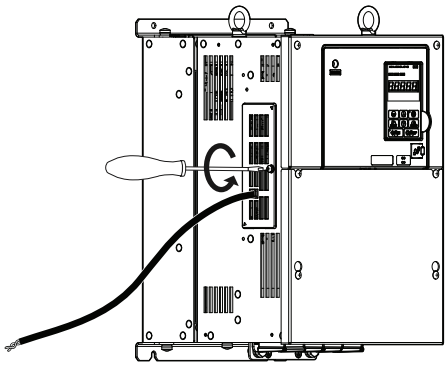


Figure 72 Reattaching the CN19 Connector Cover

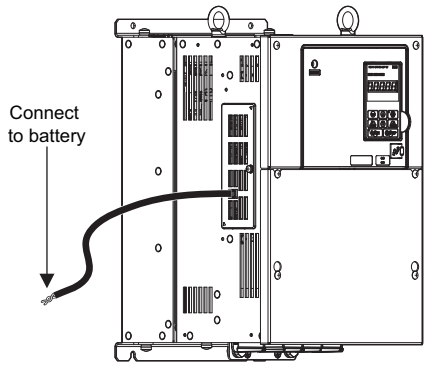
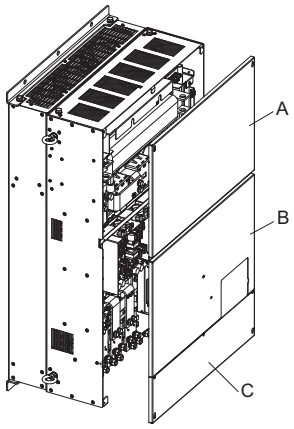


Figure 73 Drive and Battery CN19 Connection Complete

Models CIMR-LU4A0450 and 0605

1. use a Phillips screwdriver to remove the drive covers.



A – Front cover 1
B – Front cover 2
C – Terminal cover

Figure 74 Removing the Connector Cover

2. Connect the cable provided to the CN19 port.

Note: Be sure that the connector fastens at the correct angle to the drive port. The incorrect angle could damage the battery, cable, or connector.

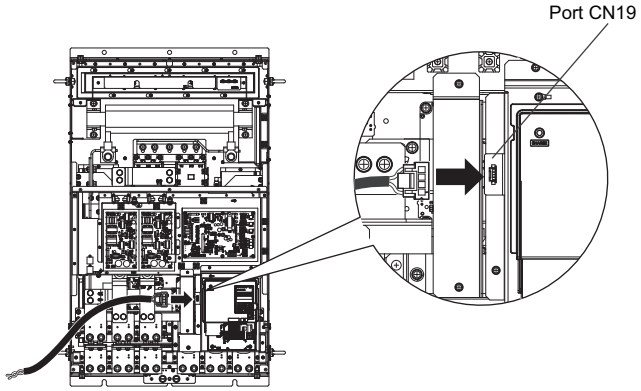
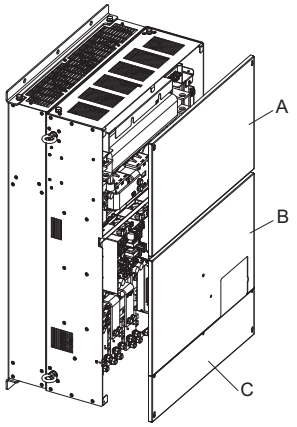


Figure 75 Connecting the Cable

3. Reinstall the drive covers to their original locations.



A – Front cover 1
B – Front cover 2
C – Terminal cover

Figure 76 Reinstalling the Covers to the Drive

Rescue Operation Torque Limit

The Torque Limit During Rescue Operation is set in parameter S4-05. After Rescue Operation is complete, the drive utilizes to the torque limits set in the L7 parameters.

Light Load Direction Search Function

Light Load Direction Search can be used to automatically perform Rescue Operation in the direction with the lower load. It can help to minimize the amount of power required by the backup power supply required for Rescue Operation. Light Load Direction Search can be set so that it is automatically performed when Rescue Operation is started. To enable Light Load Direction Search set parameter S4-01 = 1.

When Light Load Direction Search is enabled the drive first runs in the up and then in the down direction, each for the time set to S4-03. It then compares the load condition of both operations and travels to the next floor using the lighter load condition direction. The speed reference used for Light Load Direction Search can be set in parameter S4-04.

- When the lightest load direction is up, the drive stops after Light Load Direction Search and then accelerates upwards to the Rescue Operation speed set in parameter S4-15. The output terminals set for “Light Load Direction” (H2-□□ = 54) and “Light Load Direction detection status”(H2-□□ = 55) will close.

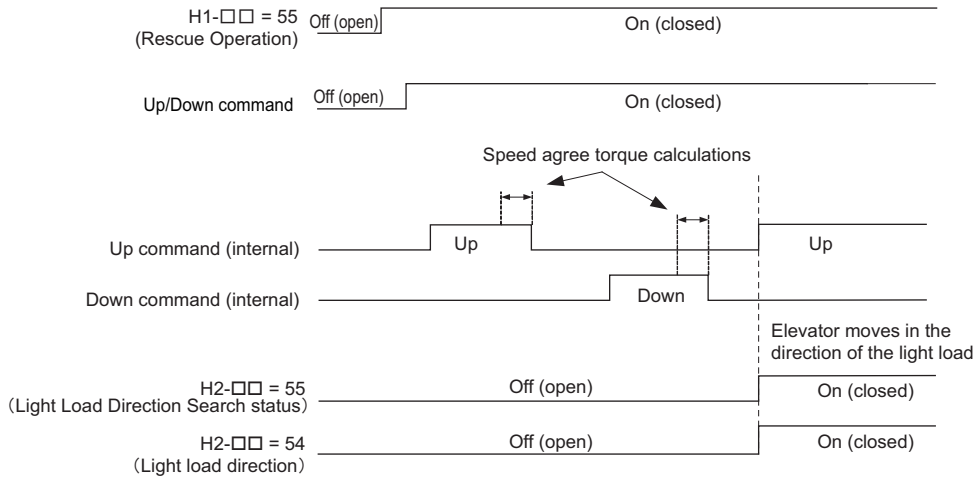


Figure 77 Light Load Direction Detection (Up)

- When the lightest direction is down, then after Light Load Direction Detection is finished the drive immediately accelerates to the Rescue Operation speed set in S4-15 without stopping. An output terminal set for “Light load direction” (H2-□□ = 54) will stay open, and an output terminal set for “Light Load Direction detection status”(H2-□□ = 55) will close.

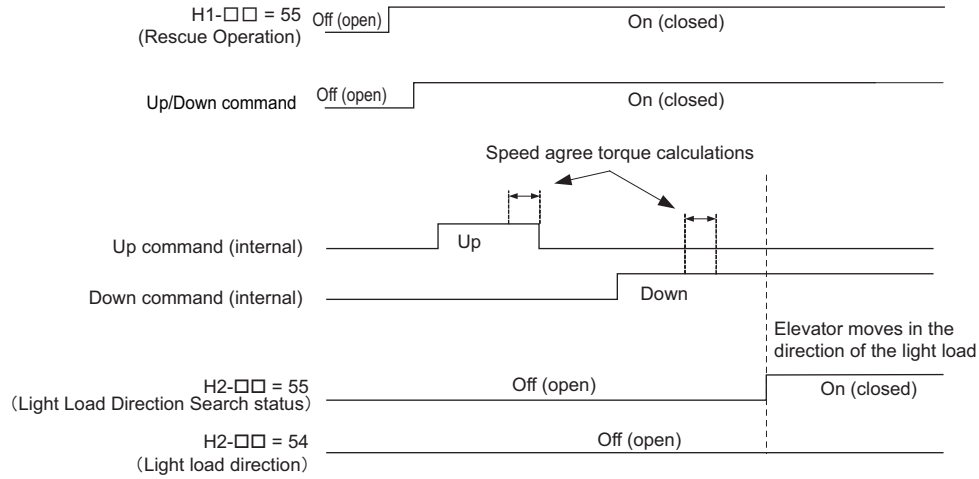


Figure 78 Light Load Direction Detection (Down)

◆ Setup Troubleshooting and Possible Solutions

This section describes troubleshooting problems that do not trip an alarm or fault.

Symptom		Page
Cannot Change Parameter Settings		*127*
Motor Does Not Rotate Properly after Pressing RUN Button or after Entering External Up/Down Command	Motor Does Not Rotate	*128*
	Motor Rotates in the Opposite Direction from the Up/Down Command	*128*
Motor Gets Too Hot		*129*
Drive Does Not Allow Selection of Rotational Auto-Tuning		*129*
Encoder Offset (E5-11) Set During Auto-Tuning (Rotational or Stationary) Consistently Differs by 30 Degrees or More.		*129*
Noise From Drive or Output Lines When the Drive is Powered On		*129*

■ Cannot Change Parameter Settings

Cause	Possible Solutions
The drive is running the motor (i.e., the Up/Down command is present).	• Stop the drive and switch over to the Programming Mode. • Most parameters cannot be edited during run.
The Access Level is set to restrict access to parameter settings.	• Set the Access Level to allow parameters to be edited (A1-01 = 2).
The operator is not in the Parameter Setup Mode.	• Verify the digital operator mode, Drive or Programming mode? • Switch to the Programming Mode. Refer to *The Drive and Programming Modes on page 61*.
The wrong password was entered.	• If the password entered to A1-04 does not match the password saved to A1-05, then drive settings cannot be changed. • Reset the password. If the password is unknown: • Scroll to A1-04. Press STOP and press ∧ at the same time. Parameter A1-05 will appear. • Set a new password to parameter A1-05.
Undervoltage was detected.	• Check the drive main input voltage by looking at the DC bus voltage (U1-07). • Check all main circuit wiring.

■ Motor Does Not Rotate Properly after Pressing RUN Button or after Entering External Up/Down Command

Motor Does Not Rotate

Cause	Possible Solutions
The drive is not in the Drive Mode.	• Check if the DRV on the digital operator is displayed. • Enter the Drive Mode. *Refer to The Drive and Programming Modes on page 61*.
The LO/RE button is enabled (o2-01=1) and was pushed.	Stop the drive and check if the correct frequency reference source is selected. If the digital operator is the source, the LO/RE button LED must be on. If the source is REMOTE, it must be off. Take the following steps to solve the problem: • Push the LO/RE button. • o2-01 is set to 0 by default, i.e. the LO/RE button is disabled.
Auto-Tuning has just completed.	• When Auto-Tuning completes, the drive is switched back to the Programming Mode. The Up/Down command will not be accepted unless the drive is in the Drive Mode. • Use the digital operator to enter the Drive Mode. *Refer to The Drive and Programming Modes on page 61*.
A Fast Stop was executed and is not reset.	Reset the Fast Stop command.
Settings are incorrect for the source that provides the Up/Down command.	Check parameter b1-02 (Up/Down Command Selection). Set b1-02 so that it corresponds with the correct Up/Down command source. 0: Digital operator 1: Control circuit terminal (default setting) 2: MEMOBUS/Modbus communications 3: Option card
There is faulty wiring in the control circuit terminals.	• Check the wiring for the control terminal. • Correct wiring mistakes. • Check the input terminal status monitor (U1-10).
The speed reference source setting is incorrect.	Check parameter b1-01 (Speed Reference Selection). Set b1-01 to the correct source of the speed reference. 0: Digital operator 1: Control circuit terminal (default setting) 2: MEMOBUS/Modbus communications 3: Option card
The settings for the analog speed reference are incorrect.	Check the settings (signal level, function, bias, gain) for the analog input that supplies the speed reference.
Selection for the sink/source mode and the internal/external power supply is incorrect.	Check the position of the jumper and setting for S3. *Refer to Control I/O Configuration on page 53*.
Speed reference is too low.	• Check the speed reference monitor (U1-01). • Increase the speed reference above the minimum output speed (E1-09). • Make sure speed references are set properly and the speed selection works properly. If using an analog signal make sure the input signal is present at the time the Up/Down command is issued.
The brake does not release or motor contactor is not closed.	Check the brake and motor contactor sequence.
The STOP button is enabled (o2-02=1) and was pressed when the drive was started from a REMOTE source.	• When the STOP button is pressed, the drive will decelerate to stop. • Switch off the Up/Down command and then re-enter a new Up/Down command. • o2-02 is set to 0 by default, i.e. the Stop button is disabled.

Motor Rotates in the Opposite Direction from the Up/Down Command

Cause	Possible Solutions
Phase wiring between the drive and motor is incorrect.	Check the motor wiring. Perform the steps described in *Motor Rotation Direction Setup on page 67* and *PG Encoder Setup on page 67*.
Drive control circuit terminals for the Up and Down commands are switched.	• Check the control circuit wiring. • Correct any fault wiring.

■ Motor is Too Hot

Cause	Possible Solutions
The load is too heavy.	If the load is too heavy for the motor, the motor will overheat as it exceeds its rated torque value for an extended period of time. Keep in mind that the motor also has a short-term overload rating in addition to the possible solutions provided below: • Reduce the load. • Lower the acceleration and deceleration ramps. (Increase the acceleration time and deceleration time.) • Check the values set for the motor protection (L1-01, L1-02) as well as the motor rated current (E2-01). • Increase motor capacity.
The air around the motor is too hot.	• Check the ambient temperature. • Cool the area until it is within the specified temperature range.
The drive is operating in a vector control mode but Auto-Tuning has not yet been performed.	• Perform Auto-Tuning. • Calculate the motor value and reset the motor parameters. • Change the motor control method to V/f Control (A1-02 = 0).
Insufficient voltage insulation between motor phases.	When the motor cable is long, high voltage surges occur between the motor coils and drive switching. Normally, surges can reach up to three times the drive input power supply voltage. • Use a motor with a voltage tolerance higher than the max voltage surge. • Install an AC reactor on the output side of the drive. Make sure the output reactor can handle frequencies in the range of the drive carrier frequency.
The motor fan has stopped or is clogged.	Check the motor fan.

■ Drive Does Not Allow Selection the Desired Auto-Tuning Mode

Cause	Possible Solutions
The desired Auto-Tuning mode is not available for the selected control mode.	• Check if the desired tuning mode is available for the selected control mode. • Change the motor control method by setting A1-02.

■ Encoder Offset (E5-11) Set During Auto-Tuning (Rotational or Stationary) Consistently Differs by 30 Degrees or More.

Cause	Possible Solutions
PG-E3 option detected excess position error with the ERN1387 encoder.	Perform Auto-Tuning of PG-E3 encoder characteristics (T2-01 = 12).

■ Electrical Noise From Drive or Output Lines When the Drive is Operating

Cause	Possible Solutions
PWM switching in the drive generates excessive noise.	• Lower the carrier frequency (C6-03). • Install a noise filter on the input side of drive input power. • Install a noise filter on the output side of the drive. • Place the wiring inside a metal conduit to shield it from switching noise. • Ground the drive and motor properly. • Separate the main circuit wiring and the control lines. • Make sure wires and the motor have been properly grounded.

5 Troubleshooting

◆ Fault Detection

■ Fault Displays, Causes, and Possible Solutions

Faults are detected for drive protection, and cause the drive to stop while triggering the fault output terminal MA-MB-MC. Remove the cause of the fault and manually clear the fault before attempting to run the drive again.

Table 35 Detailed Fault Displays, Causes, and Possible Solutions

Digital Operator Display		Fault Name
boL	boL	Braking Transistor Overload
		The braking transistor has reached its overload level.
bUS	bUS	Option Communication Error
		• The connection was lost after establishing initial communication. • Only detected when the Up/Down command speed reference is assigned to an option card.
CE	CE	MEMOBUS/Modbus Communication Error
		Communication data was not received for the amount of time set in parameter, H5-09 Communication Fault Detection Time.
CF	CF	Control Fault
		The torque limit was reached continuously for three seconds or longer while ramping to stop in OLV Control.
CoF	CoF	Current Offset Fault
		The current sensor is damaged or there was residual induction current in the motor (e.g., during sudden deceleration or when coasting) when the drive attempted to start the motor.
CPF00 or CPF01 <1>	CPF00 or CPF01	Control Circuit Error
CPF02	CPF02	A/D Conversion Error
		An A/D conversion error or control circuit error occurred.
CPF03	CPF03	Control Board Connection Error
		Connection error between the control board and the drive
CPF06	CPF06	EEPROM Memory Data Error
		An error in the data saved to EEPROM
CPF07	CPF07	Terminal Board Connection Error
CPF08	CPF08	
CPF11 to CPF14, CPF16 to CPF21 <1>	CPF11 to CPF14, CPF16 to CPF21	Control Circuit Error
CPF22	CPF22	Hybrid IC Failure
CPF23	CPF23	Control Board Connection Error
		Connection error between the control board and the drive
CPF24	CPF24	Drive Unit Signal Fault
		The drive capacity cannot be detected correctly (drive capacity is checked when the drive is powered up).
CPF25	CPF25	Terminal Board not Connected
CPF26 to CPF34	CPF26 to CPF34	Control Circuit Error
		CPU error
CPF35	CPF35	A/D Conversion Error
		An A/D conversion error or control circuit error occurred.

Digital Operator Display		Fault Name
dEv	dEv	Speed Deviation (for Control Mode with Encoder)
		The deviation between the speed reference and speed feedback is greater than the setting in F1-10 for longer than the time set to F1-11.
dv1	dv1	Encoder Z Pulse Fault
		The motor turned one full rotation without the Z Pulse being detected.
dv2	dv2	Z Pulse Noise Fault Detection
		The Z pulse is out of phase by more than 5 degrees for the number of times specified in parameter F1-17.
dv3	dv3	Inversion Detection
		The torque reference and acceleration are in opposite directions and the speed reference and actual motor speed differ by over 30% for the number of times set to F1-18.
dv4	dv4	Inversion Prevention Detection
		Pulses indicate that the motor is rotating in the opposite direction of the speed reference. Set the number of pulses to trigger inverse detection to F1-19. **Note:** Set F1-19 to 0 to disable inverse detection in applications where the motor may rotate in the opposite direction of the speed reference.
dv6	dv6	Overacceleration Detection
		The acceleration of the elevator car exceeds the overacceleration detection level (S6-10)
dv7	dv7	Rotor Polarity Detection Timeover
		Unable to detect the magnetic poles within the designated time.
dv8	dv8	PM Rotor Position Estimation Error
		An invalid value resulted from Initial Pole Search. **Note:** Reset the fault and try Initial Pole Search again.
EF0	EF0	Option Card External Fault
		An external fault condition is present.
EF3	EF3	External Fault (input terminal S3)
		External fault at multi-function input terminal S3.
EF4	EF4	External Fault (input terminal S4)
		External fault at multi-function input terminal S4.
EF5	EF5	External Fault (input terminal S5)
		External fault at multi-function input terminal S5.
EF6	EF6	External Fault (input terminal S6)
		External fault at multi-function input terminal S6.
EF7	EF7	External Fault (input terminal S7)
		External fault at multi-function input terminal S7
EF8	EF8	External Fault (input terminal S8)
		External fault at multi-function input terminal S8
Err	Err	EEPROM Write Error
		Data cannot be written to the EEPROM.
FrL	FrL	Speed Reference Missing
		Parameter d1-18 is set to 3, leveling speed detection is not assigned to a digital input (H1-□□ ≠ 53) and no speed was selected while an Up or Down command was entered.
GF	GF	Ground Fault
		A current short to ground exceeded 50% of rated current on the output side of the drive.
LF	LF	Output Phase Loss
		• Phase loss on the output side of the drive. • Setting L8-07 to 1 or 2 enables Phase Loss Detection.
LF2	LF2	Output Current Imbalance (detected when L8-29 = 1)
		One or more of the phases in the output current is lost.
oC	oC	Overcurrent
		Drive sensors have detected an output current greater than the specified overcurrent level.

Digital Operator Display		Fault Name
oFA00	oFA00	Option Card Connection Error at Option Connector CN5-A, Option Card Fault at Option Connector CN5-A
		Option compatibility error
oFA01	oFA01	Option Card Fault at Option Connector CN5-A
		Option not properly connected
oFA05 , oFA06	oFA05, oFA06	Option card error occurred at option port CN5-A
oFA10, oFA11	oFA10, oFA11	
oFA12 to oFA17	oFA12 to oFA17	
oFA30 to oFA43	oFA30 to oFA43	
oFb00	oFb00	Option Card Fault at Option Port CN5-B
		Option compatibility error
oFb01	oFb01	Option Card Fault at Option Port CN5-B
		Option not properly connected
oFb02	oFb02	Option Card Fault at Option Port CN5-B
		Same type of option card already connected
oFb03 to oFb11	oFb03 to oFb11	Option card error occurred at Option Port CN5-B
oFb12 to oFb17	oFb12 to oFb17	
oFC00	oFC00	Option Card Connection Error at Option Port CN5-C
		Option compatibility error
oFC01	oFC01	Option Card Fault at Option Port CN5-C
		Option not properly connected
oFC02	oFC02	Option Card Fault at Option Port CN5-C
		A maximum of two PG option boards can be used simultaneously. Remove the PG option board installed into option port CN5-A.
oFC03 to oFC11	oFC03 to oFC11	Option card error occurred at option port CN5-C
oFC12 to oFC17	oFC12 to oFC17	
oFC50	oFC50	Encoder Option AD Conversion Error
		Error with the A/D conversion level (VCC level), or A/D conversion timed out.
oFC51	oFC51	Encoder Option Analog Circuit Error
		Incorrect signal level (+2.5 V signal)
oFC52	oFC52	Encoder Communication Timeout
		Signal encoder timed out waiting to receive data
oFC53	oFC53	Encoder Communication Data Error
		Serial encoder CRC checksum error
oFC54	oFC54	Encoder Error
		Alarm reading EnDat absolute position data from encoder (OR flag from EnDat error for overvoltage, undervoltage, etc.)
oH	oH	Heatsink Overheat
		The temperature of the heatsink exceeded the overheat pre-alarm level set to L8-02. Default value for L8-02 is determined by drive capacity (o2-04).
oH1	oH1	Heatsink Overheat
		The temperature of the heatsink exceeded the drive overheat level. The overheat level is determined by drive capacity (o2-04).
oH3	oH3	Motor Overheat Alarm (PTC thermistor input)
		• The motor overheat signal to analog input terminal A1 or A2 exceeded the alarm detection level. • Detection requires multi-function analog input H3-02 or H3-10 be set to “E”.
oH4	oH4	Motor Overheat Fault (PTC thermistor input)
		• The motor overheat signal to analog input terminal A1 or A2 exceeded the fault detection level. • Detection requires that multi-function analog input H3-02 or H3-10 = “E”.

Digital Operator Display		Fault Name
oL1	oL1	Motor Overload
		The electronic motor overload protection tripped.
oL2	oL2	Drive Overload
		The thermal sensor of the drive triggered overload protection.
oL3	oL3	Overtorque Detection 1
		The current has exceeded the value set for torque detection (L6-02) for longer than the allowable time (L6-03).
oL4	oL4	Overtorque Detection 2
		The current has exceeded the value set for Overtorque Detection 2 (L6-05) for longer than the allowable time (L6-06).
oPr	oPr	External Digital Operator Connection Fault
		• The external operator has been disconnected from the drive. **Note:** An oPr fault will occur when all of the following conditions are true: • Output is interrupted when the operator is disconnected (o2-06 = 1). • The Up/Down command is assigned to the operator (b1-02 = 0 and LOCAL has been selected).
oS	oS	Overspeed
		The motor speed feedback exceeded the F1-08 setting.
ov	ov	DC Bus Overvoltage
		Voltage in the DC bus has exceeded the overvoltage detection level. • For 200 V class: approximately 410 V • For 400 V class: approximately 820 V • For 600 V class: approximately 1040 V
PF	PF	Input Phase Loss
		Drive input power has an open phase or has a large imbalance of voltage between phases. Detected when L8-05 = 1 (enabled).
PF5	PF5	Rescue Operation Power Supply Deterioration Error
PGo	PGo	Encoder Disconnected (for Control Mode with Encoder)
		No encoder pulses are received for longer than the time set to F1-14.
PGoH	PGoH	Encoder Disconnected (detected when using an encoder)
		Encoder cable is not connected properly.
rF	rF	Braking Resistor Fault
		The resistance of the braking resistor being used is too low.
rr	rr	Dynamic Braking Transistor Fault
		The built-in dynamic braking transistor failed.
SC	SC	IGBT Short Circuit
		Short Circuit or Ground Fault is detected
SE1	SE1	Motor Contactor Response Error
		Motor contactor does not respond within the time set to S1-10 (Run Command Delay Time).
SE2	SE2	Starting Current Error
		The output current was lower than 25% of the motor no-load current at start.
SE3	SE3	Output Current Error
		The output current was lower than 25% of the motor no-load current during operation.
SE4	SE4	Brake Feedback Error
		The input terminal set for “Brake feedback” (H1-□□ = 79) or “Brake feedback 2” (H1-□□ = 5B) did not respond within the SE4 error time set to S6-05 after an output terminal set for “Brake release” (H2-□□ = 50) closed.
SvE	SvE	Position Lock Error
		Position deviation during Position Lock.
STo	STo	Motor Pull Out or Step Out Detection
		Motor pull out or step out has occurred. Motor has exceeded its pull out torque.

Digital Operator Display		Fault Name
UL3	UL3	Undertorque Detection 1
		The current has fallen below the minimum value set for torque detection (L6-02) for longer than the allowable time (L6-03).
UL4	UL4	Undertorque Detection 2
		The current has fallen below the minimum value set for torque detection (L6-05) for longer than the allowable time (L6-06).
Uv1	Uv1	DC Bus Undervoltage
		One of the following conditions occurred while the drive was running: • Voltage in the DC bus fell below the undervoltage detection level (L2-05) • For 200 V class: approximately 190 V • For 400 V class: approximately 380 V (350 V when E1-01 is less than 400) • For 600 V class: approximately 500 V
Uv2	Uv2	Control Power Supply Voltage Fault
		Voltage is too low for the control drive input power.
Uv3	Uv3	Soft-Charge Bypass Circuit Fault
		The soft-charge bypass circuit failed.
voF	voF	Output Voltage Detection Error
		Problem detected with the voltage on the output side of the drive.

<1> Displayed as CPF00 or CPF20 when occurring at drive power up. When one of the faults occurs after successfully starting the drive, the display will show CPF01 or CPF21.

◆ Alarm Detection

■ Alarm Codes, Causes, and Possible Solutions

Alarms are drive protection functions that do not necessarily cause the drive to stop. Once the cause of an alarm is removed, the drive will return to the same status as before the alarm occurred.

When an alarm has been triggered, the ALM light on the digital operator display blinks and the alarm code display flashes. If a multi-function output is set for an alarm (H2-□□ = 10), that output terminal will be triggered for certain alarms.

Note: If a multi-function output is set to close when an alarm occurs (H2-□□ = 10), it will also close when maintenance periods are reached, triggering alarms LT-1 through LT-4 (triggered only if H2-□□ = 2F).

Table 36 Alarm Codes, Causes, and Possible Solutions

Digital Operator Display		Minor Fault Name
AEr	AEr	Communication Option Node ID Setting Error (CANopen)
		Option card node address is outside the acceptable setting range.
bb	bb	Baseblock
		Drive output interrupted as indicated by an external baseblock signal.
boL	boL	Braking Transistor Overload
		The braking transistor in the drive has been overloaded.
bUS	bUS	Option Communication Error
		• After initial communication was established, the connection was lost. • Assign a Up/Down command or speed reference to the option card.
CALL	CALL	Serial Communication Stand By
		Communication has not yet been established.
CE	CE	MEMOBUS/Modbus Communication Error
		Control data was not received correctly for two seconds.
CrST	CrST	Cannot Reset
dEv	dEv	Speed Deviation (when using a PG option card)
		The deviation between the speed reference and speed feedback is greater than the setting in F1-10 for longer than the time in F1-11.

Digital Operator Display		Minor Fault Name
EF	EF	Up/Down Command Error
		Both forward run and reverse run closed simultaneously for over 0.5 s.
EF0	EF0	Option Card External Fault
		An external fault condition is present.
EF3	EF3	External fault (input terminal S3)
		External fault at multi-function input terminal S3.
EF4	EF4	External fault (input terminal S4)
		External fault at multi-function input terminal S4.
EF5	EF5	External fault (input terminal S5)
		External fault at multi-function input terminal S5.
EF6	EF6	External fault (input terminal S6)
		External fault at multi-function input terminal S6.
EF7	EF7	External fault (input terminal S7)
		External fault at multi-function input terminal S7.
EF8	EF8	External fault (input terminal S8)
		External fault at multi-function input terminal S8.
Hbb	Hbb	Safe Disable Circuit Fault Signal (H1-HC, H2-HC) Release <1>
		Both Safe Disable Input channels are open.
HbbF	HbbF	Safe Disable Circuit Fault Signal (H1-HC, H2-HC) Release <1>
		One Safe Disable channel is open while the other one is closed.
HCA	HCA	High Current Alarm
		Drive current exceeded overcurrent warning level (150% of the rated current).
LT-1	LT-1	Cooling Fan Maintenance Time
		The cooling fan has reached its expected maintenance period and may need to be replaced. **Note:** An alarm output (H2-☐☐ = 10) will only be triggered if H2-☐☐ = 2F.
LT-2	LT-2	Capacitor Maintenance Time
		The main circuit and control circuit capacitors are nearing the end of their expected performance life. **Note:** An alarm output (H2-☐☐ = 10) will only be triggered if H2-☐☐ = 2F.
LT-3	LT-3	Soft Charge Bypass Relay Maintenance Time
		The DC bus soft charge relay is nearing the end of its expected performance life. **Note:** An alarm output (H2-☐☐ = 10) will only be triggered if H2-☐☐ = 2F.
LT-4	LT-4	IGBT Maintenance Time (90%)
		IGBTs have reached 90% of their expected performance life. **Note:** An alarm output (H2-☐☐ = 10) will only be triggered if H2-☐☐ = 2F.
oH	oH	Heatsink Overheat
		The temperature of the heatsink exceeded the overheat pre-alarm level set to L8-02 (90-100°C). Default value for L8-02 is determined by drive capacity (o2-04).
oH3	oH3	Motor Overheat Alarm (PTC thermistor input)
		• The motor overheat signal to analog input terminal A1 or A2 exceeded the alarm detection level. • Detection requires multi-function analog input H3-02 or H3-10 be set to “E”.
oL3	oL3	Overtorque Detection 1
		Drive output current (or torque in OLV, CLV, CLV/PM) was greater than L6-02 for longer than the time set in L6-03.
oL4	oL4	Overtorque Detection 2
		Drive output current (or torque in OLV, CLV, CLV/PM) was greater than L6-05 for longer than the time set in L6-06.
oS	oS	Overspeed (for Control Mode with Encoder)
		The motor speed feedback exceeded the F1-08 setting.

Digital Operator Display		Minor Fault Name
ou	ov	DC Bus Overvoltage
		The DC bus voltage exceeded the trip point. For 200 V class: approximately 410 V For 400 V class: approximately 820 V For 600 V class drives: approximately 1040 V
PASS	PASS	MEMOBUS/Modbus Communication Test Mode Complete
PGo	PGo	Encoder Disconnected (for Control Mode with Encoder)
		Detected when no encoder signal is received for a time longer than setting in F1-14.
PGoH	PGoH	Encoder Disconnected (detected when using an encoder)
		Encoder cable has become disconnected.
SE	SE	MEMOBUS/Modbus Self Test Failed
trPC	TrPC	IGBT Maintenance Time (90%)
		IGBTs have reached 90% of their expected performance life. **Note:** This alarm will not trigger a multi-function output terminal that is set for alarm output (H2-□□ = 10).
UL3	UL3	Undertorque Detection 1
		Drive output current (or torque in OLV, CLV, CLV/PM) less than L6-02 for longer than L6-03 time.
UL4	UL4	Undertorque Detection 2
		Drive output current (or torque in OLV, CLV, CLV/PM) less than L6-05 for longer than L6-06 time.
Uv	Uv	Undervoltage
		One of the following conditions was true when the drive was stopped and a Up/Down command was entered: • DC bus voltage dropped below the level specified in L2-05. • Contactor to suppress inrush current in the drive was opened. • Low voltage in the control drive input power. This alarm outputs only if L2-01 is not 0 and DC bus voltage is under L2-05.
voF	voF	Output Voltage Detection Error
		There is a problem with the output voltage.

<1> Terminals H1, H2, DM+, and DM- on 600 V class models are designed to the functionality, but are not certified to IEC/EN 61800-5-1, ISO/EN 13849 Cat. 3, IEC/EN 61508 SIL2, Insulation coordination: class 1.

◆ Operator Programming Errors

■ oPE Codes, Causes, and Possible Solutions

An Operator Programming Error (oPE) occurs when a contradictory parameter is set or an individual parameter is set to an inappropriate value.

The drive will not operate until the parameter or parameters causing the problem are set correctly. An oPE, however, does not trigger an alarm or fault output. If an oPE occurs, investigate the cause and refer to *Table 37* for the appropriate action. When an oPE appears on the operator display, press the ENTER button to view U1-18 and see which parameter is causing the oPE.

Table 37 oPE Codes, Causes, and Possible Solutions

Digital Operator Display		Error Name
oPE01	oPE01	Drive Capacity Setting Fault
		Drive capacity and the value set to o2-04 do not match.
oPE02	oPE02	Parameter Range Setting Error
		Use U1-18 to find parameters set outside the range.
oPE03	oPE03	Multi-function Digital Input Selection Error
		A contradictory setting is assigned to multi-function contact inputs H1-03 to H1-08.
oPE04	oPE04	Terminal Board Mismatch Error
oPE05	oPE05	Reference Source Selection Error
oPE06	oPE06	Control Mode Selection Error
		Correct the setting for the control method.
oPE07	oPE07	Multi-function Analog Input Selection Error
		A contradictory setting is assigned to multi-function analog inputs H3-02 and H3-10.
oPE08	oPE08	Parameter Selection Error
		A function has been set that cannot be used in the motor control method selected.
oPE10	oPE10	V/f Pattern Setting Error
		The following setting errors have occurred where: E1-04 is greater than or equal to E1-06, E1-06 is greater than or equal to E1-07, E1-07 is greater than or equal to E1-09, or E1-09 is greater than or equal to E1-11.
oPE16	oPE16	Energy Savings Constants Error
oPE18	oPE18	Parameter Setting Error, Online Tuning Parameter Setting Error
		• The input from load cell with load condition 1 (S3-29) is set to the same value as load condition 2 (S3-30). • DWELL 2 related parameters are not set correctly. • Parameters that control Online Tuning are not set correctly.
oPE20	oPE20	PG-F3 Setting Error
		The encoder signal frequency is too high.
oPE21	oPE21	Elevator Parameter Setting Fault
		Elevator parameters are not set correctly.

◆ Auto-Tuning Fault Detection

Auto-Tuning faults in this section are displayed on the digital operator and will cause the motor to coast to a stop. Auto-Tuning faults do not trigger a multi-function digital output set for fault or alarm output.

An End□ error on the digital operator display indicates Auto-Tuning has successfully completed with discrepancies in the calculations. Check the cause of the End□ error using the tables in this section and perform Auto-Tuning again after fixing the cause.

The drive may be used in the application if no cause can be identified despite the existence of an End□ error.

An Er□ error indicates that Auto-Tuning has not completed successfully. Check for the cause of the error using the tables in this section, and perform Auto-Tuning again after fixing the cause.

■ Auto-Tuning Codes, Causes, and Possible Solutions

Table 38 Auto-Tuning Codes, Causes, and Possible Solutions

Digital Operator Display		Error Name
End 1	End1	Excessive V/f Setting (detected only during Rotational Auto-Tuning, and displayed after Auto-Tuning is complete)
End2	End2	Motor Iron-Core Saturation Coefficient (detected only during Rotational Auto-Tuning and displayed after Auto-Tuning is complete)
End3	End3	Rated Current Setting Alarm (displayed after Auto-Tuning is complete)
End4	End4	Adjusted Slip Calculation Error
End5	End5	Resistance Tuning Error
End6	End6	Leakage Inductance Alarm
End7	End7	No-Load Current Alarm
End8	End8	Rescue Operation Speed Warning
End9	End9	Rescue Operation Rotor Pole Position Search Warning
End 10	End10	Rescue Operation Rotor Polarity Detection Warning
Er-01	Er-01	Motor Data Error
Er-02	Er-02	Alarm
Er-03	Er-03	STOP Button Input
Er-04	Er-04	Line-to-Line Resistance Error
Er-05	Er-05	No-Load Current Error
Er-08	Er-08	Rated Slip Error
Er-09	Er-09	Acceleration Error
Er- 10	Er-10	Motor Direction Error
Er- 11	Er-11	Motor Speed Fault
Er- 12	Er-12	Current Detection Error
Er- 13	Er-13	Leakage Inductance Error
Er- 18	Er-18	Induction Voltage Error
Er- 19	Er-19	Inductance Error
Er-20	Er-20	Stator Resistance Error
Er-21	Er-21	Z Pulse Correction Error
Er-22	Er-22	Initial Rotor Pole Search Error
Er-23	Er-23	Non-rotating Encoder Offset Tuning Warning
Er-24	Er-24	Auto-Tuning Error for PG-E3 Encoder Characteristics

◆ Copy Function Related Displays

■ Tasks, Errors, and Troubleshooting

The table below lists the messages and errors that may appear when using the Copy function.

When executing the tasks offered by the Copy function, the operator will indicate the task being performed. When an error occurs, a code appears on the operator to indicate the error. Note that errors related to the Copy function do not trigger a multi-function output terminal that has been set up to close when a fault or alarm occurs. To clear an error, simply press any key on the operator and the error display will disappear.

Table 39 lists the corrective action that can be taken when an error occurs.

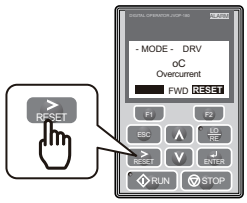
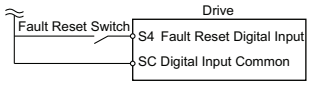
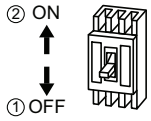
Note: **1.** Whenever using the copy function, the drive should be fully stopped.
2. The drive will not accept an Up/Down command while the Copy function is being executed.
3. Parameters can only be saved to a drive when the voltage class, capacity, control mode, and software version match.

Table 39 Copy Function Task and Error Displays

Digital Operator Display		Task
CoPy	CoPy	Writing Parameter Settings (flashing)
CPEr	CPEr	Control Mode Mismatch
CPyE	CPyE	Error Writing Data
CSEr	CSEr	Copy Unit Error
dFPS	dFPS	Drive Model Mismatch
ECE	ECE	Copy Error
ECS	ECS	Checksum Error
EdE	EdE	Write Impossible
E iF	EiF	Write Data Error
End	End	Task Complete
EPE	EPE	ID Mismatch
ErE	ErE	Data Error
EvE	EvE	Verify Error
iFEr	iFEr	Communication Error
ndAT	ndAT	Model, Voltage Class, Capacity Mismatch
rdEr	rdEr	Error Reading Data
rEAd	rEAd	Reading Parameter Settings (flashing)
vAEr	vAEr	Voltage Class, Capacity Mismatch
vFyE	vFyE	Parameter settings in the drive and those saved to the copy function are not the same
vrFy	vrFy	Comparing Parameter Settings (flashing)

■ Fault Reset Methods

When a fault occurs, the cause of the fault must be removed and the drive must be restarted. The table below lists the different ways to restart the drive.

After the Fault Occurs	Procedure	
Fix the cause of the fault, restart the drive, and reset the fault	Press RESET on the digital operator when error code is displayed.	
Resetting via Fault Reset Digital Input S4	Close then open the fault signal digital input via terminal S4. S4 is set for “Fault Reset” as default (H1-04 = 14).	
If the above methods do not reset the fault, turn off the drive main power supply. Reapply power after the digital operator display is out.		

Note: If the Up/Down command is present, the drive will disregard any attempts to reset the fault. Remove the Up/Down command before attempting to clear a fault situation.

6 Periodic Inspection & Maintenance

◆ Inspection

Power electronics have limited life and may exhibit changes in characteristics or performance deterioration after years of use under normal conditions. To help avoid such problems, it is important to perform preventive maintenance and periodic inspection on the drive.

Drives contain a variety of power electronics such as power transistors, semiconductors, capacitors, resistors, fans, and relays. The electronics in the drive serve a critical role in maintaining proper motor control.

Follow the inspection lists provided in this chapter as a part of a regular maintenance program.

Note: The drive will require more frequent inspection if it is placed in harsh environments, such as:

- High ambient temperatures
- Frequent starting and stopping
- Fluctuations in the AC supply or load
- Excessive vibrations or shock loading
- Dust, metal dust, salt, sulfuric acid, chlorine atmospheres
- Poor storage conditions.

Perform the first equipment inspection one to two years after installation.

■ Recommended Daily Inspection

Table 40 outlines the recommended daily inspection for Yaskawa drives. Check the following items on a daily basis to avoid premature deterioration in performance or product failure. Copy this checklist and mark the "Checked" column after each inspection.

Table 40 General Recommended Daily Inspection Checklist

Inspection Category	Inspection Points	Corrective Action	Checked
Motor	Inspect for abnormal oscillation or noise coming from the motor.	• Check the load coupling. • Measure motor vibration. • Tighten all loose components.	
Cooling	Inspect for abnormal heat generated from the drive or motor and visible discoloration.	Check for excessive load. • Excessive load. • Loose connections. • Dirty heatsink or motor. • Ambient temperature.	
	Inspect drive cooling fan and circulation fan operation.	Check for the following: • Clogged or dirty fan. • Correct fan operation parameter setting.	
Environment	Verify the drive environment complies with the specifications listed in *Installation Environment on page 17*.	Eliminate the source of contaminants or correct poor environment.	
Load	The drive output current should not be higher than the motor or drive rating for an extended period of time.	Check for the following: • Excessive load. • Correct motor parameter settings.	
Power Supply Voltage	Check main power supply and control voltages.	• Correct the voltage or power supply to within nameplate specifications. • Verify all main circuit phases.	

■ Recommended Periodic Inspection

Table 41 outlines the recommended periodic inspections for Yaskawa drive installations. Although periodic inspections should generally be performed once a year, the drive may require more frequent inspection in harsh environments or with rigorous use. Operating and environmental conditions, along with experience in each application, will determine the actual inspection frequency for each installation. Periodic inspection will help to avoid premature deterioration in performance or product failure. Copy this checklist and mark the "Checked" column after each inspection.

Periodic Inspection

WARNING! *Electrical Shock Hazard. Do not inspect, connect, or disconnect any wiring while the power is on. Failure to comply can result in serious personal injury. Before servicing the drive, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. After shutting off the power, wait for at least the amount of time specified on the drive before touching any components.*

Table 41 Periodic Inspection Checklist

Inspection Area	Inspection Points	Corrective Action	Checked
Main Circuit Periodic Inspection			
General	• Inspect equipment for discoloration from overheating or deterioration. • Inspect for damaged or deformed parts.	• Replace damaged components as required. • The drive has few serviceable parts and may require complete drive replacement.	
	Inspect for dirt, foreign particles, or dust collection on components.	• Inspect enclosure door seal if used. • Remove foreign particles and dust by sucking them out with a vacuum cleaner to avoid touching parts. • Replace components if cleaning is not possible.	
Conductors and Wiring	• Inspect wiring and connections for discoloration, damage, or heat stress. • Inspect wire insulation and shielding for wear.	Repair or replace damaged wiring.	
Terminals	Inspect terminals for stripped, damaged, or loose connections.	Tighten loose screws and replace damaged screws or terminals.	
Relays and Contactors	• Inspect contactors and relays for excessive noise during operation. • Inspect coils for signs of overheating such as melted or cracked insulation.	• Check coil voltage for overvoltage or undervoltage conditions. • Replace damaged removable relays contactors or circuit board.	
Braking Resistors	Inspect for discoloration of heat stress on or around resistors.	• Minor discoloration may be acceptable. • Check for loose connections if discoloration exists.	
Electrolytic Capacitor	• Inspect for leaking, discoloration, or cracks. • Check if the cap has come off, for any swelling, or if the sides have burst open.	The drive has few serviceable parts and may require complete drive replacement.	
Diode, IGBT (Power Transistor)	Inspect for dust or other foreign material collected on the surface.	Remove foreign particles and dust by sucking them out with a vacuum cleaner to avoid touching parts.	
Motor Periodic Inspection			
Operation Check	Check for increased vibration or abnormal noise.	Stop the motor and contact qualified maintenance personnel as required.	
Control Circuit Periodic Inspection			
General	• Inspect terminals for stripped, damaged, or loose connections. • Make sure all terminals have been properly tightened.	• Tighten loose screws and replace damaged screws or terminals. • If terminals are integral to a circuit board, then board or drive replacement may be required.	

Inspection Area	Inspection Points	Corrective Action	Checked
Circuit Boards	Check for any odor, discoloration, and rust. Make sure connections are properly fastened and that no dust or oil mist has accumulated on the surface of the board.	• Fix any loose connections. • If an antistatic cloth or vacuum plunger cannot be used, replace the board. • Do not use any solvents to clean the board. • Remove foreign particles and dust by sucking them out with a vacuum cleaner to avoid touching parts. • The drive has few serviceable parts and may require complete drive replacement.	
Cooling System Periodic Inspection			
Cooling Fan, Circulation Fan, Control Board Cooling Fan	• Check for abnormal oscillation or unusual noise. • Check for damaged or missing fan blades.	• Clean or replace the fan.	
Heatsink	Inspect for dust or other foreign material collected on the surface.	Remove foreign particles and dust by sucking them out with a vacuum cleaner to avoid touching parts.	
Air Duct	Inspect air intake and exhaust openings. They must be free from obstruction and properly installed.	• Visually inspect the area. • Clear obstructions and clean air duct as required.	
Display Periodic Inspection			
Digital Operator	• Make sure data appears on the operator properly. • Inspect for dust or other foreign material that may have collected on surrounding components.	• Contact a Yaskawa representative if there is any trouble with the display or keypad. • Clean the digital operator.	

◆ Periodic Maintenance

The drive has Maintenance Monitors that keep track of component wear. This feature provides advance maintenance warning and eliminates the need to shut down the entire system for unexpected problems. The drive allows the user to check predicted maintenance periods for the components listed below.

- Cooling Fan, Circulation Fan, Control Board Cooling Fan
- Electrolytic Capacitors
- Inrush Prevention Circuit
- IGBTs

For replacement parts, contact the distributor where the drive was purchased or contact Yaskawa directly.

■ Replacement Parts

Table 42 contains the estimated performance life of components that require replacement during the life of the drive. Only use Yaskawa replacement parts for the appropriate drive model and revision.

Table 42 Estimated Performance Life

Component	Estimated Performance Life
Cooling Fan, Circulation Fan	10 years
Electrolytic Capacitors	10 years <1>

<1> The drive has few serviceable parts and may require complete drive replacement.

NOTICE: *Estimated performance life based on specific usage conditions. These conditions are provided for the purpose of replacing parts to maintain performance. Some parts may require more frequent replacement due to poor environments or rigorous use. Usage conditions for estimated performance life:*
Ambient temperature: Yearly average of 40°C (104°F) (IP00 enclosure)
Load factor: 80% maximum
Operation time: 24 hours a day

Performance Life Monitors Maintenance Monitors

The drive calculates the maintenance period for components that may require replacement during the life of the drive. A percentage of the maintenance period is displayed on the digital operator by viewing the appropriate monitor parameter.

When the maintenance period reaches 100%, there is increased risk that the drive may malfunction. Yaskawa recommends checking the maintenance period regularly to ensure maximum performance life.

Refer to Recommended Periodic Inspection on page 142 for more details.

Table 43 Performance Life Monitors Used for Component Replacement

Parameter	Component	Contents
U4-03	Cooling Fan, Circulation Fan, Control Board Cooling Fan	Displays the accumulated operation time of the fan, from 0 to 99999 hours. This value is automatically reset to 0 once it reaches 99999.
U4-04		Displays the accumulated fan operation time as a percentage of the specified maintenance period.
U4-05	DC Bus Capacitors	Displays the accumulated time the capacitors are used as a percentage of the specified maintenance period.
U4-06	Inrush (pre-charge) Relay	Displays the number of times the drive is powered up as a percentage of the performance life of the inrush circuit.
U4-07	IGBT	Displays the percentage of the maintenance period reached by the IGBTs.

Alarm Outputs for Maintenance Monitors

An output can be set up to inform the user when a specific components has neared its expected performance life.

When one of multi-function digital output terminals has been assigned the maintenance monitor function (H2-☐☐ = 2F), the terminal will close when the cooling fan, DC bus capacitors, or DC bus pre-charge relay reach 90% of the expected performance life, or when the IGBTs have reached 50% of their expected performance life. Additionally the digital operator will display an alarm like shown in *Table 44* to indicate the specific components that may need maintenance.

Table 44 Maintenance Alarms

Alarm Display		Function	Corrective Action
LED Operator	LCD Operator		
LT-1 <1>	LT-1	The cooling fans have reached 90% of their designated lifetime.	Replace the cooling fan.
LT-2 <1>	LT-2	The DC bus capacitors have reached 90% of their designated lifetime.	Replace the drive.
LT-3 <1>	LT-3	The DC bus charge circuit has reached 90% of its designated lifetime.	Replace the drive.
LT-4 <1>	LT-4	The IGBTs have reached 50% of their designated lifetime.	Check the load, carrier frequency, and output frequency.
TrPC <2>	TrPC	The IGBTs have reached 90% of their designated lifetime.	Replace the drive.

<1> This alarm message will be output only if the Maintenance Monitor function is assigned to one of the digital outputs (H2-☐☐ = 2F). The alarm will also trigger a digital output that is programmed for alarm indication (H2-☐☐ = 10).
<2> This alarm message will always be output, even if the Maintenance Monitor function is not assigned to any of the digital outputs (H2-☐☐ = 2F). The alarm will also trigger a digital output that is programmed for alarm indication (H2-☐☐ = 10).

Related Drive Parameters

Use parameters o4-03, o4-05, o4-07, and o4-09 to reset a Maintenance Monitor to zero after replacing a specific component. *Refer to Parameter Table on page 165* for details on parameter settings.

NOTICE: *If these parameters are not reset after the corresponding parts have been replaced, the Maintenance Monitor function will continue to count down the performance life from the value that was reached with the old part. If the Maintenance Monitor is not reset, the drive will not have the correct value of the performance life for the new component.*

◆ Drive Replacement

■ Serviceable Parts

The drive contains some serviceable parts. The following parts can be replaced over the life span of the drive:

- Terminal board I/O PCBs
- Cooling fan(s)
- Front cover

Replace the drive if the main power circuitry is damaged. Contact your local Yaskawa representative before replacing parts if the drive is still under warranty. Yaskawa reserves the right to replace or repair the drive according to Yaskawa warranty policy.

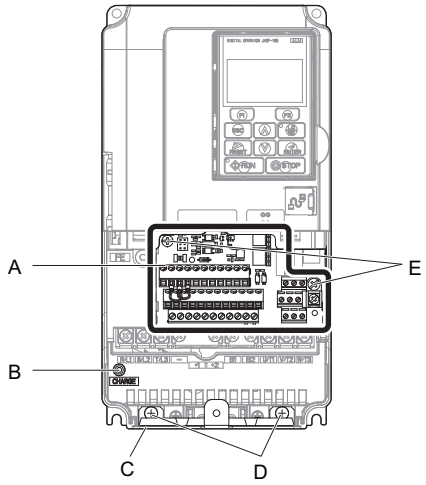
■ Terminal Board

CAUTION! *Crush Hazard. Carrying the drive by the front cover may cause the main body of the drive to fall, resulting in minor or moderate injury. Always hold the case when carrying the drive.*

NOTICE: *Correctly set parameter o2-04 when replacing the control terminal board. Failure to comply may result in drive damage due to lack of protective functions and poor drive performance.*

The drive has a modular I/O terminal block that facilitates quick drive replacement. The terminal board contains on-board memory that stores all drive parameter settings and allows the parameters to be saved and transferred to the replacement drive. To transfer the terminal board, disconnect the terminal board from the damaged drive then reconnect it to the replacement drive. Once transferred, there is no need to manually reprogram the replacement drive.

Note: If the damaged drive and the new replacement drive are have different capacities, the data stored in the control terminal board cannot be transferred to the new drive and an oPE01 error will appear on the display. The control terminal board can still be used, but parameter setting from the old drive cannot be transferred. The replacement drive must be initialized and manually programmed.



A – Removable terminal board
B – Charge LED
C – Bottom cover
D – Bottom cover screws
E – Control terminal board locking screws

Figure 79 Terminal Board

■ Replacing the Drive

WARNING! *Electrical Shock Hazard. Do not connect or disconnect wiring while the power is on. Failure to comply can result in serious personal injury. Before servicing the drive, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. After shutting off the power, wait for at least the amount of time specified on the drive before touching any components.*

WARNING! *Electrical Shock Hazard. Do not allow unqualified personnel to perform work on the drive. Failure to comply could result in serious injury. Installation, maintenance, inspection and servicing must be performed only by authorized personnel familiar with installation, adjustment and maintenance of AC drives.*

NOTICE: *Damage to Equipment. Observe proper electrostatic discharge procedures (ESD) when handling the drive and circuit boards. Failure to comply may result in ESD damage to the drive circuitry.*

The following procedure explains how to replace a drive. This section provides instructions for drive replacement only. To install option cards or other types of options, refer to the specific manuals for those options.

NOTICE: *When transferring a braking transistor, braking resistor, or other type of option from a damaged drive to a new replacement drive, make sure they are working properly before reconnecting them to the new drive. Replace broken options to prevent immediate break down of the replacement drive.*

1. Remove the terminal cover. Refer to ***Terminal Cover on page 29*** for details.

Note: The shape of the terminal covers and the numbers of the screws differ depending on the drive models.

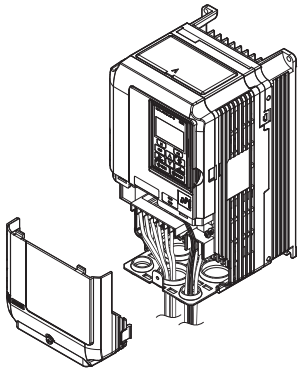


Figure 80 Drive Replacement: Removing the Terminal Cover

2. Loosen the screws holding the terminal board in place. Remove the screw securing the bottom cover and remove the bottom cover from the drive.

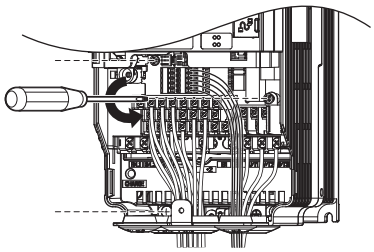


Figure 81 Drive Replacement: Removing the Control Terminal Board

3. Slide the terminal board as illustrated by the arrows to remove it from the drive along with the bottom cover.

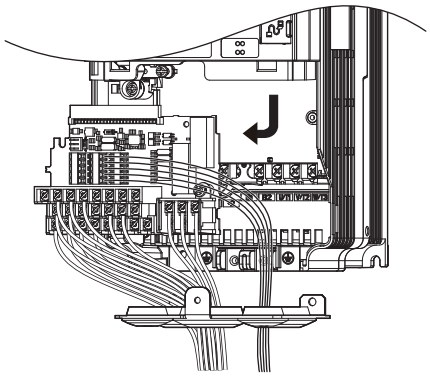


Figure 82 Drive Replacement: Remove the Control Terminal Board

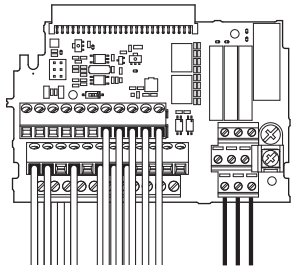


Figure 83 Drive Replacement: Removable Control Terminal Board Disconnected from the Drive

4. Disconnect all option cards and options. Make sure they are intact before reusing them.
5. Replace the drive and wire the main circuit.

Installing the Drive

1. After wiring the main circuit, connect the terminal block to the drive as shown in ***Figure 84***. Use the installation screw to fasten the terminal block into place.

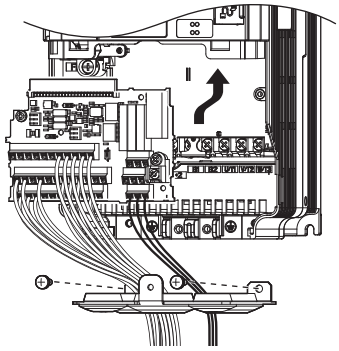


Figure 84 Drive Replacement: Installing the Control Terminal Board

2. Reconnect all options to the new drive in the same way they were installed in the old drive. Connect option boards to the same option ports in the new drive that were used in the old drive.
3. Put the terminal cover back into its original place.
4. After powering on the drive, all parameter settings are transferred from the terminal board to the drive memory. If an oPE04 error occurs, load the parameter settings saved on the terminal board to the new drive by setting parameter A1-03 to 5550. Reset the Maintenance Monitor function timers by setting parameters o4-01 through o4-12 to 0, and parameter o4-13 to 1.

7 Option Card Installation

This section provides instructions on installing the option cards listed in *Table 45*.

◆ Prior to Installing the Option

Prior to installing the option, wire the drive, make the necessary connections to the drive terminals, and verify that the drive functions normally. Refer to the *Table 45* for information on wiring and connecting the drive.

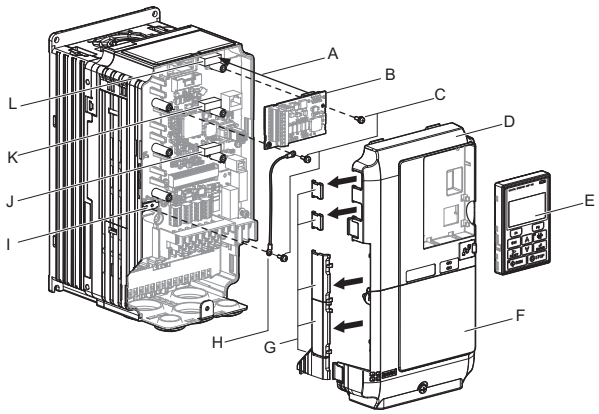
Table 45 below lists the number of option cards that can be connected to the drive and the drive connectors for connecting those option cards.

Table 45 Option Card Installation

Option Card	Connector	Number of Cards Possible
PG-B3, PG-X3	CN5-C	2 <1>
PG-F3 <2>, PG-E3	CN5-C	1
DO-A3, AO-A3	CN5-A, B, C	1
SI-S3, DI-A3 <3>	CN5-A	1

<1> If two PG option cards are connected, use both CN5-B and CN5-C. If only one PG option card is connected to the drive, use the CN5-C connector.
<2> These option cards are not available for the application with Motor 2 Selection.
<3> When DI-A3 is to be used as monitors, the card can be connected to any of CN5-A, CN5-B or CN5-C. The input status of DI-A3 can then be viewed using U1-17.

Figure 85 shows an exploded view of the drive with the option and related components for reference.



A – Insertion point for CN5
B – Option card
C – Included screws
D – Front cover
E – Digital operator
F – Terminal cover
G – Removable tabs for wire routing
H – Ground wire
I – Drive grounding terminal (FE)
J – Connector CN5-A
K – Connector CN5-B
L – Connector CN5-C

Figure 85 Installing an Option Card

◆ Installing the Option

Refer to the instructions below to install the option.

DANGER! *Electrical Shock Hazard. Disconnect all power to the drive and wait at least the amount of time specified on the drive front cover safety label. After all indicators are off, measure the DC bus voltage to confirm safe level, and check for unsafe voltages before servicing to prevent electric shock. The internal capacitor remains charged even after the power supply is turned off.*

WARNING! *Electrical Shock Hazard. Do not allow unqualified personnel to perform work on the drive. Failure to comply could result in death or serious injury. Maintenance, inspection, and replacement of parts must be performed only by authorized personnel familiar with installation, adjustment and maintenance of AC drives and Option Cards.*

NOTICE: *Damage to Equipment. Observe proper electrostatic discharge procedures (ESD) when handling the option, drive, and circuit boards. Failure to comply may result in ESD damage to circuitry.*

NOTICE: *Damage to Equipment. Tighten all terminal screws to the specified tightening torque. Failure to comply may cause the application to operate incorrectly or damage the drive.*

1. Shut off power to the drive, wait the appropriate amount of time for voltage to dissipate, then remove the digital operator (E) and front covers (D, F). Refer to ***Digital Operator and Front Cover on page 31***.

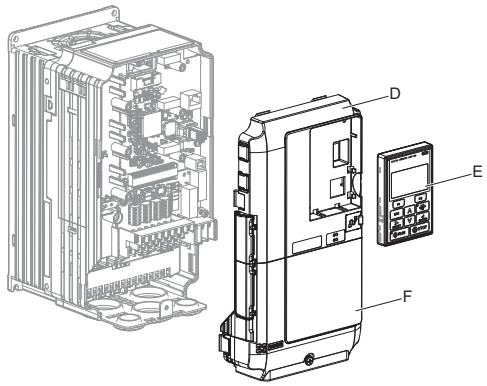


Figure 86 Remove the Front Covers and Digital Operator

2. Insert the option card (B) into the CN5-A (J), CN5-B (K) or CN5-C (L) connectors located on the drive and fasten it into place using one of the included screws (C).

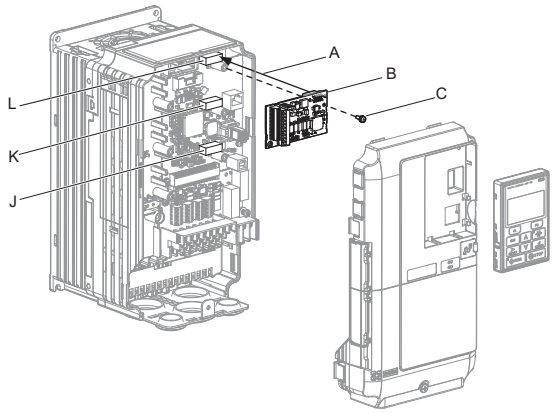


Figure 87 Insert the Option Card

3. Connect one end of the ground wire (H) to the ground terminal (I) using one of the remaining screws (C). Connect the other end of the ground wire (H) to the remaining ground terminal and installation hole on the option (B) using the last remaining provided screw (C).

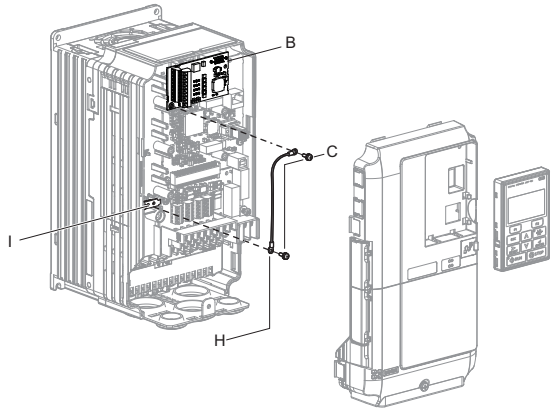


Figure 88 Connect the Ground Wire

Note: 1. The option package includes two ground wires. Use the longer wire when plugging the option into connector CN5-C on the drive side. Use the shorter wire when plugging the option into connector CN5-B. Refer to the option card instruction manual for more information.

2. There are two screw holes on the drive for use as ground terminals (I). When connecting three options, two ground wires will need to share the same drive ground terminal.

4. Prepare and connect the wire ends as shown in ***Figure 89*** and ***Figure 90***. ***Wire Gauges and Tightening Torques on page 153*** to confirm that the proper tightening torque is applied to each terminal. Take particular precaution to ensure that each wire is properly connected and wire insulation is not accidentally pinched into electrical terminals.

WARNING! *Fire Hazard. Tighten all terminal screws according to the specified tightening torque. Loose electrical connections could result in death or serious injury by fire due to overheating electrical connections. Tightening screws beyond the specified tightening torque may result in erroneous operation, damage to the terminal block, or cause a fire.*

NOTICE: *Heat shrink tubing or electrical tape may be required to ensure that cable shielding does not contact other wiring. Insufficient insulation may cause a short circuit and damage the option or drive.*

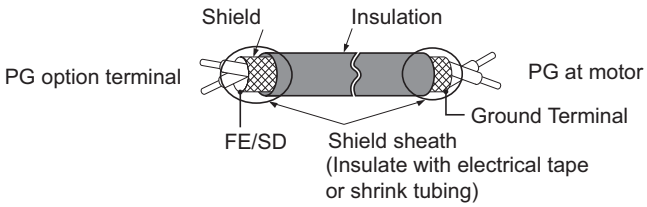


Figure 89 Preparing Ends of Shielded Cable

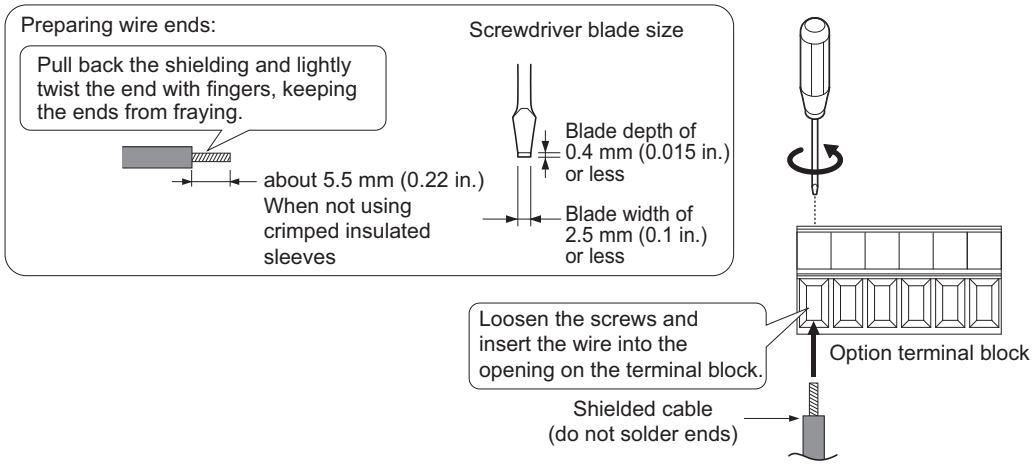


Figure 90 Preparing and Connecting Cable Wiring

5. For the PG-B3 and PG-X3 Option, wire the motor PG encoder to the terminal block. Refer to ***Figure 91*** and ***Figure 95*** for wiring instructions.
Refer to Terminal Functions on page 152 for a detailed description of the option terminal functions.

■ Connecting PG-B3 Option

Parameter Settings and Connections for Different Encoder Types

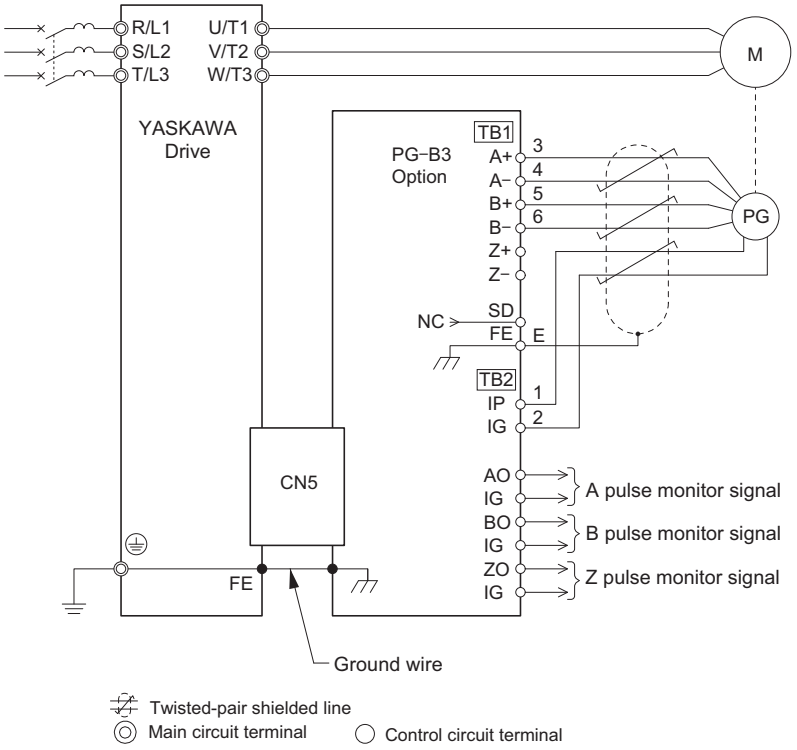
- Connecting a Single-Pulse Encoder
  When using a single-pulse encoder in V/f with PG control mode, connect the pulse output from the PG to the option and set drive parameter F1-21 to 0.
- Connecting a Two-Pulse Encoder
  When using a two-pulse encoder, connect the A and B pulse outputs on the PG to the option and set F1-21 to 1.
  When using a two-pulse encoder in Closed Loop Vector control mode, connect pulse outputs A and B from the encoder to the corresponding terminals on the option.
- Connecting a Two-Pulse Encoder with Z Marker Pulse
  When using a two-pulse encoder with Z marker pulse, connect the A, B, and Z pulse outputs to the corresponding terminals on the option.

Control Method	V/f with PG		Closed Loop Vector	
No. of Encoders	1 (CN5-C)	2 (CN5-B)	1 (CN5-C)	2 (CN5-B)
Single Pulse (A)	F1-21 = 0	F1-37 = 0	N/A	N/A
Two Pulse (AB Quadrature)	F1-21 = 1	F1-37 = 1	No setting required	No setting required
Two Pulse with Marker (ABZ)	F1-21 = 1	F1-37 = 1	No setting required	No setting required

Connection Diagram of PG-B3

Refer to ***Table 46*** for a detailed description of the option board terminal functions.

Refer to ***Wire Gauges and Tightening Torques on page 153*** for information on making cables.



<1> Ground the shield on the PG side and the drive side. If noise problems arise in the PG signal, remove the shield ground from one end of the signal line or remove the shield ground connection on both ends.

Figure 91 PG-B3 Option and Encoder Connection Diagram

Note: The PG-B3 Option reads a maximum input frequency from the PG encoder of 50 kHz. Be sure to select an PG encoder with an output pulse frequency of maximum 50 kHz when operating at maximum speed.

Take the following steps to prevent erroneous operation caused by noise interference:

- Use shielded wire for the PG encoder signal lines.
- Limit the length of all motor output power cables to less than 100 m. Limit the length of open-collector output lines to less than 50 m.
- Use separate conduit or cable tray dividers to separate option control wiring, main circuit input power wiring, and motor output power cables.

Interface Circuit

- Complementary Output

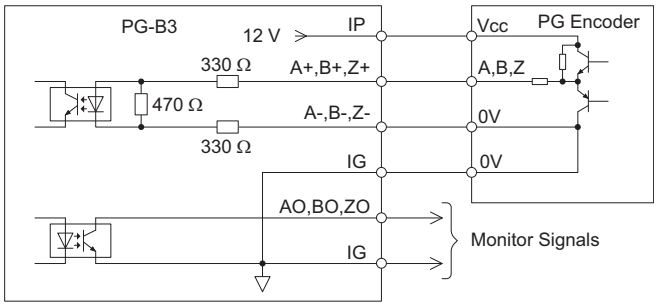


Figure 92 Complementary Outputs for the Interface Circuit

- Open-Collector Outputs

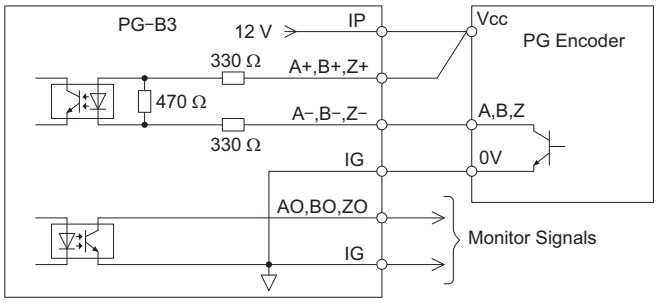
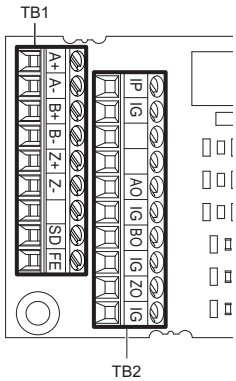


Figure 93 Open-Collector Outputs for the Interface Circuit

Terminal Functions

Table 46 Option Terminal Functions

	Terminal Block	Terminal	Function	Description
	TB1	A+	A+ pulse signal input	• Pulse signal inputs from the PG. • Signal inputs from complementary and open-collector outputs • Signal level H level: 8 to 12 V L level: 2.0 V or less
		A–	A– pulse signal input	
		B+	B+ pulse signal input	
		B–	B– pulse signal input	
		Z+	Z+ pulse signal input	
		Z–	Z– pulse signal input	
		SD	NC pin (open)	For use when cables shields should not be grounded
		FE	Ground	Used for grounding shielded lines
	TB2	IP	PG power supply	• Output voltage: 12.0 V ± 5% • Max output current: 200 mA <1>
		IG	PG power supply common	
		AO	A pulse monitor signal	• Outputs the monitor signal for the A, B, and Z pulses from the PG speed control card • For open collector outputs from the option • Max voltage: 24 V • Max current: 30 mA
		BO	B pulse monitor signal	
		ZO	Z pulse monitor signal	
		IG	Monitor signal common	

<1> A separate UL-listed class 2 power supply is necessary when the PG requires more than 200 mA to operate.

Wire Gauges and Tightening Torques

Wire gauge and torque specifications are listed in *Table 47*. For simpler and more reliable wiring, use crimp ferrules on the wire ends. Refer to the option manuals for the wire size and torque specifications of other options.

Table 47 Wire Gauges and Tightening Torques

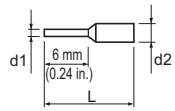
Terminal Signal	Screw Size	Tightening Torque N·m (lb.in.)	Bare Cable		Crimp Terminals		Wire Type
			Applicable Gauges mm²	Recomm. Gauge mm²	Applicable Gauges mm²	Recomm. Gauge mm²	
A+, A–, B+, B–, Z+, Z–, FE, IP, IG	M2	0.22 to 0.25 (1.95 to 2.21)	0.75 (18 AWG)	Stranded wire: 0.25 to 1.0 (24 to 17 AWG) Solid wire: 0.25 to 1.5 (24 to 16 AWG)	0.5 (20 AWG)	0.25 to 0.5 (24 to 20 AWG)	Shielded twisted pair, etc.
AO, IG, BO, IG, ZO, IG							Shielded cable, etc.

Crimp Terminals

Yaskawa recommends using CRIMPFOX 6 by Phoenix Contact or equivalent crimp terminals with the specifications listed in *Table 48* for wiring to ensure proper connections.

Note: Properly trim wire ends so loose wire ends do not extend from the crimp terminals.

Table 48 Crimp Terminal Sizes

	Wire Gauge mm²	Phoenix Contact Model	L mm (in)	d1 mm (in)	d2 mm (in)
	0.25 (24 AWG)	AI 0.25 - 6YE	10.5 (13/32)	0.8 (1/32)	2 (5/64)
	0.34 (22 AWG)	AI 0.34 - 6TQ	10.5 (13/32)	0.8 (1/32)	2 (5/64)
	0.5 (20 AWG)	AI 0.5 - 6WH	14 (9/16)	1.1 (3/64)	2.5 (3/32)

PG Encoder Cables for PG-B3 Option

Yaskawa recommends using a LMA-☐☐B-S185Y (complementary output) for cables running between the PG-B3 Option and the PG as show in *Figure 94*.

For instructions on wiring the terminal block, refer to *Table 46*.

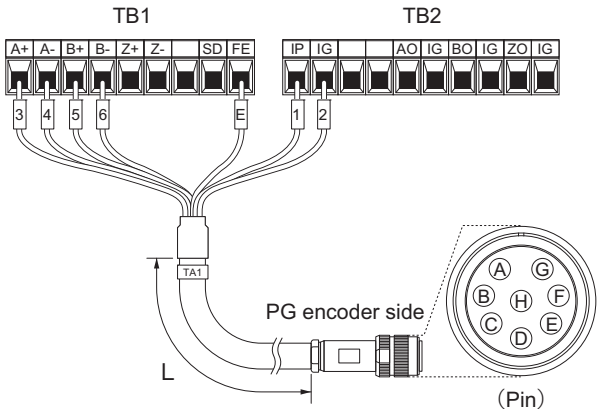


Figure 94 Wiring PG Encoder Cable

Table 49 Connecting the PG Encoder Cable Specification

Option Terminal	PG Encoder Cable		
	Wire	Color	Pin
IP	1	Blue	C
IG	2	White	H
A+	3	Yellow	B
A–	4	White	G
B+	5	Green	A
B–	6	White	F
FE	E	N/A (shield)	D

Table 50 PG Encoder Cable Types

Length	Type	Length	Type
10 m (32 ft.)	W5010	50 m (164 ft.)	W5050
30 m (98 ft.)	W5030	100 m (328 ft.)	W5100

■ Connecting PG-X3 Option

Parameter Settings and Connections for Different Encoder Types

- Connecting a Single-Pulse Encoder
  When using a single-pulse encoder in V/f with PG control mode, connect the pulse output from the PG to the option and set drive parameter F1-21 to 0.
- Connecting a Two-Pulse Encoder
  When using a two-pulse encoder, connect the A and B pulse outputs on the PG to the option and set F1-21 to 1.
  When using a two-pulse encoder in Closed Loop Vector control mode, connect pulse outputs A and B from the encoder to the corresponding terminals on the option.
- Connecting a Two-Pulse Encoder with Z Marker Pulse
  When using a two-pulse encoder with Z marker pulse, connect the A, B, and Z pulse outputs to the corresponding terminals on the option.
  When using a two-pulse encoder in CLV/PM control mode, connect pulse outputs A and B from the encoder to the corresponding terminals on the option.

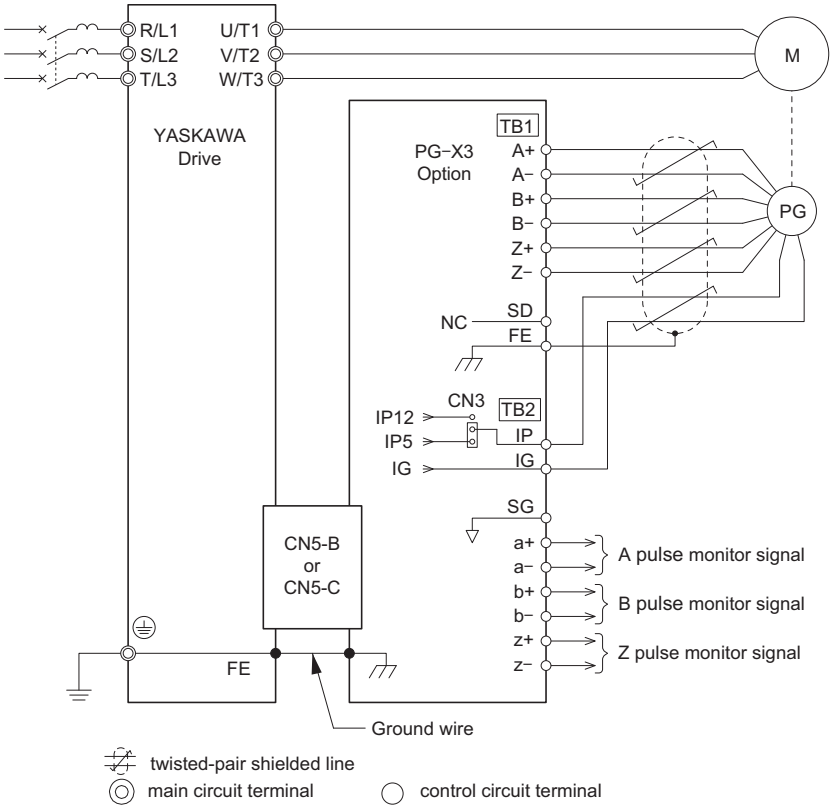
Control Method	V/f with PG		Closed Loop Vector	
No. of Encoders	1 (CN5-C)	2 (CN5-B)	1 (CN5-C)	2 (CN5-B)
Single Pulse (A)	F1-21 = 0	F1-37 = 0	N/A	N/A
Two Pulse (AB Quadrature)	F1-21 = 1	F1-37 = 1	No setting required	No setting required
Two Pulse with Marker (ABZ)	F1-21 = 1	F1-37 = 1	No setting required	No setting required

Connection Diagram of PG-X3

Refer to *Table 51* for a detailed description of the option board terminal functions.

The positioning of jumper CN3 selects the PG encoder power supply voltage (5.5 V or 12 V). Select the voltage level for the PG encoder connected to the option and motor. If the wrong voltage is selected, the PG encoder may not operate properly or may become damaged as a result.

Refer to *Setting the PG Encoder Power Supply Voltage on page 156* for details.



<1> Ground the shield on the PG side and the drive side. If noise problems arise in the PG signal, remove the shield ground from one end of the signal line or remove the shield ground connection on both ends.

Figure 95 PG-X3 Option and PG Encoder Connection Diagram

Note: The PG-X3 Option reads a maximum input frequency from the PG of 300 kHz. Be sure to select a PG with an output pulse frequency of maximum 300 kHz when operating at maximum speed.

Take the following steps to prevent erroneous operation caused by noise interference:

- Use shielded wire for the PG encoder signal lines.
- Use separate conduit or cable tray dividers to separate option control wiring, main circuit input power wiring, and motor output power cables.

Interface Circuit

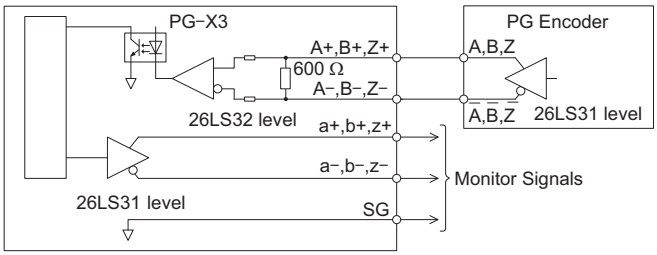
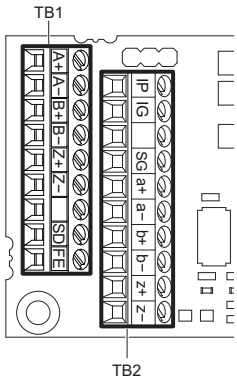


Figure 96 Interface Circuit (PG-X3)

Terminal Functions

Table 51 Option Terminal Functions

Terminal Block		Terminal	Function	Description
	TB1	A+	A+ pulse signal input	• Inputs for the A channel, B channel, and Z pulses from the PG encoder • Signal level matches RS-422
		A–	A– pulse signal input	
		B+	B+ pulse signal input	
		B–	B– pulse signal input	
		Z+	Z+ pulse signal input	
		Z–	Z– pulse signal input	
		SD	NC pin (open)	Open connection connectors for use when cable shields should not be grounded
		FE	Ground	Used as the shield ground termination point.
	TB2	IP	PG encoder power supply	• Output voltage: 12.0 V ± 5% or 5.5 V ± 5% • Max. output current: 200 mA <1>
		IG	PG encoder power supply common	
		SG	Monitor signal common	• Output signal for monitoring A channel, B channel, and Z pulses from the PG encoder • Signal level matches RS-422
		a+	A+ pulse monitor signal	
		a–	A- pulse monitor signal	
		b+	B+ pulse monitor signal	
		b–	B- pulse monitor signal	
		z+	Z+ pulse monitor signal	
		z–	Z- pulse monitor signal	

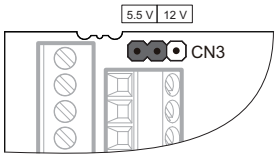
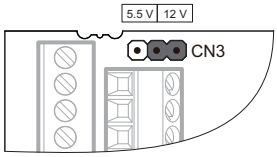
<1> A separate UL-listed class 2 power supply is necessary when the PG requires more than 200 mA to operate.

Setting the PG Encoder Power Supply Voltage

For the PG-X3 Option, set the voltage for the PG encoder power supply using jumper CN3 located on the option.

NOTICE: *The positioning of jumper CN3 selects the PG encoder power supply voltage (5.5 V or 12 V). Select the voltage level for the PG encoder connected to the option and motor. If the wrong voltage is selected, the PG encoder may not operate properly or may become damaged as a result.*

Table 52 Setting the PG Encoder Power Supply Voltage (IP) with Jumper CN3

Voltage Level	5.5 V ± 5% (default)	12.0 V ± 5%
Jumper CN3		

Wire Gauges and Tightening Torques

Wire gauge and torque specifications are listed in ***Table 53***. For simpler and more reliable wiring, use crimp ferrules on the wire ends. Refer to the option manuals for the wire size and torque specifications of other options.

Table 53 Wire Gauges and Tightening Torques

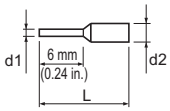
Terminal Signal	Screw Size	Tightening Torque N·m (lb.in.)	Bare Cable		Crimp Terminals		Wire Type
			Applicable Gauges mm²	Recomm. Gauge mm²	Applicable Gauges mm²	Recomm. Gauge mm²	
A+, A–, B+, B–, Z+, Z–, SD, FE, IP, IG	M2	0.22 to 0.25 (1.95 to 2.21)	0.75 (18 AWG)	Stranded wire: 0.25 to 1.0 (24 to 17 AWG) Solid wire: 0.25 to 1.5 (24 to 16 AWG)	0.5 (20 AWG)	0.25 to 0.5 (24 to 20 AWG)	Shielded twisted pair, etc.
a+, a–, b+, b–, z+, z–, SG							Shielded cable, etc.

Crimp Terminals

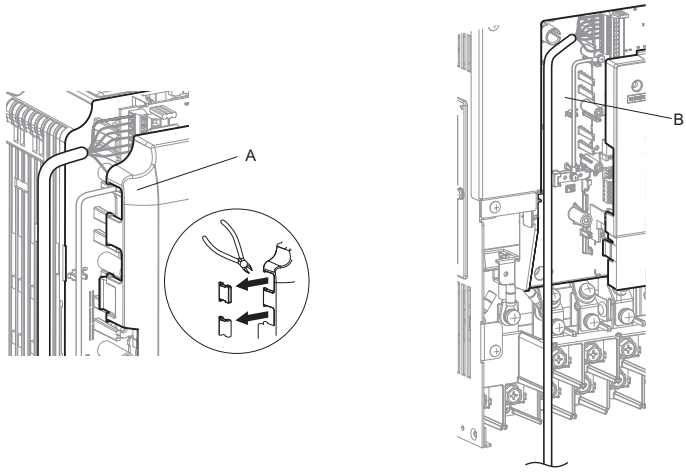
Yaskawa recommends using CRIMPFOX 6 by Phoenix Contact or equivalent crimp terminals with the specifications listed in *Table 54* for wiring to ensure proper connections.

Note: Properly trim wire ends so loose wire ends do not extend from the crimp terminals.

Table 54 Crimp Terminal Sizes

	Wire Gauge mm^2	Phoenix Contact Model	L mm (in)	d1 mm (in)	d2 mm (in)
	0.25 (24 AWG)	AI 0.25 - 6YE	10.5 (13/32)	0.8 (1/32)	2 (5/64)
	0.34 (22 AWG)	AI 0.34 - 6TQ	10.5 (13/32)	0.8 (1/32)	2 (5/64)
	0.5 (20 AWG)	AI 0.5 - 6WH	14 (9/16)	1.1 (3/64)	2.5 (3/32)

6. Route the option wiring.
Depending on the drive model, some drives may require routing the wiring through the side of the front cover to the outside. For drive models CIMR-LU2A0008 through 2A0033, 4A0005 through 4A0018, and 5A0003 through 5A0010, cut out the perforated openings on the left side of the drive front cover as shown in *Figure 97*-A and leave no sharp edges to damage wiring.
Route the wiring inside the enclosure as shown in *Figure 97*-B for drive models CIMR-LU2A0047 through 2A0415, 4A0024 through 4A0605, and 5A0013 through 5A0200 that do not require routing through the front cover.



A – Route wires through the openings provided on the left side of the front cover. <1>
(CIMR-LU2A0008 through 2A0033, 4A0005 through 4A0018, and 5A0003 through 5A0010)

B – Use the open space provided inside the drive to route option wiring.
(CIMR-LU2A0047 through 2A0415, 4A0024 through 4A0605, and 5A0013 through 5A0200)

<1> The drive will not meet NEMA Type 1 requirements if wiring is exposed outside the enclosure.

Figure 97 Wire Routing Examples

7. Replace and secure the front covers of the drive (D, F) and replace the digital operator (E).

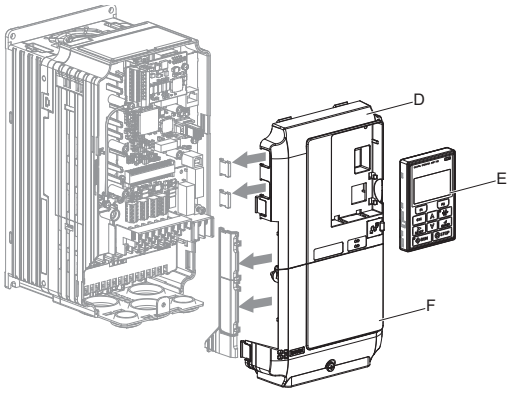


Figure 98 Replace the Front Covers and Digital Operator

Note: Take proper precautions when wiring the option so that the front covers will easily fit back onto the drive. Make sure cables are not pinched between the front covers and the drive when replacing the covers.

8. For the PG-B3 and PG-X3 Option, set drive parameters ***A1: Initialization Parameters on page 165*** and ***F1: PG Speed Control Card on page 178*** for proper motor rotation.
With a two-pulse or three-pulse PG encoder, the leading pulse determines the motor rotation direction. A PG encoder signal with leading A pulse is considered to be rotating forward (counter-clockwise when viewing rotation from motor load side).

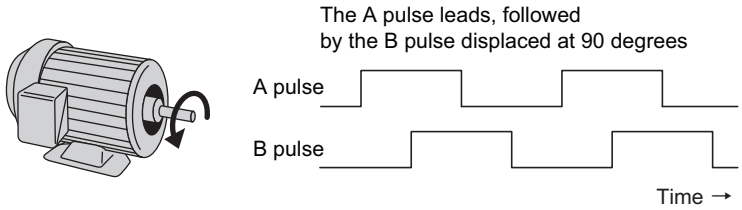


Figure 99 Displacement of A and B Pulses

After connecting the PG encoder outputs to the option, apply power to the drive and manually rotate the motor and check the rotation direction by viewing monitor U1-05 on the digital operator.
Reverse motor rotation is indicated by a negative value for U1-05; forward motor rotation is indicated by a positive value.
If monitor U1-05 indicates that the forward direction is opposite of what is intended, set F1-05 to 1, or reverse the two A pulse wires with the two B pulse wires on option terminal TB1 as shown in ***Figure 100***.

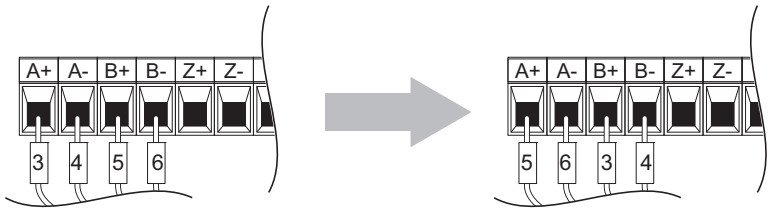


Figure 100 A Channel and B Channel Wire Switching

If switching the wires is inconvenient, set drive parameter F1-05 to 1 to switch the direction of how the option reads pulses from the PG encoder output.
Please note that when the drive is initialized using A1-03 =1110, 2220, 3330, the value for F1-05 will reset to factory default and the parameter will need to be adjusted again to switch the direction.

A Specifications

◆ Three-Phase 200 V Class Drives

Table 55 Power Ratings (Three-Phase 200 V Class)

Item		Specification																
CIMR-LU2A		0008	0011	0014	0018	0025	0033	0047	0060	0075	0085	0115	0145	0180	0215	0283	0346	0415
Maximum Applicable Motor Capacity (HP) <1>		2	3	4	3.7 (5)	7.5	10	15	20	25	30	40	50	60	75	100	125	150
Input	Input Current (A) <2>	7.5	11	15.6	18.9	28	37	52	68	80	82	111	136	164	200	271	324	394
	Rated Voltage Rated Frequency	Three-phase 200 to 240 Vac 50/60 Hz/270 to 340 Vdc <3>																
	Allowable Voltage Fluctuation	-15 to 10%																
	Allowable Frequency Fluctuation	±5%																
	Input Power (kVA)	4.1	5.8	7.8	9.5	14	18	27	36	44	37	51	62	75	91	124	148	180
Output	Rated Output Capacity (kVA) <4>	3 <5>	4.2 <5>	5.3 <5>	6.7 <5>	9.5 <5>	12.6 <5>	17.9 <5>	23 <5>	29 <5>	32 <5>	44 <5>	55 <6>	69 <6>	82 <6>	108 <6>	132 <6>	158 <6>
	Rated Output Current (A)	8 <5>	11 <5>	14 <5>	17.5 <5>	25 <5>	33 <5>	47 <5>	60 <5>	75 <5>	85 <5>	115 <5>	145 <6>	180 <6>	215 <6>	283 <6>	346 <6>	415 <6>
	Overload Tolerance	150% of rated output current for 60 s																
	Carrier Frequency	User adjustable between 2 and 15 kHz											User adjustable between 2 and 10 kHz					
	Maximum Output Voltage (V)	Three-phase 200 to 240 V (proportional to input voltage)																
	Maximum Output Speed (Hz)	200 Hz (user-set)																

<1> The motor capacity (HP) refers to a NEC rated 4-pole motor. The rated output current of the drive output amps should be equal to or greater than the motor current. Select the appropriate capacity drive if operating the motor continuously above motor nameplate current.
<2> Assumes operation at the rated output current. Input current rating varies depending on the power supply transformer, input reactor, wiring connections, and power supply impedance.
<3> DC is not available for UL standards.
<4> Rated motor capacity is calculated with a rated output voltage of 220 V.
<5> Carrier frequency can be set up to 8 kHz while keeping this current rating. Higher carrier frequency settings require derating.
<6> Carrier frequency can be set up to 5 kHz while keeping this current rating. Higher carrier frequency settings require derating.

◆ Three-Phase 400 V Class Drives

Table 56 Power Ratings (Three-Phase 400 V Class)

Item		Specification										
CIMR-LU4A		0005	0006	0007	0009	0015	0018	0024	0031	0039	0045	0060
Maximum Applicable Motor Capacity (HP) <1>		2	3	5	7.5	10	15	20	25	25-30	25-30	40
Input	Input Current (A) <2>	3.6	5.1	8.3	12	16	23	31	38	44	43	58
	Rated Voltage Rated Frequency	Three-phase 380 to 480 Vac 50/60 Hz 510 to 680 Vdc <3>										
	Allowable Voltage Fluctuation	-15 to 10%										
	Allowable Frequency Fluctuation	±5%										
	Input Power (kVA)	4.1	5.8	9.5	14	18	26	35	43	46.6	39.3	53.0
Output	Rated Output Capacity (kVA) <4>	3.5 <5>	4.1 <5>	6.3 <5>	9.8 <5>	12 <5>	17 <5>	22 <5>	27 <5>	30 <5>	34 <5>	48 <5>
	Rated Output Current (A)	3.5 <5>	4.1 <5>	6.3 <5>	9.8 <5>	12 <5>	17 <5>	22 <5>	27 <5>	39 <5>	45 <5>	60 <5>
	Overload Tolerance	150% of rated output current for 60 s										
	Carrier Frequency	User adjustable between 2 and 15 kHz										
	Maximum Output Voltage (V)	Three-phase 380 to 480 V (proportional to input voltage)										
	Maximum Output Speed (Hz)	200 Hz (user-adjustable)										

Item		Specification										
CIMR-LU4A		0075	0091	0112	0150	0180	0216	0260	0304	0370	0450	0605
Maximum Applicable Motor Capacity (HP) <1>		50-60	50-60	75	100	125-150	150	200	250	300	350	400-450-500
Input	Input Current (A) <2>	71	86	105	142	170	207	248	300	346	410	584
	Rated Voltage Rated Frequency	Three-phase 380 to 480 Vac 50/60 Hz 510 to 680 Vdc <3>										
	Allowable Voltage Fluctuation	-15 to 10%										
	Allowable Frequency Fluctuation	±5%										
	Input Power (kVA)	64.9	78.6	96.0	129.9	155	189	227	274	316	375	534
Output	Rated Output Capacity (kVA) <4>	57 <5>	69 <5>	85 <6>	114 <6>	137 <6>	165 <6>	198 <6>	232 <6>	282 <6>	343 <7>	461 <7>
	Rated Output Current (A)	75 <5>	91 <5>	112 <6>	150 <6>	180 <6>	216 <6>	260 <6>	304 <6>	370 <6>	450 <7>	605 <7>
	Overload Tolerance	150% of rated output current for 60 s										
	Carrier Frequency	User adjustable between 2 and 15 kHz		User adjustable between 2 and 10 kHz							User-adjustable between 2 and 5 kHz	
	Maximum Output Voltage (V)	Three-phase 380 to 480 V (proportional to input voltage)										
	Maximum Output Speed (Hz)	200 Hz (user-adjustable)							400 Hz (user-adjustable)			

<1> The motor capacity (HP) refers to a NEC rated 4-pole motor. The rated output current of the drive output amps should be equal to or greater than the motor current. Select the appropriate capacity drive if operating the motor continuously above motor nameplate current.
<2> Assumes operation at the rated output current. Input current rating varies depending on the power supply transformer, input reactor, wiring conditions, and power supply impedance.
<3> DC is not available for UL standards.

<4> Rated motor capacity is calculated with a rated output voltage of 440 V.
<5> Carrier frequency can be set up to 8 kHz while keeping this current rating. Higher carrier frequency settings require derating.
<6> Carrier frequency can be set up to 5 kHz while keeping this current rating. Higher carrier frequency settings require derating.
<7> Carrier frequency can be set up to 2 kHz while keeping this current derating. Higher carrier frequency settings require derating.

◆ Three-Phase 600 V Class Drives

Table 57 Power Ratings (Three-Phase 600 V Class)

Item		Specification																
CIMR-LU5A		0003	0004	0006	0010	0013	0017	0022	0027	0032	0041	0052	0062	0077	0099	0130	0172	0200
Maximum Applicable Motor Capacity (HP) <1>		2	3	5	7.5	10	15	20	25	25-30	40	50-60	50-60	75	100	125	150	250
Input	Input Current (A) <2>	3.6	5.1	8.3	12	16	23	31	38	33	44	54	66	80	108	129	158	228
	Rated Voltage Rated Frequency	Three-phase 500 to 600 Vac 50/60 Hz																
	Allowable Voltage Fluctuation	-10 (-15) to 10%																
	Allowable Frequency Fluctuation	±5%																
	Input Power (kVA)	4.1	5.8	9.5	14	18	26	35	43	38	50	62	75	91	123	147	181	261
Output	Rated Output Capacity (kVA) <3>	3.5 <5>	4.1 <5>	6.3 <5>	9.8 <5>	12 <5>	17 <5>	22 <5>	27 <5>	32 <5>	41 <5>	52 <5>	62 <5>	77 <6>	99 <4>	129 <4>	171 <4>	199 <4>
	Rated Output Current (A)	3.5 <5>	4.1 <5>	6.3 <5>	9.8 <5>	12.5 <5>	17 <5>	22 <5>	27 <5>	32 <5>	41 <5>	52 <5>	62 <5>	77 <6>	99 <4>	130 <4>	172 <4>	200 <4>
	Overload Tolerance	150% of rated output current for 60 s																
	Carrier Frequency	User adjustable between 2 and 15 kHz				User adjustable between 2 and 10 kHz								User adjustable between 2 and 8 kHz	User adjustable between 2 and 3 kHz			
	Maximum Output Voltage (V)	Three-phase 500 to 600 Vac (proportional to input voltage)																
	Maximum Output Speed (Hz)	200 Hz (user-adjustable)																

<1> The motor capacity (HP) refers to a NEC rated 4-pole motor. The rated output current of the drive output amps should be equal to or greater than the motor current. Select the appropriate capacity drive if operating the motor continuously above motor nameplate current.
<2> Assumes operation at the rated output current. Input current rating varies depending on the power supply transformer, input reactor, wiring connections, and power supply impedance.
<3> Rated motor capacity is calculated with a rated output voltage of 575 V.
<4> Carrier frequency can be set up to 3 kHz while keeping this current derating. Higher carrier frequency settings require derating.
<5> Carrier frequency can be set up to 8 kHz while keeping this current derating. Higher carrier frequency settings require derating.
<6> Carrier frequency can be set up to 5 kHz while keeping this current derating. Higher carrier frequency settings require derating.

◆ Drive Specifications

Note: **1.** Perform rotational Auto-Tuning to obtain the performance specifications given below.
2. For optimum performance life of the drive, install the drive in an environment that meets the required specifications.

Item		Specification
Control Characteristics	Control Method	The following control methods can be set using drive parameters: • V/f Control (V/f) • Open Loop Vector Control (OLV) • Closed Loop Vector Control (CLV) • Closed Loop Vector Control for PM (CLV/PM)
	Frequency Control Range	0.01 to 200 Hz
	Frequency Accuracy (Temperature Fluctuation)	Digital input: within ±0.01% of the max output speed [-10 to 40°C (14 to 104°F)] Analog input: within ±0.1% of the max output speed [25 ±10°C (77 ±18°F)]
	Frequency Setting Resolution	Digital inputs: 0.01 Hz Analog inputs: 1/2048 of the maximum output speed setting (11 bit plus sign)
	Output Speed Resolution	0.001 Hz
	Frequency Setting Signal	Main speed frequency reference: DC -10 to +10 V (20 kΩ), DC 0 to +10 V (20 kΩ), 4 to 20 mA (250 Ω), 0 to 20 mA (250 Ω)
	Starting Torque <1>	V/f: 150% at 3 Hz OLV: 200% at 0.3 Hz CLV, CLV/PM: 200% at 0 r/min
	Speed Control Range <1>	V/f: 1:40 OLV: 1:200 CLV, CLV/PM: 1:1500
	Speed Control Accuracy <1>	OLV: ±0.2% [25 ±10°C (77 ±18°F)] CLV: ±0.02% [25 ±10°C (77 ±18°F)]
	Speed Response <1>	OLV: 10 Hz [25 ±10°C (77 ±18°F)] CLV: 100 Hz <2> CLV/PM: 100 Hz <2>
	Torque Limit	Parameters setting allow separate limits in four quadrants (available in OLV, CLV, CLV/PM)
	Accel/Decel Ramp	0.0 to 6000.0 s (4 selectable combinations of independent acceleration and deceleration settings, unit changeable to m/s^2 or ft/s^2)
	Braking Transistor	Models CIMR-LU2A0008 to 2A0115, 4A0005 to 4A0060, and 5A0003 to 5A0041 have a built-in braking transistor.
	V/f Characteristics	Freely programmable
	Main Control Functions	Inertia Compensation, Position Lock at Start and Stop/Anti-Rollback Function, Overtorque/ Undertorque Detection, Torque Limit, Speed Reference, Accel/decel Switch, 5 Zone Jerk Settings, Auto-Tuning (Stationary and Rotational Motor/Encoder Offset Tuning), Dwell, Cooling Fan on/off Switch, Slip Compensation, Torque Compensation, DC Injection Braking at Start and Stop, MEMOBUS/Modbus Comm. (RS-422/485 max, 115.2 kbps), Fault Reset, Removable Terminal Block with Parameter Backup Function, Online Tuning, High Frequency Injection, Short Floor, Rescue Operation (Light Load Direction Search Function), Inspection Run, Brake Sequence, Speed related parameters with elevator units display, etc.

Item		Specification
Protection Functions	Motor Protection	Electronic thermal overload relay
	Momentary Overcurrent Protection	Drive stops when output current exceeds 200% of rated output current
	Overload Protection	Drive stops after 60 s at 150% of rated output current <3>
	Overvoltage Protection	200 V class: Stops when DC bus voltage exceeds approx. 410 V 400 V class: Stops when DC bus voltage exceeds approx. 820 V 600 V class: Stops when DC bus voltage exceeds approx. 1040 V
	Undervoltage Protection	200 V class: Stops when DC bus voltage falls below approx. 190 V 400 V class: Stops when DC bus voltage falls below approx. 380 V 600 V class: Stops when DC bus voltage falls below approx. 500 V
	Heatsink Overheat Protection	Thermistor
	Stall Prevention	Stall Prevention is available during acceleration, and during run.
	Ground Protection	Electronic circuit protection <4>
	DC Bus Charge LED	Remains lit until DC bus voltage falls below 50 V
Environment	Area of Use	Indoors
	Ambient Temperature	IP00 enclosure with top protective cover: [-10 to 40°C (14 to 104°F)] IP00 enclosure: [-10 to 50°C (14 to 122°F)]
	Humidity	95 RH% or less (no condensation)
	Storage Temperature	[-20 to 60°C (-4 to 140°F)] (short-term temperature during transportation)
	Altitude	Up to 1000 meters (3280 ft.) without derating, up to 3000 meters (9842 ft.) with output current and voltage derating
	Vibration/Shock	10 to 20 Hz: 9.8 m/s^2 20 to 55 Hz: 5.9 m/s^2 (CIMR-LU2A0008 to 2A0180, 4A0005 to 4A0150, and 5A0003 to 5A0077) or 2.0 m/s^2 (CIMR-LU2A0215 to 2A0415, 4A0180 to 4A0260, and 5A0099 to 5A0200)
Standards		• UL Underwriters Laboratories Inc: UL508C Power Conversion Equipment • IEC/EN 61800-3, IEC/EN 61800-5-1 • ISO International Organization for Standardization: ISO/EN 13849-1 Cat. 3 PLd Safety of machinery - Safety-related parts of control systems • IEC International Electrotechnical Commission: IEC/EN 61508 SIL2 Functional safety of electrical/electronic/programmable electronic safety-related systems safety integrity level 2 • CSA Canadian Standards Association International <5>: 2411-02 Elevator Equipment - Enclosed Elevator-and Escalator Electrical Equipment 3211-06 Industrial Control Equipment - Motor Controllers - Miscellaneous C22.2 No.04-04 Bonding and Grounding of Electrical Equipment C22.2 No.14-05 Industrial Control Equipment B44.1/ASME-A17.5-2004 Safety Code for Elevators and Escalator Electrical Equipment used by CSA to evaluate the L1000 to Class 2411 (Elevator Equipment) • ANSI/ASME American Society of Mechanical Engineers/American National Standards Institute: ANSI/ASME A17.1-2007/B44-04 Safety Code for Elevators and Escalators, Dumbwaiters, Moving Walks, Material Lifts, and Dumbwaiters with Automatic Transfer Devices using IEC/EN 12016:2004 immunity requirements. ANSI/ASME-A17.5-2004/CSA B44.1 - Elevator and Escalator Electrical Equipment, used by CSA to evaluate the L1000 to Class 2411 (Elevator Equipment)
Protection Design		IP00 enclosure with top protective cover, IP00

<1> The accuracy of these values depends on motor characteristics, ambient conditions, and drive settings. Specifications may vary with different motors and with changing motor temperature. Contact Yaskawa for consultation.
<2> For drives with B or earlier as the design revision order, 50 Hz is required. The design revision order and software version are printed on the nameplate affixed to the side of the drive. *Refer to Model Number on page 16* for details.
<3> Overload protection may be triggered when operating with 150% of the rated output current if the output speed is less than 6 Hz.
<4> Ground protection cannot be provided when the impedance of the ground fault path is too low, or when the drive is powered up while a ground fault is present at the output.
<5> Terminals H1, H2, DM+, and DM- on 600 V class models are designed to the functionality, but are not certified to IEC/EN 61800-5-1, ISO/EN 13849 Cat. 3, IEC/EN 61508 SIL2, Insulation coordination: class 1.

■ Altitude Derating

The drive standard ratings are valid for an installation altitude up to 3000 m (9842 ft.). If the altitude exceeds 1000 m (3280 ft.). both the drive rated voltage and the rated output current must be derated for 1% per 100 m (328 ft.). The maximum altitude is 3000 m (9842 ft.).

B Parameter Table

◆ A: Initialization Parameters

The A parameter group creates the operating environment for the drive. This includes the parameter Access Level, Motor Control Method, Password, User Parameters and more.

RUN : Indicates that the parameter setting can be changed while the drive is operating the motor

Motor 2: Refers the second motor when the drive is operating two motors (use input terminals to switch between motors).

■ A1: Initialization Parameters

No.	Name	Description	Setting
A1-00 RUN <1>	Language Selection	0: English 1: Japanese 2: German 3: French 4: Italian 5: Spanish 6: Portuguese 7: Chinese 8: Czech 9: Russian 10: Turkish 11: Polish 12: Greek **Note: 1.** Language selection settings 8 to 12 can be selected from an LCD operator with version (REV) F or later. The version number of the LCD operator's PRG software is shown on the back of the digital operator. **2.** Language selection settings 8 to 12 are available in drive software PRG: 7017 or later.	Default: 0 Min: 0 Max: 12
A1-01 RUN	Access Level Selection	0: View and set A1-01 and A1-04. U□-□□ parameters can also be viewed. 1: User Parameters (access to a set of parameters selected by the user, A2-01 to A2-32) 2: Advanced Access (access to view and set all parameters)	Default: 2 Min: 0 Max: 2
A1-02 <1>	Control Method Selection	0: V/f Control 2: Open Loop Vector Control 3: Closed Loop Vector Control 7: Closed Loop Vector Control for PM Motors	Default: 2 Min: 0 Max: 7
A1-03	Initialize Parameters	0: No initialization 1110: User Initialize (parameter values must be stored using parameter o2-03) 2220: 2-wire initialization 5550: oPE04 error reset	Default: 0 Min: 0 Max: 5550
A1-04	Password	When the value set into A1-04 does not match the value set into A1-05, parameters A1-01 through A1-03, and A2-01 through A2-33 cannot be changed.	Default: 0000 Min: 0000 Max: 9999
A1-05	Password Setting		

<1> Parameter setting value is not reset to the default value when the drive is initialized.

■ A2: User Parameters

No.	Name	Description	Setting
A2-01 to A2-32	User Parameters 1 to 32	Parameters that were recently edited are listed here. The user can also select parameters to appear here for quick access.	Default: <5> Min: A1-00 Max: S6-16
A2-33	User Parameter Automatic Selection	0: Parameters A2-01 through A2-32 are reserved for the user to create a list of User Parameters. 1: Save history of recently viewed parameters. Recently edited parameters will be saved to A2-17 through A2-32 for quick access.	Default: 1 Min: 0 Max: 1

<5> Default setting is determined by the control mode (A1-02).

◆ b: Application

Application parameters configure the source of the Up/Down command, timer functions, the Dwell function, the Droop Control function, Energy Savings, and a variety of other application-related settings.

■ b1: Operation Mode Selection

No.	Name	Description	Setting
b1-01	Speed Reference Selection	0: Digital operator 1: Analog input terminals 2: MEMOBUS/Modbus communications 3: Option card	Default: 0 Min: 0 Max: 3
b1-02	Up/Down Command Selection	0: Digital operator 1: Digital input terminals 2: MEMOBUS/Modbus communications 3: Option card	Default: 1 Min: 0 Max: 3
b1-03	Stopping Method Selection	0: Ramp to stop 1: Coast to stop 4: Elevator Emergency Stop **Note:** Setting 4 is available in the control mode CLV or CLV/PM for drives with software versions PRG: 7017 or later. The setting is 0 or 1 for software version PRG: 7016.	Default: 0 Min: 0 Max: 4
b1-06	Digital Input Reading	0: Input status is read once and processed immediately (for quick response). 1: Input is read twice and processed only if the status is the same in both readings (robust against noisy signals).	Default: 1 Min: 0 Max: 1
b1-08	Up/Down Command Selection while in Programming Mode	0: Up/Down command not accepted while in the Programming Mode. 1: Up/Down command accepted while in the Programming Mode. 2: Prohibit entering Programming Mode during run.	Default: 0 Min: 0 Max: 2
b1-14	Phase Order Selection	0: U-V-W 1: U-W-V	Default: 0 Min: 0 Max: 1

■ b2: Magnetic Flux Compensation

No.	Name	Description	Setting
b2-08	Magnetic Flux Compensation Value	Sets the magnetic flux compensation as a percentage of the no-load current value (E2-03).	Default: 0% Min: 0% Max: 1000%

■ b4: Delay Timers

No.	Name	Description	Setting
b4-01	Timer Function On-Delay Time	Used to set the on-delay and off-delay times for a digital timer output (H2-□□=12). The output is triggered by a digital input programmed to H1-□□=18).	Default: 0.0 s Min: 0.0 s Max: 3000.0 s
b4-02	Timer Function Off-Delay Time		Default: 0.0 s Min: 0.0 s Max: 3000.0 s

■ b6: Dwell Function

No.	Name	Description	Setting
b6-01	Dwell Speed at Start	Parameters b6-01 and b6-02 set the speed to hold and the time to maintain that speed at start. Parameters b6-03 and b6-04 set the speed to hold and the time to maintain that speed at stop.	Default: 0.0% Min: 0.0% Max: 100.0%
b6-02	Dwell Time at Start		Default: 0.0 s Min: 0.0 s Max: 10.0 s
b6-03	Dwell Speed at Stop		Default: 0.0% Min: 0.0% Max: 100.0%
b6-04	Dwell Time at Stop		Default: 0.0 s Min: 0.0 s Max: 10.0 s

■ b7: Droop Control

No.	Name	Description	Setting
b7-01 RUN	Droop Control Gain	Sets the speed reduction gain applied at a torque reference of 100%. Set as a percentage of motor base speed.	Default: 0.0% Min: 0.0% Max: 100.0%
b7-02 RUN	Droop Control Delay Time	Used to adjust the responsiveness of Droop Control.	Default: 0.05 s Min: 0.03 s Max: 2.00 s

■ b8: Energy Saving

No.	Name	Description	Setting
b8-01	Energy Saving Control Selection	0: Disabled 1: Enabled	Default: 0 Min: 0 Max: 1
b8-16	Energy Saving Control Constant (Ki)	Enter the Energy Saving value (Ki) as specified on the motor name plate. (for IPM motors only)	Default: 0.10 Min: 0.00 Max: 2.00
b8-17	Energy Saving Control Constant (Kt)	Enter the Energy Saving value (Kt) as specified on the motor name plate. (for IPM motors only)	Default: 1.00 Min: 0.00 Max: 2.00

◆ C: Tuning

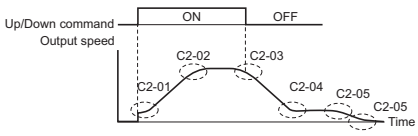
C parameters are used to adjust the acceleration and deceleration ramps, jerk settings, slip compensation, torque compensation, and carrier frequency selections.

■ C1: Acceleration and Deceleration Ramps

No.	Name	Description	Setting
C1-01 RUN	Acceleration Ramp 1	Sets the ramp to accelerate from 0 to maximum speed.	Default: 1.50 s <6> <8> Min: 0.00 s Max: 600.00 s <6> <8>
C1-02 RUN	Deceleration Ramp 1	Sets the ramp to decelerate from maximum speed to 0.	
C1-03 RUN	Acceleration Ramp 2	Sets the ramp to accelerate from 0 to maximum speed.	
C1-04 RUN	Deceleration Ramp 2	Sets the ramp to decelerate from maximum speed to 0.	
C1-05 RUN	Acceleration Ramp 3 (Motor 2 Accel Time 1)	Sets the ramp to accelerate from 0 to maximum speed.	
C1-06 RUN	Deceleration Ramp 3 (Motor 2 Decel Time 1)	Sets the ramp to decelerate from maximum speed to 0.	
C1-07 RUN	Acceleration Ramp 4 (Motor 2 Accel Time 2)	Sets the ramp to accelerate from 0 to maximum speed.	
C1-08 RUN	Deceleration Ramp 4 (Motor 2 Decel Time 2)	Sets the ramp to decelerate from maximum speed to 0.	
C1-09	Fast Stop Ramp	Sets the ramp for the Fast Stop function.	
C1-10	Accel/Decel Setting Resolution	0: 0.01 s unit 1: 0.1 s unit	Default: 0 Min: 0 Max: 1
C1-11	Accel/Decel Switching Speed	Sets the speed to switch between accel/decel ramp settings.	Default: 0.0% Min: 0.0% Max: 100.0%
C1-12	Motor 2 Acceleration Time	Sets the acceleration time for motor 2. **Note:** Parameter C1-12 determines the acceleration time for motor 2 as long as d1-27 is not set to 0.00 Hz.	Default: 1.0 s Min: 0.0 s Max: 600.0 s
C1-13	Motor 2 Acceleration Time	Sets the deceleration time for motor 2.	Default: 1.0 s Min: 0.0 s Max: 600.0 s
C1-15	Inspection Deceleration Ramp	Sets the deceleration ramp used for inspection run.	Default: 0.00 s <6> <8> Min: 0.00 s Max: 2.00 s <6> <8>

<6> Setting ranges and defaults vary by the setting units determined by parameter o1-03.
Refer to *Defaults and Setting Ranges by Display Unit Selection (o1-03) on page 214*.
<8> Setting range value is dependent on parameter C1-10, Accel/Decel Setting Resolution. When C1-10 = 0 (units of 0.01 seconds), the setting range becomes 0.00 to 600.00 seconds.

■ C2: Jerk Settings

No.	Name	Description	Setting
C2-01	Jerk at Accel Start	Five different jerk values can be set. They are automatically applied as shown in the figure below. 	Default: 0.50 s <6> Min: 0.00 s Max: 10.00 s <6>
C2-02	Jerk at Accel End		Default: 0.50 s <6> Min: 0.00 s Max: 10.00 s <6>
C2-03	Jerk at Decel Start		Default: 0.50 s <6> Min: 0.00 s Max: 10.00 s <6>
C2-04	Jerk at Decel End		Default: 0.50 s <6> Min: 0.00 s Max: 10.00 s <6>
C2-05	Jerk below Leveling Speed	Sets the jerk used when the speed reference is lower than the leveling speed setting.	Default: 0.50 s <6> Min: 0.00 s Max: 10.00 s <6>

<6> Setting ranges and defaults vary by the setting units determined by parameter o1-03.
Refer to *Defaults and Setting Ranges by Display Unit Selection (o1-03) on page 214*.

■ C3: Slip Compensation

No.	Name	Description	Setting
C3-01 RUN	Slip Compensation Gain	Sets the gain for the motor slip compensation function.	Default: 1.0 Min: 0.0 Max: 2.5
C3-02 RUN	Slip Compensation Primary Delay Time	Adjusts the slip compensation function delay time.	Default: 2000 ms Min: 0 ms Max: 10000 ms
C3-03	Slip Compensation Limit	Sets an upper limit for the slip compensation function as a percentage of motor rated slip for motor 1 (E2-02).	Default: 200% Min: 0% Max: 250%
C3-04	Slip Compensation Selection during Regeneration	0: Disabled. 1: Enabled above 6 Hz. 2: Enabled whenever slip compensation is possible.	Default: 0 Min: 0 Max: 2
C3-05	Output Voltage Limit Operation Selection	0: Disabled. 1: Enabled. Automatically decreases motor flux when output voltage saturation is reached. **Note:** Available control modes for parameter C3-05 vary by drive model: Models CIMR-LU2A0008 to 2A0415, 4A0005 to 4A0605, and 5A0003 to 5A0200: Available when A1-02 = 2, 3	Default: <5> Min: 0 Max: 1

<5> Default setting is determined by the control mode (A1-02).

■ C4: Torque Compensation

No.	Name	Description	Setting
C4-01 RUN	Torque Compensation Gain	Sets the gain for the automatic torque (voltage) boost function and helps to produce better starting torque.	Default: 1.00 Min: 0.00 Max: 2.50
C4-02 RUN	Torque Compensation Primary Delay Time	Sets the torque compensation filter time.	Default: <5> Min: 0 ms Max: 60000 ms
C4-03	Torque Compensation at Forward Start	Sets torque compensation at forward start as a percentage of motor torque.	Default: 0.0% Min: 0.0% Max: 200.0%
C4-04	Torque Compensation at Reverse Start	Sets torque compensation at reverse start as a percentage of motor torque.	Default: 0.0% Min: -200.0% Max: 0.0%
C4-05	Torque Compensation Time Constant	Sets the time constant for torque compensation at forward start and reverse start (C4-03 and C4-04).	Default: 10 ms Min: 0 ms Max: 200 ms

<5> Default setting is determined by the control mode (A1-02).

■ C5: Speed Control Loop Settings

No.	Name	Description	Setting
C5-01 RUN	Speed Control Loop Proportional Gain 1	Sets the proportional gain 1 of the speed control loop.	Default: <5> Min: 0.00 Max: 300.00
C5-02 RUN	Speed Control Loop Integral Time 1	Sets the integral time 1 of the speed control loop.	Default: <5> Min: 0.000 s Max: 10.000 s
C5-03 RUN	Speed Control Loop Proportional Gain 2	Sets the proportional gain 2 of the speed control loop.	Default: <5> Min: 0.00 Max: 300.00
C5-04 RUN	Speed Control Loop Integral Time 2	Sets the integral time 2 of the speed control loop.	Default: 0.500 s Min: 0.000 s Max: 10.000 s
C5-06	Speed Control Loop Primary Delay Time Constant	Sets the filter time constant for the time from the speed loop to the torque command output.	Default: 0.004 s Min: 0.000 s Max: 0.500 s
C5-07	Speed Control Settings Switching Speed	Sets the speed for switching between proportional gain 1, 2, 3 and integral time 1, 2, 3.	Default: <5> Min: 0.0% Max: 100.0%
C5-08	Speed Control Loop Integral Limit	Sets the speed control loop integral upper limit as a percentage of rated torque.	Default: 400% Min: 0% Max: 400%
C5-13 RUN	Speed Control Loop Proportional Gain 3	Sets the proportional gain 3 of the speed control loop.	Default: <5> Min: 0.00 Max: 300.00
C5-14 RUN	Speed Control Loop Integral Time 3	Sets the integral time 3 of the speed control loop.	Default: <5> Min: 0.000 s Max: 10.000 s
C5-16	Speed Control Loop Delay Time during Position Lock	Sets a delay to the torque command output from speed control loop during Position Lock.	Default: 0.000 s Min: 0.000 s Max: 0.500 s
C5-17	Motor Inertia	Sets the motor inertia.	Default: <4> Min: 0.0001 kgm^2 Max: 600.00 kgm^2

No.	Name	Description	Setting
C5-18	Load Inertia Ratio	Sets the ratio between the motor and load inertia.	Default: 1.0 Min: 0.0 Max: 6000.0
C5-19 RUN	Speed Control Loop Proportional Gain Time during Position Lock	Sets the Speed Control Loop Proportional gain used during Position Lock.	Default: <5> Min: 0.00 Max: 300.00
C5-20 RUN	Speed Control Loop Integral Time during Position Lock	Sets the Speed Control Loop Integral time used during Position Lock.	Default:0.100 s Min: 0.000 s Max: 10.000 s
C5-50 <45>	Set Vibrational Frequency Filter	Sets the mechanical vibration filter frequency in units of 1 Hz. **Note:** Set C5-50 to 0 (Hz) to disable the filter. The frequencies from 1 to 19 Hz cannot be set. Test equipment may be required to determine the mechanical resonance frequency. Setting C5-50 to an improper frequency will result in ineffective filtering of the effects of mechanical resonance.	Default: 0 Hz Min: 20 Hz Max: 1000 Hz

<4> Default setting value varies by the drive model (o2-04).
<5> Default setting is determined by the control mode (A1-02).
<45> Available in drive software versions PRG: 7200 or later.

■ C6: Carrier Frequency

No.	Name	Description	Setting
C6-03	Carrier Frequency	Sets the carrier frequency.	Default: <4> Min: 1.0 kHz Max: 15.0 kHz
C6-06	PWM Method	Selects PWM modulation method. 0: 2-phase/3-phase conversion 1: 2-phase modulation 2: 3-phase modulation	Default: 0 Min: 0 Max: 2
C6-09	Carrier Frequency during Rotational Auto-Tuning	0: Carrier Frequency = 5 kHz 1: Setting value for C6-03	Default: 0 Min: 0 Max: 1
C6-21	Inspection Operation Carrier Frequency	Sets the carrier frequency during Inspection Run. 0: Setting value for C6-03 1: Carrier Frequency = 2 kHz	Default: 1 Min: 0 Max: 1
C6-23	Carrier Frequency during Initial Motor Pole Search	Sets the carrier frequency when estimating the initial polarity. 0: Carrier Frequency = 2 kHz 1: Setting value for C6-03	Default: 0 Min: 0 Max: 1
C6-31 <39>	Carrier Frequency during Rescue Operation	Sets the carrier frequency during Rescue Operation. 0: C6-03 setting 1: 2 kHz	Default: 0 Min: 0 Max: 1

<4> Default setting value varies by the drive model (o2-04).
<39> Available in drive software versions PRG: 7016 or later.

◆ d: Speed References

Speed Reference parameters are used to set the various speed reference values during operation.

■ d1: Speed Reference

No.	Name	Description	Setting
d1-01 RUN	Speed Reference 1	Sets the Speed reference for the drive when d1-18 is set to 0 or 3. Setting units are determined by parameter o1-03.	Default: 0.00% <6> Min: 0.00% Max: 100.00% <6>
d1-02 RUN	Speed Reference 2		
d1-03 RUN	Speed Reference 3		
d1-04 RUN	Speed Reference 4		
d1-05 RUN	Speed Reference 5		
d1-06 RUN	Speed Reference 6		
d1-07 RUN	Speed Reference 7		
d1-08 RUN	Speed Reference 8		
d1-18	Speed Reference Selection Mode	Sets the mode of speed reference selection by digital inputs. 0: Use multi-speed references (d1-01 to d1-08) 1: High speed reference has priority (d1-19 to d1-23, d1-26) 2: Leveling speed reference has priority (d1-19 to d1-23, d1-26) 3: Use multi-speed references d1-02 to d1-08, no speed selection stops the drive. Drive will stop when all input terminals programmed for speed references (H1-☐☐ = 3, 4, 5) are open.	Default: 0 Min: 0 Max: 3
d1-19 RUN	Nominal Speed	Sets the nominal speed reference when d1-18 = 1 or 2.	Default: 100.00% <6> Min: 0.00% Max: 100.00% <6>
d1-20 RUN	Intermediate Speed 1	Sets intermediate speed reference 1 when d1-18 = 1 or 2.	Default: 0.00% <6> Min: 0.00% Max: 100.00% <6>
d1-21 RUN	Intermediate Speed 2	Sets intermediate speed reference 2 when d1-18 = 1 or 2.	Default: 0.00% <6> Min: 0.00% Max: 100.00% <6>
d1-22 RUN	Intermediate Speed 3	Sets intermediate speed reference 3 when d1-18 = 1 or 3.	Default: 0.00% <6> Min: 0.00% Max: 100.00% <6>
d1-23 RUN	Releveling Speed	Sets speed reference for releveling when d1-18 = 1 or 2.	Default: 0.00% <6> Min: 0.00% Max: 100.00% <6>
d1-24 RUN	Inspection Operation Speed	Sets speed reference when inspection operation is enabled.	Default: 50.00% <6> Min: 0.00% Max: 100.00% <6>

No.	Name	Description	Setting
d1-25 RUN	Rescue Operation Speed	Sets the speed reference during inspection operation.	Default: 10.00% <6> Min: 0.00% Max: 100.00% <6>
d1-26 RUN	Leveling Speed	Sets leveling speed reference when d1-18 = 1 or 2.	Default: 8.00% <6> Min: 0.00% Max: 100.00% <6>
d1-27	Motor 2 Speed Reference	Sets the speed reference for motor 2. **Note:** 1. If set to 0.00, the drive will control motor 1 instead. 2. When using motor 2, be sure that the accel/decel times are set in parameters C1-12 and C1-13.	Default: 0.00 Hz Min: 0.00 Hz Max: 200.00 Hz
d1-28	Leveling Speed Detection Level	Used when d1-18 = 0 or 3. If the speed reference selected is lower than d1-28, then the drive uses the leveling speed as the speed reference.	Default: 0.0% Min: 0.0% Max: 100.0%
d1-29	Inspection Speed Detection Level	Used when d1-18 = 0 or 3. If the speed reference selected is higher than d1-28 but lower or equal to d1-29, then the drive uses inspection speed as the speed reference.	Default: 0.0% Min: 0.0% Max: 100.0%

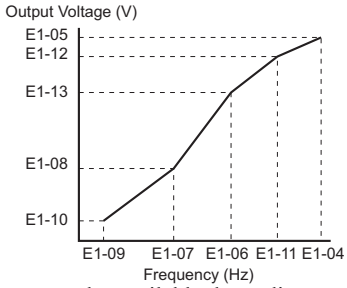
<6> Setting ranges and defaults vary by the setting units determined by parameter o1-03.
Refer to *Defaults and Setting Ranges by Display Unit Selection (o1-03) on page 214*.

■ d6: Field Forcing

No.	Name	Description	Setting
d6-03	Field Forcing Selection	0: Disabled 1: Enabled	Default: 0 Min: 0 Max: 1
d6-06	Field Forcing Limit	Sets the upper limit of the excitation current command during magnetic field forcing. A setting of 100% is equal to motor no-load current. Disabled only during DC Injection Braking.	Default: 400% Min: 100% Max: 400%

◆ E: Motor Parameters

■ E1: V/f Pattern

No.	Name	Description	Setting
E1-01	Input Voltage Setting	This parameter must be set to the power supply voltage. **WARNING!** Electrical Shock Hazard. Drive input voltage (not motor voltage) must be set in E1-01 for the protective features of the drive to function properly. Failure to do so may result in equipment damage and/or death or personal injury.	Default: 230 V <9> Min: 155 V Max: 255 V <9>
E1-03	V/f Pattern Selection	F: Custom V/f, E1-04 through E1-13 settings define the V/f pattern	Default: F Min: – Max: F
E1-04	Maximum Output Frequency	To set linear V/f characteristics, set the same values for E1-07 and E1-09. In this case, the setting for E1-08 will be disregarded. Ensure that the five frequencies are set according to these rules: E1-09 ≤ E1-07 < E1-06 ≤ E1−11 ≤ E1-04 Note that if E1-11 = 0, then both E1-11 and E1-12 are disabled, and the above conditions do not apply.  **Note:** Some parameters may not be available depending on the control mode. • E1-07, E1-08 and E-10 are available only in the V/f control and Open Loop Vector control modes. • E1-11, E1-12 and E-13 are available only in the V/f control and Closed Loop Vector control modes.	Default: <5> Min: <23> Max: 200.0 Hz
E1-05	Maximum Voltage		Default: 230.0 V <9> Min: 0.0 V Max: 255.0 V <9>
E1-06	Base Frequency		Default: <5> Min: 0.0 Hz Max: 200.0 Hz
E1-07	Middle Output Frequency		Default: 3.0 Hz Min: 0.0 Hz Max: 200.0 Hz
E1-08	Middle Output Frequency Voltage		Default: <2> <9> Min: 0.0 V Max: 255.0 V <9>
E1-09	Minimum Output Frequency		Default: <5> Min: 0.0 Hz Max: 200.0 Hz
E1-10	Minimum Output Frequency Voltage		Default: <2> <9> Min: 0.0 V Max: 255.0 V <9>
E1-11 <11>	Middle Output Frequency 2		Default: 0.0 Hz Min: 0.0 Hz Max: 120.0 Hz
E1-12 <11>	Middle Output Frequency Voltage 2		Default: 0.0 V <9> Min: 0.0 V Max: 255.0 V <9>
E1-13 <13>	Base Voltage		Default: 0.0 V <9> Min: 0.0 V Max: 255.0 V <9>

<2> Default setting is dependent on the control mode (A1-02) and the drive model (o2-04).
<5> Default setting is determined by the control mode (A1-02).
<9> Values shown here are for 200 V class drives. The default is 400 V when using a 400 V class drive. Multiply value by 2.875 for 600 V class drives.
<11> Parameter is ignored when E1-11 and E1-12 are set to 0.0.
<13> When E1-13 (Base Voltage) is set to 0.0, output voltage is controlled with E1-05 (Maximum Voltage) = E1-13. When Auto-Tuning is performed, E1-05 and E1-13 are automatically set to the same value.
<23> Setting range depends on the type of motor being used. CLV allows a setting range of 10.0 to 200.0 Hz, while CLV/PM allows a setting range of 4.0 to 200.0 Hz.

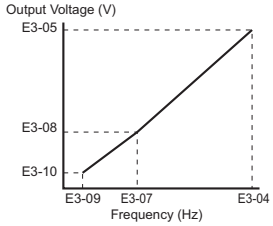
■ E2: Motor Parameters

No.	Name	Description	Setting
E2-01	Motor Rated Current	Sets the motor nameplate full load current in Amps. Automatically set during Auto-Tuning.	Default: <4> Min: 10% of drive rated current Max: 200% of drive rated current <10>
E2-02	Motor Rated Slip	Sets the motor rated slip. Automatically set during Auto-Tuning.	Default: <4> Min: 0.00 Hz Max: 20.00 Hz
E2-03	Motor No-Load Current	Sets the no-load current for the motor. Automatically set during Auto-Tuning.	Default: <4> Min: 0 A Max: E2-01 <10>
E2-04	Number of Motor Poles	Sets the number of motor poles. Automatically set during Auto-Tuning.	Default: 4 Min: 2 Max: 48
E2-05	Motor Line-to-Line Resistance	Sets the phase-to-phase motor resistance. Automatically set during Auto-Tuning.	Default: <4> Min: 0.000 Ω Max: 65.000 Ω
E2-06	Motor Leakage Inductance	Sets the voltage drop due to motor leakage inductance as a percentage of motor rated voltage. Automatically set during Auto-Tuning.	Default: <4> Min: 0.0% Max: 40.0%
E2-07	Motor Iron-Core Saturation Coefficient 1	Sets the motor iron saturation coefficient at 50% of magnetic flux. Automatically set during Auto-Tuning.	Default: 0.50 Min: 0.00 Max: 0.50
E2-08	Motor Iron-Core Saturation Coefficient 2	Sets the motor iron saturation coefficient at 75% of magnetic flux. Automatically set during Auto-Tuning.	Default: 0.75 Min: E2-07 Max: 0.75
E2-09	Motor Mechanical Loss	Sets the motor mechanical loss as a percentage of motor rated power (kW).	Default: 0.0% Min: 0.0% Max: 10.0%
E2-10	Motor Iron Loss for Torque Compensation	Sets the motor iron loss.	Default: <4> Min: 0 W Max: 65535 W
E2-11	Motor Rated Power	Sets the motor rated power in kilowatts (1 HP = 0.746 kW). Automatically set during Auto-Tuning.	Default: <4> Min: 0.00 kW Max: 650.00 kW

<4> Default setting value varies by the drive model (o2-04).
<10> The display resolution depends on the rated output power of the drive. Models CIMR-LU2A0008 to 2A0033, 4A0005 to 4A0018, and 5A0003 to 5A0013 display values in 0.01 A units, while models CIMR-LU2A0047 to 2A0415, 4A0024 to 4A0605, and 5A0017 to 5A0200 display values in 0.1 A units.

■ E3: V/f Pattern for Motor 2

These parameters are hidden when a PM motor control mode has been selected for motor 1 (A1-02 = 7).

No.	Name	Description	Setting
E3-04 <31>	Motor 2 Maximum Output Frequency	These parameters are only applicable when E1-03 is set to F. To set linear V/f characteristics, set the same values for E3-07 and E3-09. In this case, the setting for E3-08 will be disregarded. Ensure that the four frequencies are set according to these rules or an oPE10 fault will occur: E3-09 ≤ E3-07 < E3-06 ≤ E3-04  	Default: 60.0 Hz Min: 10.0 Hz Max: 200.0 Hz
E3-05 <31>	Motor 2 Maximum Voltage		Default: 230.0 V <9> Min: 0.0 V Max: 255.0 V <9>
E3-06 <31>	Motor 2 Base Frequency		Default: 60.0 Hz Min: 0.0 Hz Max: 200.0 Hz
E3-07 <31>	Motor 2 Mid Output Frequency		Default: 3.0 Hz Min: 0.0 Hz Max: 200.0 Hz
E3-08 <31>	Motor 2 Mid Output Frequency Voltage		Default: <4> <9> Min: 0.0 V Max: 255.0 V <9>
E3-09 <31>	Motor 2 Minimum Output Frequency		Default: 1.5 Hz Min: 0.0 Hz Max: 200.0 Hz
E3-10 <31>	Motor 2 Minimum Output Frequency Voltage		Default: <4> <9> Min: 0.0 V Max: 255.0 V <9>

<4> Default setting value is dependent on the drive model (o2-04).
<9> Values shown here are for 200 V class drives. Double the value when using a 400 V class drive. Multiply value by 2.875 for 600 V class drives.
<31> Available in drive software versions PRG: 7012 or later.

■ E4: Motor 2 Parameters

These parameters are hidden when a PM motor control mode has been selected for motor 1 (A1-02 = 7).

No.	Name	Description	Setting
E4-01	Motor 2 Rated Current	Sets the full load current for motor 2. Automatically set during Auto-Tuning.	Default: <4> Min: 10% of drive rated current Max: 200% of drive rated current <10>
E4-02	Motor 2 Rated Slip	Sets the rated slip for motor 2. Automatically set during Auto-Tuning.	Default: <4> Min: 0.00 Hz Min: 20.00 Hz
E4-03	Motor 2 Rated No-Load Current	Sets the no-load current for motor 2. Automatically set during Auto-Tuning.	Default: <4> Min: 0 A Min: [E4-01] <10>
E4-04	Motor 2 Motor Poles	Sets the number of poles of motor 2. Automatically set during Auto-Tuning.	Default: 4 Min: 2 Max: 48
E4-05	Motor 2 Line-to-Line Resistance	Sets the phase-to-phase resistance for motor 2. Automatically set during Auto-Tuning.	Default: <4> Min: 0.000 Ω Max: 65.000 Ω
E4-06	Motor 2 Leakage Inductance	Sets the voltage drop for motor 2 due to motor leakage inductance as a percentage of rated voltage. Automatically set during Auto-Tuning.	Default: <4> Min: 0.0% Max: 40.0%

<4> Default setting value is dependent on the drive model (o2-04).
<10> The display resolution depends on the rated output power of the drive. Models CIMR-LU2A0008 to 2A0033, 4A0005 to 4A0018, and 5A0003 to 5A0013 display values in 0.01 A units, while models CIMR-LU2A0047 to 2A0415, 4A0024 to 4A0605, and 5A0017 to 5A0200 display values in 0.1 A units.

■ E5: PM Motor Settings

No.	Name	Description	Setting
E5-02 <1>	Motor Rated Power	Sets the rated capacity of the motor.	Default: <4> Min: 0.10 kW Max: 650.00 kW
E5-03 <1>	Motor Rated Current	Sets the motor rated current.	Default: <4> Min: 10% of drive rated current Max: 200% of drive rated current <10>
E5-04 <1>	Number of Motor Poles	Sets the number of motor poles.	Default: 12 Min: 2 Max: 120 <43>
E5-05 <1>	Motor Stator Resistance (Single Phase)	Sets the stator resistance (1 phase value).	Default: <4> Min: 0.000 Ω Max: 65.000 Ω
E5-06 <1>	Motor d-Axis Inductance	Sets the d-axis inductance.	Default: <4> Min: 0.00 mH Max: 600.00 mH
E5-07 <1>	Motor q-Axis Inductance	Sets the q-axis inductance.	Default: <4> Min: 0.00 mH Max: 600.00 mH
E5-09 <1>	Motor Induction Voltage Constant 1	Sets the induced phase peak voltage in units of 0.1 mV (rad/s) [electrical angle]. When setting this parameter, E5-24 should be set to 0.0.	Default: <4> Min: 0.0 mV/(rad/s) Max: 6500.0 mV/(rad/s)
E5-11	Encoder Offset	Sets the offset between the rotor magnetic axis and the encoder zero position. Set during Encoder Offset Tuning.	Default: 0.0 deg Min: -180 deg Max: 180 deg
E5-24	Motor Induction Voltage Constant 2	Sets the induced phase-to-phase rms voltage in units of 0.1 mV/(r/min) [mechanical angle]. When setting this parameter, E5-09 should be set to 0.0.	Default: 0.0 mV/(r/min) Min: 0.0 mV/(r/min) Max: 6500.0 mV/(r/min)

<1> Parameter setting value is not reset to the default value when the drive is initialized.
<4> Default setting value is determined by the drive model (o2-04).
<10> The display resolution depends on the rated output power of the drive. Models CIMR-LU2A0008 to 2A0033, 4A0005 to 4A0018, and 5A0003 to 5A0013 display values in 0.01 A units, while models CIMR-LU2A0047 to 2A0415, 4A0024 to 4A0605, and 5A0017 to 5A0200 display values in 0.1 A units.
<43> When PG-E3 option connected: Max setting = 48

◆ F: Option Settings

F parameters are used to program the drive for Encoder and PG feedback from the motor and to function with option cards.

■ F1: PG Speed Control Card

No.	Name	Description	Setting
F1-01	Encoder 1 Resolution	Sets the encoder resolution (number of pulses per revolution)	Default: <5> Min: 1 ppr Max: 60000 ppr <34>
F1-02	Operation Selection at PG Open Circuit (PGo)	0: Ramp to stop. Decelerate to stop using the deceleration ramp in C1-02. 1: Coast to stop. 2: Fast Stop. Decelerate to stop using the deceleration ramp in C1-09. 3: Alarm only.	Default: 1 Min: 0 Max: 3
F1-03	Operation Selection at Overspeed (oS)	0: Ramp to stop. Decelerate to stop using the deceleration ramp in C1-02. 1: Coast to stop. 2: Fast Stop. Decelerate to stop using the deceleration ramp in C1-09. 3: Alarm only.	Default: 1 Min: 0 Max: 3
F1-04	Operation Selection at Deviation	0: Ramp to stop. Decelerate to stop using the deceleration ramp in C1-02. 1: Coast to stop. 2: Fast Stop. Decelerate to stop using the deceleration ramp in C1-09. 3: Alarm only.	Default: 3 Min: 0 Max: 3
F1-05	Encoder 1 Rotation Direction Selection	0: A phase leads B in the up direction 1: B phase leads A in the up direction	Default: <5> Min: 0 Max: 1
F1-06	PG 1 Pulse Monitor Output Division Ratio	Sets the division ratio for the pulse monitor used of the PG option card installed to connector CN5-C. By setting “xyz”, the division ratio becomes = [(1 + x) / yz]. If only using the A pulse for one track input, then the input ratio will be 1:1, regardless of what F1-06 is set to.	Default: 1 Min: 1 Max: 132
F1-08	Overspeed Detection Level	Sets the overspeed detection level as a percentage of the maximum output frequency.	Default: 115% Min: 0% Max: 120%
F1-09	Overspeed Detection Delay Time	Sets the time in seconds for an overspeed situation to trigger a fault (oS).	Default: 0.0 s Min: 0.0 s Max: 2.0 s
F1-10	Excessive Speed Deviation Detection Level	Sets the speed deviation detection level as a percentage of the maximum output frequency.	Default: 10% Min: 0% Max: 50%
F1-11	Excessive Speed Deviation Detection Delay Time	Sets the time in seconds for a speed deviation situation to trigger a fault (dEv).	Default: 0.5 s Min: 0.0 s Max: 10.0 s
F1-14	PG Open-Circuit Detection Time	Sets the time required to trigger a PG Open fault (PGo).	Default: 2.0 s Min: 0.0 s Max: 10.0 s
F1-18	dv3 Detection Selection	0: Disabled n: Sets the number of dv3 situations that may be detected before triggering an actual dv3 fault.	Default: 10 Min: 0 Max: 10
F1-19	dv4 Detection Selection	0: Disabled n: Number of pulses that the A and B pulse are reversed that triggers dv4 detection.	Default: 128 Min: 0 Max: 5000
F1-20	PG Option Card Disconnect Detection 1	0: Disabled 1: Enabled	Default: 1 Min: 0 Max: 1

No.	Name	Description	Setting
F1-29	dEv Detection Condition Selection	Selects when DEV is active. 0: After speed reference, soft starter output and motor speed have matched once. 1: After speed reference and soft starter output have matched once. 2: Always during Run	Default: 2 Min: 0 Max: 2
F1-50 <39>	Encoder Selection	Selects the encoder connected the PG-F3 option. 0: EnDat 2.1/01, 2.2/01 Serial Communication + Sin/Cos 1: EnDat 2.2/22 Serial Communication 2: HIPERFACE	Default: 0 Min: 0 Max: 2
F1-51	PGoH Detection Level	Sets the level for detecting PG Hardware Fault (PGoH). Available when F1-20 = 1	Default: 80% Min: 1% Max: 100%
F1-52 <39>	Communication Speed of Serial Encoder Selection	Selects the communication speed between the PG-F3 option and serial encoder. 0: 1M bps/9600 bps 1: 500k bps/19200 bps 2: 1M bps/38400 bps 3: 1M bps/38400 bps	Default: 0 Min: 0 Max: 3
F1-63	PG-E3 R Track Selection	0: Disabled 1: Enabled	Default: 0 Min: 0 Max: 1
F1-66 to F1-81 (B9AH to BA9H) <44>	Encoder Adjust 1 to 16	Sets encoder offsets 1 to 16 for the PG-E3 option card. These parameters are automatically set by the execution of Auto-Tuning of PG-E3 encoder characteristics.	Default: 0 Min: 0 Max: FFFF

<5> Default setting is determined by the control mode (A1-02).
<34> Setting range is 1 to 15000 ppr when the drive is set for CLV/PM.
<39> Available in drive software versions PRG: 7016 or later.
<44> Available in drive software versions PRG: 7017 or later.

■ F3: Digital Input Card (DI-A3)

No.	Name	Description	Setting
F3-01	DI-A3 Option Card Input Selection	0: BCD, 1% units 1: BCD, 0.1% units 2: BCD, 0.01% units 3: BCD, 1 Hz units 4: BCD, 0.1 Hz units 5: BCD, 0.01 Hz units 6: BCD customized setting (5 digit), 0.02 Hz units 7: Binary input The unit and the setting range are determined by F3-03. F3-03 = 0: 255/100% (-255 to +255) F3-03 = 1: 40961/100% (-4095 to +4095) F3-03 = 2: 30000/100% (-33000 to +33000) When the digital operator units are set to be displayed in Hertz or user-set units (o1-03 = 2 or 3), the units for F3-01 are determined by parameter o1-03.	Default: 0 Min: 0 Max: 7
F3-03	DI-A3 Option Card Data Length Selection	0: 8 bit 1: 12 bit 2: 16 bit	Default: 2 Min: 0 Max: 2

■ F4: Analog Monitor Card (AO-A3)

No.	Name	Description	Setting
F4-01	Terminal V1 Function Selection	Sets the monitor signal for output from terminal V1. Set this parameter to the last three digits of the desired U□-□□ monitor. Some U parameters are available only in certain control modes.	Default: 102 Min: 000 Max: 999
F4-02 RUN	Terminal V1 Gain	Sets the gain for voltage output via terminal V1.	Default: 100.0% Min: -999.9% Max: 999.9%
F4-03	Terminal V2 Function Selection	Sets the monitor signal for output from terminal V2. Set this parameter to the last three digits of the desired U□-□□ monitor. Some U parameters are available only in certain control modes.	Default: 103 Min: 000 Max: 999
F4-04 RUN	Terminal V2 Gain	Sets the gain for voltage output via terminal V2.	Default: 50.0% Min: -999.9% Max: 999.9%
F4-05 RUN	Terminal V1 Bias	Sets the amount of bias added to the voltage output via terminal V1.	Default: 0.0% Min: -999.9% Max: 999.9%
F4-06 RUN	Terminal V2 Bias	Sets the amount of bias added to the voltage output via terminal V2.	Default: 0.0% Min: -999.9% Max: 999.9%
F4-07	Terminal V1 Signal Level Selection	0: 0 to 10 V 1: -10 to 10 V	Default: 1 Min: 0 Max: 1
F4-08	Terminal V2 Signal Level Selection		Default: 1 Min: 0 Max: 1

■ F5: Digital Output Card (DO-A3)

No.	Name	Description	Setting
F5-01	Terminal P1-C1 Output Selection	Sets the function for contact output terminals M1-M2, M3-M4, and photocoupler output terminals P1 through P6.	Default: 0 Min: 0 Max: 161
F5-02	Terminal P2-C2 Output Selection		Default: 1 Min: 0 Max: 161
F5-03	Terminal P3-C3 Output Selection		Default: 2 Min: 0 Max: 161
F5-04	Terminal P4-C4 Output Selection		Default: 4 Min: 0 Max: 161
F5-05	Terminal P5-C5 Output Selection		Default: 6 Min: 0 Max: 161
F5-06	Terminal P6-C6 Output Selection		Default: 37 Min: 0 Max: 161
F5-07	Terminal M1-M2 Output Selection		Default: F Min: 0 Max: 161
F5-08	Terminal M3-M4 Output Selection		Default: F Min: 0 Max: 161
F5-09	DO-A3 Output Mode Selection	0: Output terminals are each assigned separate output functions. 1: Binary code output 2: Use output terminal functions selected by parameters F5-01 through F5-08.	Default: 0 Min: 0 Max: 2

■ F6: Communication Option Card

For more details on a specific option card, refer to the instruction manual for the option card.

No.	Name	Description	Setting
F6-01	Operation Selection after Communications Error	0: Ramp to stop. Decelerate to stop using the deceleration ramp in C1-02. 1: Coast to stop. 2: Fast Stop. Decelerate to stop using the deceleration ramp in C1-09. 3: Alarm only.	Default: 1 Min: 0 Max: 3
F6-02	External Fault from Communication Option Detection Selection	0: Always detected 1: Detection during run only	Default: 0 Min: 0 Max: 1
F6-03	External Fault from Communication Option Operation Selection	0: Ramp to stop. Decelerate to stop using the deceleration ramp in C1-02. 1: Coast to stop. 2: Fast Stop. Decelerate to stop using the deceleration ramp in C1-09. 3: Alarm only.	Default: 1 Min: 0 Max: 3
F6-04	bUS Error Detection Time	Sets the delay time for error detection if a bus error occurs.	Default: 2.0 s Min: 0.0 s Max: 5.0 s
F6-06	Torque Limit Selection from Communications Option	0: Disabled. Torque limit from option card disabled. 1: Enabled. Torque limit from option card enabled.	Default: 0 Min: 0 Max: 1
F6-08 <1>	Reset Communication Parameter	0: Communication-related parameters (F6-☐☐) are not reset when the drive is initialized using A1-03. 1: Reset all communication-related parameters (F6-☐☐) when the drive is initialized using A1-03.	Default: 0 Min: 0 Max: 1
F6-35	CANopen Node ID	Sets the node address.	Default: 0 Min: 0 Max: 126
F6-36	CANopen Communication Speed	0: Auto-detection 1: 10 kbps 2: 20 kbps 3: 50 kbps 4: 125 kbps 5: 250 kbps 6: 500 kbps 7: 800 kbps 8: 1 Mbps	Default: 6 Min: 0 Max: 8

<1> Parameter setting value is not reset to the default value when the drive is initialized.

◆ H: Multi-Function Terminals

H parameters assign functions to the multi-function input and output terminals.

■ H1: Multi-Function Digital Inputs

No.	Name	Description	Setting
H1-03	Terminal S3 Function Selection	Assigns a function to the multi-function digital inputs. Refer to page *182* to page *183* for a description of setting values. **Note:** Unused terminals should be set to F.	Default: <19> Min: 3 Max: 79
H1-04	Terminal S4 Function Selection		Default: <19> Min: 3 Max: 79
H1-05	Terminal S5 Function Selection		Default: <19> Min: 3 Max: 79
H1-06	Terminal S6 Function Selection		Default: <19> Min: 3 Max: 79
H1-07	Terminal S7 Function Selection		Default: <19> Min: 3 Max: 79
H1-08	Terminal S8 Function Selection		Default: F Min: 3 Max: 79

<19> With the speed reference priority d1-18 is set to 0 or 3, the default settings for parameters H1-03 to H1-07 governing input terminals S3 to S7 are: 24, 14, 3, 4, and 5 respectively. When d1-18 is set to 1 or 2, the default settings for H1-03 to H1-07 become 50, 54, 51, 53, and F respectively.

H1 Multi-Function Digital Input Settings		
H1-☐☐ Setting	**Function**	**Description**
3	Multi-Step Speed Reference 1	When input terminals are set to Multi-Step Speed References 1 through 3, switching combinations of those terminals will create a multi-step speed sequence using the speed references set in d1-01 through d1-08.
4	Multi-Step Speed Reference 2	
5	Multi-Step Speed Reference 3	
6	Jog reference selection	Closed: Jog frequency reference (d1-17) selected. The Jog frequency can be used when the speed reference selection is not assigned to input terminals (b1-01 ≠ 1) and the speed reference priority is set to use the multi-step speed reference (d1-18 = 0 or 3).
7	Accel/decel Ramp Selection 1	Used to switch between accel/decel ramp 1 (set in C1-01, C1-02) and accel/decel ramp 2 (set in C1-03, C1-04). When combined with another input terminal set for "Accel/Decel ramp 2" (H1-☐☐ = 1A), the drive can also switch between accel/decel ramp 3 (set in C1-05, C1-06) and accel/decel ramp 4 (set in C1-07, C1-08).
8	Baseblock Command (N.O.)	Closed: No drive output
9	Baseblock Command (N.C.)	Open: No drive output
F	Not Used (Through Mode)	Select this setting when the terminal is not used or when using the terminal in the pass-through mode. The terminal does not trigger a drive function but can be used as digital input for the controller the drive is connected to.
14	Fault Reset	Closed: Resets faults if the cause is cleared and the Up/Down command is removed.
15	Fast Stop (N.O.)	Closed: Decelerates to stop at the Fast Stop ramp set to C1-09.
16	Motor 2 Selection	Open: Motor 1(E1-☐☐, E3-☐☐) Closed: Motor 2 (E2-☐☐, E4-☐☐)
17	Fast Stop (N.C.)	Open: Decelerates to stop at the Fast Stop ramp set to C1-09.
18	Timer Function Input	Triggers the timer set up by parameters b4-01 and b4-02. Must be set in conjunction with the timer function output (H2-☐☐ = 12).

H1 Multi-Function Digital Input Settings		
H1-☐☐ Setting	**Function**	**Description**
1A	Accel/decel Ramp Selection 2	Used in conjunction with an input terminal set for "Accel/decel ramp selection 1" (H1-☐☐ = 7), and allows the drive to switch between accel/decel ramp 3 and 4.
20 to 2F	External Fault	20: N.O., Always detected, ramp to stop 21: N.C., Always detected, ramp to stop 22: N.O., During run, ramp to stop 23: N.C., During run, ramp to stop 24: N.O., Always detected, coast to stop 25: N.C., Always detected, coast to stop 26: N.O., During run, coast to stop 27: N.C., During run, coast to stop 28: N.O., Always detected, Fast Stop 29: N.C., Always detected, Fast Stop 2A: N.O., During run, Fast Stop 2B: N.C., During run, Fast Stop 2C: N.O., Always detected, alarm only (continue running) 2D: N.C., Always detected, alarm only (continue running) 2E: N.O., During run, alarm only (continue running) 2F: N.C., During run, alarm only (continue running)
50	Nominal Speed	Closed: Activates the nominal speed (d1-19).
51	Intermediate Speed	Closed: Activates the Intermediate Speed (d1-20).
52	Releveling Speed	Closed: Activates the Releveling Speed (d1-23).
53	Leveling Speed	Closed: Activates the Leveling Speed (d1-26).
54	Inspection Operation	Closed: Activates Inspection operation using the speed set in d1-24.
55	Rescue Operation	Closed: Activates rescue operation.
56	Motor Contactor Feedback	Open: Motor contactor open Closed: Motor contactor closed (N.O.)
57	High Speed Limit (Up)	Closed: Uses the leveling speed as the maximum speed when going up.
58	High Speed Limit (Down)	Closed: Uses the leveling speed as the maximum speed when going down.
5A <44>	Motor Contactor Feedback 2	Open: Motor contactor closed (N.C.) Closed: Motor contactor open
5B <44>	Brake Feedback 2	Open: Brake open (N.C.) Closed: Brake closed
5C	Floor Sensor	Closed: Initiate Direct Landing (S5-10 = 1)
67	Communications Test Mode	Tests the MEMOBUS/Modbus RS-485/422 interface. Displays "PASS" if the test completes successfully.
79	Brake Feedback	Open: Brake closed Closed: Brake open (N.O.)

<44> Available in drive software versions PRG: 7017 or later.

■ H2: Multi-Function Digital Outputs

No.	Name	Description	Setting
H2-01	Terminals M1-M2 Function Selection (relay)	Refer to *H2 Multi-Function Digital Output Settings on page 184* for a description of setting values.	Default: 50 Min: 0 Max: 161
H2-02	Terminals M3-M4 Function Selection (relay)		Default: 51 Min: 0 Max: 161
H2-03	Terminals M5-M6 Function Selection (relay)		Default: 6 Min: 0 Max: 161
H2-04	Terminal P1-C1 Function Selection (photocoupler)		Default: 37 Min: 0 Max: 161
H2-05	Terminal P2-C2 Function Selection (photocoupler)		Default: F Min: 0 Max: 161

H2 Multi-Function Digital Output Settings

H2-□□ Setting	Function	Description
0	During Run	Closed: An Up/Down command is active or voltage is output.
1	Zero Speed	Open: Output speed is greater than the value of E1-09 (Minimum Output Frequency) or S1-01 (Zero Speed Level at Stop). Closed: Output frequency is less than or equal to the value of E1-09 (Minimum Output Frequency) or S1-01 (Zero Speed Level at Stop).
2	Speed Agree 1	Closed: Output speed equals the speed reference (plus or minus the hysteresis set to L4-02).
3	User-set Speed Agree 1	Closed: Output speed and speed reference equal L4-01 (plus or minus the hysteresis set to L4-02).
4	Speed Detection 1	Closed: Output speed is less than or equal to the value in L4-01 with hysteresis determined by L4-02.
5	Speed Detection 2	Closed: Output speed is greater than or equal to the value in L4-01 with hysteresis determined by L4-02.
6	Drive Ready (READY)	Closed: Power up is complete and the drive is ready to accept an Up/Down command.
7	DC Bus Undervoltage	Closed: DC bus voltage is below the Uv trip level set in L2-05.
8	During Baseblock (N.O.)	Closed: Drive has entered the baseblock state (no output voltage).
9	Speed Reference Source	Open: The speed reference is supplied by an external reference (set in b1-01). Closed: Digital operator supplies the speed reference.
A	Up/Down Command Source	Open: The Up/Down command is supplied by an external reference (set in b1-02). Closed: Digital operator supplies the Up/Down command.
B	Torque Detection 1	Closed: An overtorque or undertorque situation has been detected.
E	Fault	Closed: Fault occurred. (excluding CPF00 and CPF01)
F	Not used (Through Mode)	Set this value when the terminal is not used or when using the terminal in the pass-through mode.
10	Minor Fault	Closed: An alarm has been triggered, or the IGBTs have reached 90% of their expected life span.
11	Fault Reset Command Active	Closed: The drive has received a reset command from the multi-function input terminals or from serial network, or the digital operator's RESET key has been pressed.
12	Timer Output	Closed: Timer output.
13	Speed Agree 2	Closed: When drive output frequency equals the speed reference ±L4-04.
14	User-set Speed Agree 2	Closed: When the drive output speed is equal to the value in L4-03 ±L4-04.
15	Speed Detection 3	Closed: When the drive output speed is less than or equal to the value in L4-03 ±L4-04.
16	Speed Detection 4	Closed: When the output speed is greater than or equal to the value in L4-03 ±L4-04.
18	Torque Detection 2	Closed: Overtorque or undertorque has been detected.
1A	During Down Direction	Closed: Drive is running in the down direction.
1B	During Baseblock 2 (N.C.)	Open: Drive has entered the baseblock state (no output voltage).

H2 Multi-Function Digital Output Settings		
H2-☐☐ Setting	**Function**	**Description**
1C	Motor 2 Selection	Open: Motor 1 is selected Closed: Motor 2 is selected
1D	During Regeneration	Closed: Motor is operated in regenerative mode.
1E	Reset Enabled	Closed: An automatic reset is performed
1F	Motor Overload Alarm (oL1)	Closed: oL1 is at 90% of its trip point or greater. An oH3 situation also triggers this alarm.
20	Drive Overheat Pre-alarm (oH)	Closed: Heatsink temperature exceeds the parameter L8-02 value.
2F	Maintenance Period	Closed: Cooling fan, electrolytic capacitors, IGBTs, or the soft charge bypass relay may require maintenance.
30	During Torque Limit	Closed: When the torque limit has been reached.
33	Within Position Lock Bandwidth	Closed: Position deviation is within the Position Lock Bandwidth.
37	During Frequency Output	Open: No frequency output from drive when stopped with baseblock, stopped with DC injection braking during initial excitation, or stopped with short circuit braking. Closed: Drive is outputting a frequency.
47	Input Phase Loss	Closed: Input phase loss has occurred Open: Normal operation (no phase loss detected)
4E	Braking Transistor Fault (rr)	Closed: The built-in dynamic braking transistor failed. **Note:** This function is not available in models CIMR-LU2A0145 to 2A0415, 4A0075 to 4A0216, or 5A0052 to 5A0200.
50	Brake Control	Close: Release brake Open: Apply brake
51	Output Contactor Control	Closed: Close output contactor
52	Door Zone Reached	Closed: Indicates that the door zone has been reached.
53	Not Zero Speed	Closed: Speed is greater than the zero speed level set to S1-01 Open: Operating at zero speed level
54	Light Load Direction	Closed: Light load direction is up Open: Light load direction is down
55	Light Load Direction Detection Status	Closed: Ready for Light Load Direction Search Open: Light Load Detection in progress
58	Safe Disable Status	Closed: Safe Disable terminals H1-HC and H2-HC are open, drive is in a baseblock state Open: Safe Disable terminals H1-HC and H2-HC are closed (normal operation)
5C <44>	Motor Current Monitor	Open: Output current is greater than the value of L8-99. Closed: Output current is less than or equal to the value of L8-99.
60	Internal Cooling Fan Alarm	Closed: Internal cooling fan alarm
61	Motor Pole Search Status	Closed: Motor pole search successful
100 to 161	Function 0 to 61 with Inverse Output	Inverts the output switching of the multi-function output functions. Sets the last two digits of 1☐☐ to reverse the output signal of that specific function.

<44> Available in drive software versions PRG: 7017 or later.

■ H3: Multi-Function Analog Inputs

No.	Name	Description	Setting
H3-01	Terminal A1 Signal Level Selection	0: 0 to 10 V 1: –10 to 10 V	Default: 0 Min: 0 Max: 1
H3-02	Terminal A1 Function Selection	Sets the function of terminal A1.	Default: 0 Min: 0 Max: 1F
H3-03 RUN	Terminal A1 Gain Setting	Sets the level of the input value selected in H3-02 when 10 V is input at terminal A1.	Default: 100.0% Min: -999.9% Max: 999.9%
H3-04 RUN	Terminal A1 Bias Setting	Sets the level of the input value selected in H3-02 when 0 V is input at terminal A1.	Default: 0.0% Min: -999.9% Max: 999.9%
H3-09	Terminal A2 Signal Level Selection	0: 0 to 10 V 1: –10 to 10 V **Note:** Use DIP switch S1 to set input terminal A2 for a current or a voltage input signal.	Default: 0 Min: 0 Max: 0
H3-10	Terminal A2 Function Selection	Sets the function of terminal A2.	Default: 0 Min: 0 Max: 1F
H3-11 RUN	Terminal A2 Gain Setting	Sets the level of the input value selected in H3-10 when 10 V is input at terminal A2.	Default: 100.0% Min: -999.9% Max: 999.9%
H3-12 RUN	Terminal A2 Bias Setting	Sets the level of the input value selected in H3-10 when 0 V is input at terminal A2.	Default: 0.0% Min: -999.9% Max: 999.9%
H3-13	Analog Input Filter Time Constant	Sets a primary delay filter time constant for terminals A1 and A2. Used for noise filtering.	Default: 0.03 s Min: 0.00 s Max: 2.00 s
H3-16	Offset for Terminal A1	Applies an offset to analog input A1. Can be used for zero adjustment of the analog input.	Default: 0 Min: -500 Max: 500
H3-17	Offset for Terminal A2	Applies an offset to analog input A2. Can be used for zero adjustment of the analog input.	Default: 0 Min: -500 Max: 500

H3 Multi-Function Analog Input Settings (H3-02 and H3-10)		
Setting	**Function**	**Description (For when output is 100%)**
0	Speed Reference Bias (value added to input signal when multiple analog terminals supply the speed reference)	E1-04 (maximum output frequency)
2	Auxiliary Speed Reference 1 (used as a second speed reference)	E1-04 (maximum output frequency)
3	Auxiliary Speed Reference 2 (used as third speed reference)	E1-04 (maximum output frequency)
E <44>	Motor Temperature (PTC thermistor input)	oH3 Alarm detection level: 1.18 V oH4 Fault detection level: 2.293 V
14	Torque Compensation (load cell input)	10 V = Motor rated torque
1F	Not used (Through Mode)	Sets this value when the terminal is not used or when using the terminal in the pass-through mode.

<44> Available in drive software versions PRG: 7017 or later.

■ H4: Analog Outputs

No.	Name	Description	Setting
H4-01	Terminal FM Monitor Selection	Selects the data to be output through multi-function analog output terminal FM. Set the desired monitor parameter to the digits available in U□-□□. For example, enter “103” for U1-03.	Default: 102 Min: 000 Max: 999
H4-02 RUN	Terminal FM Gain	Sets the signal level at terminal FM that is equal to 100% of the selected monitor value.	Default: 100.0% Min: -999.9% Max: 999.9%
H4-03 RUN	Terminal FM Bias	Sets the bias value added to the terminal FM output signal.	Default: 0.0% Min: -999.9% Max: 999.9%
H4-04	Terminal AM Monitor Selection	Selects the data to be output through multi-function analog output terminal AM. Set the desired monitor parameter to the digits available in U□-□□. For example, enter “103” for U1-03.	Default: 103 Min: 000 Max: 999
H4-05 RUN	Terminal AM Gain	Sets the signal level at terminal AM that is equal to 100% of the selected monitor value.	Default: 50.0% Min: -999.9% Max: 999.9%
H4-06 RUN	Terminal AM Bias	Sets the bias value added to the terminal AM output signal.	Default: 0.0% Min: -999.9% Max: 999.9%
H4-07	Terminal FM Signal Level Selection	0: 0 to 10 V 1: –10 to 10 V	Default: 0 Min: 0 Max: 1
H4-08	Terminal AM Signal Level Selection	0: 0 to 10 V 1: –10 to 10 V	Default: 0 Min: 0 Max: 1

■ H5: MEMOBUS/Modbus Serial Communication

Note: The settings for MEMOBUS/Modbus communications become effective when the drive is restarted.

No.	Name	Description	Setting
H5-01 <14>	Drive Node Address	Selects drive station node number (address) for MEMOBUS/Modbus terminals R+, R-, S+, S-. Cycle power for the setting to take effect.	Default: 1 Min: 0 Max: FF
H5-02	Communication Speed Selection	0: 1200 bps 1: 2400 bps 2: 4800 bps 3: 9600 bps 4: 19200 bps 5: 38400 bps 6: 57600 bps 7: 76800 bps 8: 115200 bps Cycle power for the setting to take effect.	Default: 3 Min: 0 Max: 8
H5-03	Communication Parity Selection	0: No parity 1: Even parity 2: Odd parity Cycle power for the setting to take effect.	Default: 0 Min: 0 Max: 2
H5-04	Stopping Method After Communication Error (CE)	0: Ramp to stop 1: Coast to stop 2: Fast Stop 3: Alarm only	Default: 3 Min: 0 Max: 3
H5-05	Communication Fault Detection Selection	0: Disabled 1: Enabled. If communication is lost for more than two seconds, a CE fault will occur.	Default: 1 Min: 0 Max: 1
H5-06	Drive Transmit Wait Time	Sets the wait time between receiving and sending data.	Default: 5 ms Min: 5 ms Max: 65 ms
H5-07	RTS Control Selection	0: Disabled. RTS is always on. 1: Enabled. RTS turns on only when sending.	Default: 1 Min: 0 Max: 1
H5-09	Communication Fault Detection Time	Sets the time required to detect a communications error. Adjustment may be needed when networking several drives.	Default: 2.0 s Min: 0.0 s Max: 10.0 s
H5-10	Unit Selection for MEMOBUS/Modbus Register 0025H	0: 0.1 V units 1: 1 V units	Default: 0 Min: 0 Max: 1
H5-11	Communications ENTER Function Selection	0: Drive requires an Enter command before accepting any changes to parameter settings. 1: Parameter changes are activated immediately without the Enter command.	Default: 0 Min: 0 Max: 1

<14> If this parameter is set to 0, the drive will be unable to respond to MEMOBUS/Modbus commands.

◆ L: Protection Functions

L parameters provide protection to the drive and motor, including control during momentary power loss, Stall Prevention, frequency detection, fault reset, overtorque detection, torque limits, and other types of hardware protection.

■ L1: Motor Protection

No.	Name	Description	Setting
L1-01	Motor Overload Protection Selection	0: Disabled 1: General purpose motor (standard fan cooled) 2: Drive dedicated motor with a speed range of 1:10 3: Vector motor with a speed range of 1:100 5: PM motor with constant torque characteristics	Default: <5> Min: 0 Max: 5
L1-02	Motor Overload Protection Time	Sets the motor thermal overload protection (oL1) time.	Default: 1.0 min Min: 0.1 min Max: 5.0 min
L1-03 <44>	Motor Overheat Alarm Operation Selection (PTC thermistor input)	Sets operation when the motor temperature analog input (H3-02 or H3-10 = E) exceeds the oH3 alarm level. 0: Ramp to stop 1: Coast to stop 2: Emergency Stop (Fast Stop) (decelerate to stop using the deceleration time in C1-09) 3: Alarm only (“oH3” will flash)	Default: 3 Min: 0 Max: 3
L1-04 <44>	Motor Overheat Fault Operation Selection (PTC thermistor input)	Sets stopping method when the motor temperature analog input (H3-02 or H3-10 = E) exceeds the oH4 fault level. 0: Ramp to stop 1: Coast to stop 2: Emergency Stop (Fast Stop) (decelerate to stop using the deceleration time in C1-09)	Default: 1 Min: 0 Max: 2
L1-05 <44>	Motor Temperature Input Filter Time (PTC thermistor input)	Adjusts the filter for the motor temperature analog input (H3-02 or H3-10 = E).	Default: 0.20 s Min: 0.00 s Max: 10.00 s
L1-13	Continuous Electrothermal Operation Selection	0: Disabled 1: Enabled	Default: 1 Min: 0 Max: 1

<5> Default setting is determined by the control mode (A1-02).
<44> Available in drive software versions PRG: 7017 or later.

■ L2: Undervoltage Detection

No.	Name	Description	Setting
L2-05	Undervoltage Detection Level (Uv)	Sets the DC bus undervoltage trip level.	Default: <9> <15> Min: 150 Vdc Max: 210 Vdc <9>

<9> Values shown here are for 200 V class drives. Double the value when using a 400 V class drive. Multiply value by 2.875 for 600 V class drives.
<15> Default setting value is dependent on the setting for the input voltage (E1-01).

■ L3: Stall Prevention

No.	Name	Description	Setting
L3-01	Stall Prevention Selection during Acceleration	0: Disabled. 1: General purpose. Acceleration is paused as long as the current is above the L3-02 setting. 2: Intelligent. Accelerate in the shortest possible time without exceeding the L3-02 level.	Default: 1 Min: 0 Max: 2
L3-02	Stall Prevention Level during Acceleration	Used when L3-01 = 1 or 2. 100% is equal to the drive rated current.	Default: <16> Min: 0% Max: 150% <16>
L3-05	Stall Prevention Selection during Run	0: Disabled. Drive runs at a set frequency. A heavy load may cause speed loss. 1: Decel time 1. Uses the deceleration ramp set to C1-02 while Stall Prevention is performed. 2: Decel time 2. Uses the deceleration ramp set to C1-04 while Stall Prevention is performed.	Default: 1 Min: 0 Max: 2
L3-06	Stall Prevention Level during Run	Enabled when L3-05 is set to 1 or 2. 100% is equal to the drive rated current.	Default: <16> Min: 30% Max: 150% <16>

<16> The setting value is dependent on the setting for the carrier frequency reduction (L8-38).

■ L4: Speed Detection

No.	Name	Description	Setting
L4-01	Speed Agreement Detection Level	L4-01 sets the speed detection level for digital output functions H2-□□ = 3, 4, 5. L4-02 sets the hysteresis or allowable margin for speed detection.	Default: 0.0% Min: 0.0% Max: 100.0%
L4-02	Speed Agreement Detection Width		Default: 4.0% Min: 0.0% Max: 40.0%
L4-03	Speed Agreement Detection Level (+/-)	L4-03 sets the speed detection level for digital output functions H2-□□ = 13, 14, 15, 16. L4-04 sets the hysteresis or allowable margin for speed detection.	Default: 0.0% Min: –100.0% Max: 100.0%
L4-04	Speed Agreement Detection Width (+/-)		Default: 4.0% Min: 0.0% Max: 40.0%
L4-05	Speed Reference Loss Detection Selection	0: Stop. Drive stops when the speed reference is lost. 1: Run. Drive runs at a reduced speed when the speed reference is lost.	Default: 0 Min: 0 Max: 1
L4-06	Speed Reference at Reference Loss	Sets the percentage of the speed reference that the drive should run with when the speed reference is lost.	Default: 80% Min: 0.0% Max: 100.0%
L4-07 <44>	Speed Agree Detection Selection	0: No detection during baseblock. 1: Detection always enabled.	Default: 0 Min: 0 Max: 1
L4-13	Door Zone Level	Sets the door zone speed level. The "door zone" multi-function digital output is closed when the speed falls below this level.	Default: 0.0% Min: 0.0% Max: 100.0%

<44> Available in drive software versions PRG: 7017 or later.

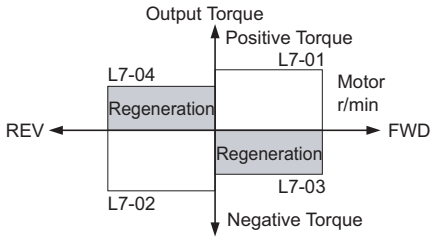
■ L5: Automatic Fault Reset

No.	Name	Description	Setting
L5-01	Number of Auto Reset Attempts	Sets the number of times the drive may attempt to reset after the following faults occur: GF, LF, oC, ov, rr, oH1, oL1, oL2, oL3, oL4, UL3, UL4.	Default: 0 Min: 0 Max: 10
L5-02	Fault Output Operation during Auto Reset	0: Fault output not active. 1: Fault output active during reset attempt.	Default: 0 Min: 0 Max: 1
L5-06	Undervoltage Fault Reset Selection	0: Same as L5-01 condition 1: Always automatically reset UV1	Default: 0 Min: 0 Max: 1

■ L6: Torque Detection

No.	Name	Description	Setting
L6-01	Torque Detection Selection 1	0: Disabled 1: oL3 detection only active during speed agree, operation continues after detection 2: oL3 detection always active during run, operation continues after detection 3: oL3 detection only active during speed agree, output shuts down on an oL3 fault 4: oL3 detection always active during run, output shuts down on an oL3 fault 5: UL3 detection only active during speed agree, operation continues after detection 6: UL3 detection always active during run, operation continues after detection 7: UL3 detection only active during speed agree, output shuts down on an oL3 fault 8: UL3 detection always active during run, output shuts down on an oL3 fault	Default: 0 Min: 0 Max: 8
L6-02	Torque Detection Level 1	Sets the overtorque and undertorque detection level.	Default: 150% Min: 0% Max: 300%
L6-03	Torque Detection Time 1	Sets the time an overtorque or undertorque condition must exist to trigger torque detection 1.	Default: 0.1 s Min: 0.0 s Max: 10.0 s
L6-04	Torque Detection Selection 2	0: Disabled 1: oL4 detection only active during speed agree, operation continues after detection 2: oL4 detection always active during run, operation continues after detection 3: oL4 detection only active during speed agree, output shuts down on an oL4 fault 4: oL4 detection always active during run, output shuts down on an oL4 fault 5: UL4 detection only active during speed agree, operation continues after detection 6: UL4 detection always active during run, operation continues after detection 7: UL4 detection only active during speed agree, output shuts down on an oL4 fault 8: UL4 detection always active during run, output shuts down on an oL4 fault	Default: 0 Min: 0 Max: 8
L6-05	Torque Detection Level 2	Sets the overtorque and undertorque detection level.	Default: 150% Min: 0% Max: 300%
L6-06	Torque Detection Time 2	Sets the time an overtorque or undertorque condition must exist to trigger torque detection 2.	Default: 0.1 s Min: 0.0 s Max: 10.0 s

■ L7: Torque Limit

No.	Name	Description	Setting
L7-01	Forward Torque Limit	Sets the torque limit value as a percentage of the motor rated torque. Four individual quadrants can be set. 	Default: 200% Min: 0% Max: 300%
L7-02	Reverse Torque Limit		Default: 200% Min: 0% Max: 300%
L7-03	Forward Regenerative Torque Limit		Default: 200% Min: 0% Max: 300%
L7-04	Reverse Regenerative Torque Limit		Default: 200% Min: 0% Max: 300%
L7-16	Torque Limit Process at Start	0: Disabled 1: Enabled	Default: 1 Min: 0 Max: 1

■ L8: Drive Protection

No.	Name	Description	Setting
L8-02	Overheat Alarm Level	An overheat alarm will occur if the heatsink temperature exceeds the level set in L8-02.	Default: <4> Min: 50°C Max: 150°C
L8-03	Overheat Pre-Alarm Operation Selection	0: Ramp to stop. A fault is triggered. 1: Coast to stop. A fault is triggered. 2: Fast Stop. Decelerate to stop using the deceleration ramp in C1-09. A fault is triggered. 3: Continue operation. An alarm is triggered.	Default: 3 Min: 0 Max: 3
L8-05	Input Phase Loss Protection Selection	Selects the detection of input current phase loss, power supply voltage imbalance, or main circuit electrolytic capacitor deterioration. 0: Disabled 1: Enabled always 2: Enabled during operation 3: Enabled during constant speed Setting 1 cannot be selected for 600 V class drives.	Default: <4> Min: 0 Max: 3
L8-06	Input Phase Loss Detection Level	When ripple is observed in the DC bus, expansion of the input bias is calculated and becomes the input phase if the difference between the max and minimum values of the ripple are greater than L8-06. Detection Level = 100% = Voltage class × $\sqrt{2}$ (determines standards for setting values)	Default: <4> Min: 0.0% Max: 50.0%
L8-07	Output Phase Loss Protection Selection	0: Disabled 1: Enabled (triggered by a single phase loss) 2: Enabled (triggered when two phases are lost) 3: Fault at phase loss at start or when two phases lost mid-operation **Note:** Setting 3 is available in the control mode V/f or OLV for drives with software versions PRG: 7200 or later.	Default: 0 Min: 0 Max: 3
L8-09	Output Ground Fault Detection Selection	0: Disabled 1: Enabled	Default: 1 Min: 0 Max: 1
L8-10	Heatsink Cooling Fan Operation Selection	0: Run with timer (Fan operates only during run and for L8-11 seconds after stop.) 1: Run always (Cooling fan operates whenever the drive is powered up.) 2: Temperature controlled (Cooling fan operated depending on the temperature of the drives heatsink.)	Default: 0 Min: 0 Max: 2
L8-11	Heatsink Cooling Fan Off Delay Time	Sets a delay time to shut off the cooling fan after the Up/Down command is removed when L8-10 = 0.	Default: 60 s Min: 0 s Max: 300 s

No.	Name	Description	Setting
L8-12	Ambient Temperature Setting	Enter the ambient temperature. This value adjusts the oL2 detection level.	Default: 40°C Min: -10°C Max: 50°C
L8-15	oL2 (drive overload) Characteristics Selection at Low Speeds	0: No oL2 level reduction below 6 Hz. 1: oL2 level is reduced linearly below 6 Hz. It is halved at 0 Hz.	Default: 1 Min: 0 Max: 1
L8-27	Overcurrent Detection Gain	Sets the gain for overcurrent detection as a percentage of the motor rated current. Overcurrent is detected using the drive's overcurrent level or the value set to L8-27, whichever is lower.	Default: 300.0% Min: 0.0% Max: 300.0%
L8-29	Current Unbalance Detection (LF2)	0: Disabled 1: Enabled	Default: 1 Min: 0 Max: 1
L8-35 <1>	Installation Selection	0: IP00 enclosure drive 2: IP00 enclosure drive with top protective cover	Default: <4> Min: 0 Max: 2
L8-38	Automatic Torque Boost Selection	Torque Boost increases the output current limit while decreasing the carrier frequency when the output current exceeds a certain value. 0: Disabled 3: Enabled	Default: 0 Min: 0 Max: 3
L8-39	Reduced Carrier Frequency	Sets the reduced carrier frequency used by the Torque Boost function.	Default: 3.0 kHz Min: 1.0 kHz Max: 15.0 kHz
L8-55	Internal Braking Transistor Protection	0: Disabled. L8-55 should be disabled when using a regen converter or an optional braking unit. 1: Protection enabled.	Default: 1 Min: 0 Max: 1
L8-62	Operation Selection at Input Phase Loss	Sets stopping method when a Input phase loss fault (PF) occurs. See parameter L8-05. 0: Ramp to Stop - Decelerate to stop using the deceleration ramp in C1-02. 1: Coast to Stop 2: Fast Stop - Decelerate to stop using the deceleration ramp in C1-09. 3: Alarm only - Drive continues operation.	Default: 1 Min: 0 Max: 3
L8-77	Oscillation Suppression	Used to suppress speed oscillations that occur with an unloaded motor and that have the same frequency as the output frequency.	Default: 0 Min: -100 Max: 100
L8-88	Safe Disable Operation Mode	0: Mode 0 1: Mode 1	Default: 1 Min: 0 Max: 1
L8-89 <44>	Current Monitoring Selection	Enables or disables the Current Monitoring function. 0: Disabled 1: Enabled	Default: 0 Min: 0 Max: 1
L8-99 <44>	Current Monitoring Level	Sets the current monitoring level as a percentage of the drive's rated current. Sets the level of current used for L8-89 and H2-□□ = 5C.	Default: 10.0% Min: 0.0% Max: 50.0%

<1> Parameter setting value is not reset to the default value when the drive is initialized.
<4> Default setting is determined by the drive model (o2-04).
<44> Available in drive software versions PRG: 7017 or later.

◆ n: Advanced Performance Set-Up

The n parameters are used to adjust more advanced performance characteristics such as speed feedback detection, Online Tuning for motor line-to-line resistance, and PM motor control tuning.

■ n1: Hunting Prevention

No.	Name	Description	Setting
n1-08 <45>	Leakage Current Vibration Control Selection	0: Method 1 1: Method 2	Default: 0 Min: 0 Max: 1

<45> Available in drive software versions PRG: 7200 or later.

■ n2: Speed Feedback Detection Control (AFR) Tuning

No.	Name	Description	Setting
n2-01	Speed Feedback Detection Control (AFR) Gain	Sets the internal speed feedback detection control gain in the automatic frequency regulator (AFR). If hunting occurs, increase the set value. If response is low, decrease the set value.	Default: 1.00 Min: 0.00 Max: 10.00
n2-02	Speed Feedback Detection Control (AFR) Time Constant 1	Sets the time constant used for speed feedback detection control (AFR).	Default: 50 ms Min: 0 ms Max: 2000 ms
n2-03	Speed Feedback Detection Control (AFR) Time Constant 2	Sets the AFR time constant to be used during regen.	Default: 750 ms Min: 0 ms Max: 2000 ms

■ n5: Inertia Compensation

No.	Name	Description	Setting
n5-01	Inertia Compensation Selection	0: Disabled 1: Enabled	Default: 0 Min: 0 Max: 1
n5-02	Motor Acceleration Time	Sets the time required to accelerate the motor at 100% torque from 0 to the nominal speed.	Default: <4> Min: 0.001 s Max: 10.000 s
n5-03	Inertia Compensation Gain	Sets the ratio between motor and load inertia. Lower this setting if overshoot occurs at the end of acceleration.	Default: 1.00 Min: 0.00 Max: 100.00
n5-07	Speed Feedback Compensation Selection	0: Disabled 1: Enabled 2: Test Mode	Default: 1 Min: 0 Max: 2
n5-08	Speed Feedback Compensation Gain (P)	Sets the proportional gain for the Speed Feedback Compensation.	Default: 12.00 Min: 0.00 Max: 300.00

<4> Default setting value is dependent on the drive model (o2-04).

■ n6: Online Tuning

No.	Name	Description	Setting
n6-01	Online Tuning Selection	0: Disabled 1: Line-to-line resistance tuning 2: Voltage correction.	Default: 2 Min: 0 Max: 2
n6-05	Online Tuning Gain	Decrease this setting for motors with a relatively large rotor time constant. If overload occurs, increase this setting slowly in increments of 0.1.	Default: 1.0 Min: 0.1 Max: 50.0

■ n8: PM Motor Control Tuning

No.	Name	Description	Setting
n8-01	Initial Polarity Estimation Current	Sets the current used for initial rotor position estimation as a percentage of the motor rated current (E5-03). If the motor nameplate lists an “Si” value, that value should be entered here.	Default: 50% Min: 0% Max: 100%
n8-02	Pole Attraction Current	Sets the current during initial polar attraction as a percentage of the motor rated current. Enter a high value when attempting to increase starting torque.	Default: 80% Min: 0% Max: 150%
n8-29	q-Axis Current Control Gain during Normal Operation	Sets the q axis proportional gain for the normal control range.	Default: 1000 rad/s Min: 0 rad/s Max: 2000 rad/s
n8-30	q-Axis Current Control Integral Time during Normal Operation	Sets the q axis integral time for the normal control range.	Default: 10.0 ms Min: 0.0 ms Max: 100.0 ms
n8-32	d-Axis Current Control Gain during Normal Operation	Sets the d axis proportional gain for the normal control range.	Default: 1000 rad/s Min: 0 rad/s Max: 2000 rad/s
n8-33	d-Axis Current Control Integral Time during Normal Operation	Sets the d axis integral time for the normal control range.	Default: 10.0 ms Min: 0.0 ms Max: 100.0 ms
n8-35	Initial Rotor Position Detection Selection	1: High frequency injection 2: Pulse injection	Default: 1 Min: 1 Max: 2
n8-36	High Frequency Injection Level	Sets the frequency in Hz for the superimposed signal used for superimposed harmonics.	Default: 500 Hz Min: 25 Hz Max: 1000 Hz
n8-37	High Frequency Injection Amplitude	Sets the amplitude for superimposed harmonics according to the voltage class of the motor. Adjust this value when there is too much or too little current as a result of the settings assigned to motor parameters.	Default: 20.0% Min: 0.0% Max: 99.9%
n8-62	Output Voltage Limit	Prevents output voltage saturation. Should be set just below the voltage provided by the input power supply.	Default: 200.0 V <9> Min: 0.0 V Max: 230.0 V <9>
n8-81	High Frequency Injection during Rescue Operation	Sets the frequency used for Polar Detection Method 1 during Rescue Operation.	Default: 90 Hz Min: 25 Hz Max: 1000 Hz
n8-82	High Frequency Injection Amplitude during Rescue Operation	Sets the amplitude for High Frequency Injection during Rescue Operation as a percentage of the voltage (200 V or 400 V).	Default: 15.0% Min: 0.1% Max: 99.9%
n8-84	Polarity Detection Current	Sets the current level (E5-03) as a percentage for detecting polarity during Initial Polarity Estimation.	Default: 100% Min: 0% Max: 150%
n8-86	Magnet Pole Search Error Detection Selection	0: Disabled 1: Enabled	Default: 0 Min: 0 Max: 1

<9> Values shown here are for 200 V class drives. Double the value when using a 400 V class drive. Multiply value by 2.875 for 600 V class drives.

■ n9: Current Detection Adjustments

No.	Name	Description	Setting
n9-60	A/D Conversion Start Delay	Sets a delay time for starting the current signal A/D conversion. This value seldom needs to be changed.	Default: <4> Min: 0.0 µs Max: 40.0 µs

<4> Default setting is determined by the drive model (o2-04).

◆ o: Operator Related Parameters

The o parameters set up the digital operator displays.

■ o1: Digital Operator Display Selection

No.	Name	Description	Setting
o1-01 RUN	Drive Mode Unit Monitor Selection	Switches the display after the power has been turned on. When using an LED operator, pressing the up arrow key will display the following data: frequency reference → rotational direction → output frequency → output current → output voltage → U1-□□. (This is done by entering the 1□□ part of U1-□□. Certain monitors are not available in some control modes.)	Default: 106 (Monitor U1-06) Min: 105 Max: 699
o1-02 RUN	User Monitor Selection after Power Up	o1-02 selects the information that is displayed when the power is turned on. 1: Speed reference (U1-01) 2: Direction 3: Output speed (U1-02) 4: Output current (U1-03) 5: User-selected monitor (set by o1-01)	Default: 1 Min: 1 Max: 5
o1-03	Digital Operator Display Unit Selection	Sets the units the drive should use to display the frequency reference and motor speed monitors. 0: 0.01 Hz 1: 0.01% (100% = E1-04) 2: r/min (calculated using the number of motor poles setting in E2-04, E4-04, or E5-04) 3: User-selected units (set by o1-10 and o1-11) 4: Elevator units 1 (speed in m/s, accel/decel rate and jerk in s) 5: Elevator units 2 (speed in m/s, accel/decel rate in m/s^2, jerk in m/s^3) 6: Elevator units 3 (speed in ft/min, accel/decel rate in ft/s^2, jerk in ft/s^3)	Default: 1 Min: 0 Max: 6 <21>
o1-04	V/f Pattern Setting Units	0: Hz 1: r/min	Default: <5> Min: 0 Max: 1
o1-05 RUN	LCD Contrast Control	Sets the brightness of the LCD operator (option).	Default: 3 Min: 0 Max: 5
o1-06 <44>	User Monitor Selection Mode	0: 3 Monitor Sequential (Displays the next 2 sequential monitors) 1: 3 Monitor Selectable (o1-07 and o1-08 selected monitor is displayed)	Default: 0 Min: 0 Max: 1
o1-07 <44>	Second Line Monitor Selection	Selects the monitor displayed on the second line.	Default: 102 Min: 101 Max: 699
o1-08 <44>	Third Line Monitor Selection	Selects the monitor displayed on the third line.	Default: 103 Min: 101 Max: 699
o1-10	User-Set Display Units Maximum Value	These settings define the display values when o1-03 is set to 3. o1-10 sets the display value that is equal to the maximum output frequency. o1-11 sets the position of the decimal position.	Default: <20> Min: 1 Max: 60000
o1-11	User-Set Display Units Decimal Display		Default: <20> Min: 0 Max: 3
o1-12	Length Units	0: Millimeter unit 1: Inch unit	Default: 0 Min: 0 Max: 1
o1-20	Traction Sheave Diameter	Sets the traction sheave diameter for display unit calculations.	Default: 400 mm <38> Min: 100 mm Max: 2000 mm <38>

No.	Name	Description	Setting
o1-21	Roping Ratio	Sets the roping ratio. 1: 1:1 2: 1:2 3: 1:3 4: 1:4	Default: 2 Min: 1 Max: 4
o1-22	Mechanical Gear Ratio	Sets the ratio of the gear installed for display unit calculations.	Default: <5> Min: 0.10 Max: <46>
o1-23 <45>	HBB Non Display Select	Shows or hides the HBB command on the digital operator while the safety signal is being input. 0: Shows HBB 1: Hide HBB	Default: 0 Min: 0 Max: 1

<5> Default setting is determined by the control mode (A1-02).
<20> This parameter appears when the drive displays user-set units (o1-03 = 3).
<21> The control mode determines the selections available. In V/f Control, only settings 1 through 3 are permitted.
<38> Default setting and setting range changes when inches are selected for the length units (o1-12 = 1). The setting range becomes 3.70 to 78.00 inches, and the default becomes 15.70 inches.
<44> Available in drive software versions PRG: 7017 or later.
<45> Available in drive software versions PRG: 7200 or later.
<46> The setting range changes depending on drive software versions.
PRG: 7017 or earlier: 0.10 to 50.00
PRG: 7200 or later: 0.10 to 100.00

■ o2: Digital Operator Keypad Functions

No.	Name	Description	Setting
o2-01	LO/RE Key Function Selection	0: Disabled 1: Enabled. LO/RE key switches between LOCAL and REMOTE operation.	Default: 0 Min: 0 Max: 1
o2-02	STOP Key Function Selection	0: Disabled. STOP key is disabled in REMOTE operation. 1: Enabled. STOP key is always enabled.	Default: 0 Min: 0 Max: 1
o2-03	User Parameter Default Value	0: No change. 1: Set defaults. Saves parameter settings as default values for a User Initialization. 2: Clear all. Clears the default settings that have been saved for a User Initialization.	Default: 0 Min: 0 Max: 2
o2-04 <1>	Drive Model Selection	Enter the drive model. Setting required only if installing a new control board.	Default: Determined by drive capacity Min: – Max: –
o2-05	Speed Reference Setting Method Selection	0: ENTER key must be pressed to enter a speed reference. 1: ENTER key is not required. The speed reference can be adjusted using the up and down arrow keys only.	Default: 0 Min: 0 Max: 1
o2-06	Operation Selection when Digital Operator is Disconnected	0: The drive continues operating if the digital operator is disconnected. 1: A fault is triggered (oPr) and the motor coasts to stop.	Default: 0 Min: 0 Max: 1
o2-09	Reserved	–	–

<1> Parameter setting value is not reset to the default value when the drive is initialized.

■ o3: Copy Function

No.	Name	Description	Setting
o3-01	Copy Function Selection	0: Copy select 1: INV → OP READ (Read parameters from the drive, saving them onto the digital operator.) 2: OP → INV WRITE (Copy parameters from the digital operator, writing them to the drive.) 3: OP ↔ INV VERIFY (Verify parameter settings on the drive to check if they match the data saved on the operator.) To read the drive's parameter settings into the digital operator, set o3-02 to 1 (to allow reading).	Default: 0 Min: 0 Max: 3
o3-02	Copy Allowed Selection	Selects whether the read operation (o3-01 = 1) is enabled or disabled. 0: Read operation prohibited 1: Read operation allowed	Default: 0 Min: 0 Max: 1

■ o4: Maintenance Monitor Settings

No.	Name	Description	Setting
o4-01	Cumulative Operation Time Setting	Sets the value for the cumulative operation time of the drive in units of 10 h.	Default: 0 Min: 0 Max: 9999
o4-02	Cumulative Operation Time Selection	0: Logs power-on time 1: Logs operation time when the drive output is active (output operation time).	Default: 0 Min: 0 Max: 1
o4-03	Cooling Fan Operation Time Setting	Sets the value of the fan operation time monitor U4-03 in units of 10 h.	Default: 0 h Min: 0 h Max: 9999 h
o4-05	Capacitor Maintenance Setting	Sets the value of the Maintenance Monitor for the capacitors. See U4-05 to check when the capacitors may need to be replaced.	Default: 0% Min: 0% Max: 150%
o4-07	DC bus Pre-charge Relay Maintenance Setting	Sets the value of the Maintenance Monitor for the soft charge bypass relay. See U4-06 to check when the bypass relay may need to be replaced.	Default: 0% Min: 0% Max: 150%
o4-09	IGBT Maintenance Setting	Sets the value of the Maintenance Monitor for the IGBTs. See U4-07 to check when the IGBTs may need to be replaced.	Default: 0% Min: 0% Max: 150%
o4-11	U2, U3 Initialization	0: U2-□□ and U3-□□ monitor data is not reset when the drive is initialized (A1-03). 1: Resets the data for the U2-□□ and U3-□□ monitors. Once o4-11 is set to 1 and the ENTER key is pressed, fault data is erased and the display returns to 0.	Default: 0 Min: 0 Max: 1
o4-12	kWh Monitor Initialization	0: U4-10 and U4-11 monitor data is not reset when the drive is initialized (A1-03). 1: Resets the kWh counter. The monitors U4-10 and U4-11 will display "0" after they are initialized. Once o4-12 is set to 1 and the ENTER key is pressed, kWh data is erased and the display returns to 0.	Default: 0 Min: 0 Max: 1
o4-13	Number of Travels Counter Reset	0: Keep the number of travels counter value. The counter is not reset when the drive is initialized (A1-03). 1: Resets the number 0 travels counter. The monitor U4-24/25 will show 0. Once o4-13 is set to 1 and the ENTER key is pressed, the counter value is erased and the display returns to 0.	Default: 0 Min: 0 Max: 1
o4-15 <1>	Maintenance Alarm Snooze Period	After a maintenance alarm output has been triggered, o4-15 determines the level that will trigger the next alarm for the same component. The same alarm will be triggered by the detection level that triggered the original alarm plus the level set in o4-15.	Default: 2% Min: 0% Max: 20%
o4-16 <1>	Maintenance Monitoring Selection	Selects the Maintenance Monitor using bits 0 to 3. 0: LT1 (cooling fan) 1: LT2 (DC bus capacitors) 2: LT3 (soft-charge bypass relay) 3: LT4 (IGBTs have passed 90% of the their life expectancy)	Default: 1000 Min: 0000 Max: 1111

<1> Parameter setting value is not reset to the default value during drive initialization (A1-03).

◆ S: Elevator Parameters

This section describes various functions and faults needed to operate an elevator application: braking sequence, slip compensation for elevators, start/stop optimization, Rescue Operation, and elevator-related faults.

■ S1: Brake Sequence

No.	Name	Description	Setting
S1-01	Zero Speed Level at Stop	Determines the speed to begin applying DC Injection (or Position Lock) when the drive is ramping to stop (b1-03 = 0). Set as a percentage of the maximum output frequency (E1-04).	Default: <5> Min: 0.000% Max: 9.999%
S1-02	DC Injection Current at Start	Determines the amount of current to use for DC Injection at start. Set as a percentage of the drive rated current.	Default: 50% Min: 0% Max: 100%
S1-03	DC Injection Current at Stop	Determines the amount of current to use for DC Injection at stop. Set as a percentage of the drive rated current.	Default: 50% Min: 0% Max: 100%
S1-04	DC Injection/Position Lock Time at Start	Determines how long the drive should perform DC Injection at start. In CLV and CLV/PM, S1-04 determines how long Position Lock should be performed. A setting of 0.00 disables S1-04.	Default: 0.40s Min: 0.00 s Max: 10.00 s
S1-05	DC Injection/Position Lock Time at Stop	Determines how long the drive should perform DC Injection at stop. In CLV and CLV/PM, S1-05 determines how long Position Lock should be performed. A setting of 0.00 disables S1-05.	Default: 0.60s Min: 0.00 s Max: 10.00 s
S1-06	Brake Release Delay Time	Determines the delay time between the start of DC injection/Position Lock and setting the brake control command (H2-□□=50) in order to release the brake at the beginning of the ride.	Default: 0.20s Min: 0.00 s Max: 10.00 s
S1-07	Brake Close Delay Time	Determines the delay time between reaching Zero Speed (S1-01) and resetting the brake control command (H2-□□ = 50) in order to apply the brake at the end of the ride.	Default: 0.10s Min: 0.00 s Max: [S1-05]
S1-10	Run Command Delay Time	Sets the time that must pass after the Up/Down command is entered until the drive internal Run command is set and the ride is started.	Default: 0.10s Min: 0.00 s Max: 1.00 s
S1-11	Output Contactor Open Delay Time	Determines the delay time between shutting off the output of the drive and resetting the contactor control command (H2-□□ = 51) in order to release the motor contactor after a ride has finished.	Default: 0.10s Min: 0.00 s Max: 1.00 s
S1-12 <39>	Motor Contactor Control During Auto-Tuning	Determines the state of the output contactor control command (H2-□□ = 51) during Auto-Tuning. 0: Disabled 1: Enabled 2: Enabled during Auto-Tuning and HBB **Note:** Setting 2 is available in the control mode CLV or CLV/PM for drives with software versions PRG: 7017 or later. The setting is 0 or 1 for software version PRG: 7016.	Default: 0 Min: 0 Max: 2
S1-26 <44>	Emergency Stop Start Level	Sets the Emergency Stop Start Level as a percentage of the Maximum Output Frequency.	Default: 10.0% Min: 0.0% Max: 100.0%

<5> Default setting is determined by the control mode (A1-02).
<39> Available in drive software versions PRG: 7016 or later.
<44> Available in drive software versions PRG: 7017 or later.

■ S2: Slip Compensation for Elevators

No.	Name	Description	Setting
S2-01	Motor Rated Speed	Sets the motor rated speed.	Default: 1380 rpm Min: 300 rpm Max: 1800 rpm
S2-02 RUN	Slip Compensation Gain in Motoring Mode	Slip compensation for leveling speed can be set separately for motoring and regenerative states. This can help improve the accuracy of leveling.	Default: 0.7 Min: 0.0 Max: 5.0
S2-03 RUN	Slip Compensation Gain in Regenerative Mode		Default: 1.0 Min: 0.0 Max: 5.0
S2-05	Slip Compensation Torque Detection Delay Time	Sets a delay time before detecting torque for slip compensation.	Default: 1000 ms Min: 0 ms Max: 10000 ms
S2-06	Slip Compensation Torque Detection Filter Time Constant	Sets the filter time constant applied to the torque signal used for the slip compensation value calculation.	Default: 500 ms Min: 0 ms Max: 2000 ms

■ S3: Start/Stop Optimization

No.	Name	Description	Setting
S3-01 RUN	Position Lock Gain at Start 1	Sets gain levels 1 and 2 for the Position Lock function. Position Lock at start attempts to keep the car position when opening the brake in order to avoid roll back.	Default: 5 Min: 0 Max: 100
S3-02 RUN	Position Lock Gain at Start 2 (Anti Rollback Gain)		Default: 0.00 Min: 0.00 Max: 100.00
S3-03 RUN	Position Lock Gain at Stop	Sets the Position Lock gain at stop. Position Lock at stop keeps the car in position until the brake has been applied entirely.	Default: 5 Min: 0 Max: 100
S3-04	Position Lock Bandwidth	Determines the bandwidth around the stop position in which a digital output programmed for "Within Position Lock Bandwidth" (H2-□□ = 33) is closed.	Default: 10 Min: 0 Max: 16383
S3-10	Starting Torque Compensation Increase Time	Sets a time constant for the torque reference to reach 300%. Enabled by setting an analog input terminal for torque compensation (H3-□□ = 14).	Default: 500 ms Min: 0 ms Max: 5000 ms
S3-12	Starting Torque Compensation Bias in Down Direction	Adds a bias to torque compensation value from the load cell when moving in the down direction.	Default: 0 Min: -40.0% Max: 40.0%
S3-14	Torque Compensation Diminish Speed	Sets the speed level for torque compensation to diminish during the time determined by S3-15. Sets as a percentage of the maximum output frequency (E1-04). A setting of 0.0% disables this function.	Default: 0.0% Min: 0.0% Max: 200.0%
S3-15	Torque Compensation Diminish Time	Sets the time for torque compensation to diminish once motor speed reaches the level set in S3-14.	Default: 1000 ms Min: 0 ms Max: 5000 ms
S3-16	Torque Limit Reduction Time	Determines the reduction rate used bring the internal torque reference value down to zero after Position Lock at Stop has finished. Rate = $\frac{\text{Torque 300\%}}{\text{S3-16}}$	Default: 100 ms Min: 0 ms Max: 10000 ms
S3-20	Dwell 2 Speed Reference	Sets the speed reference for the Dwell 2 function. **Note:** A setting of 0.00 essentially disables the Dwell 2 function.	Default: 0.00% Min: 0.00% Max: 100.00%
S3-21	Dwell 2 End Speed	The Dwell 2 function will end when the drive reaches this speed. **Note:** A setting of 0.00 will disable the acceleration rate switch that occurs at the end of Dwell 2.	Default: 0.00% Min: 0.00% Max: 100.00%

No.	Name	Description	Setting
S3-25	DC Injection Gain in Regenerative Operation	Sets the gain level applied to the DC injection current at stop (S1-03) for when the load is 100% regenerative. The current applied during DC Injection at stop is determined as S1-03 × S3-25.	Default: 100% Min: 0% Max: 400%
S3-26	DC Injection Gain in Motoring Operation	Sets the gain level applied to the DC injection current at stop (S1-03) for when the load is 100% motoring. The current applied during DC Injection at stop is determined as S1-03 × S3-26.	Default: 20% Min: 0% Max: 400%
S3-27	Torque Compensation Value with Load Condition 1	Used for starting torque compensation utilizing a load cell signal. Sets the torque compensation value for load condition 1.	Default: –50% Min: –100% Max: 100%
S3-28	Torque Compensation Value with Load Condition 2	Used for starting torque compensation utilizing a load cell signal. Sets the torque compensation value for load condition 2.	Default: 50% Min: –100% Max: 100%
S3-29	Analog Input from Load Cell with Load Condition 1	Used for starting torque compensation utilizing a load cell signal. Sets the analog signal level from the load cell for load condition 1.	Default: 0.0% Min: –100% Max: 100%
S3-30	Analog Input from Load Cell with Load Condition 2	Used for starting torque compensation utilizing a load cell signal. Sets the analog signal level from the load cell for load condition 2.	Default: 100.0% Min: –100.0% Max: 100%
S3-34	Anti-Rollback Torque Bias 1	Sets the Anti-Rollback Bias applied at small position deviations during Position Lock at start.	Default: 0.0% Min: 0.0% Max: 100.0%
S3-35	Anti-Rollback Torque Bias 2	Sets the Anti-Rollback Bias applied at large position deviations during Position Lock at start.	Default: 0.0% Min: 0.0% Max: 100.0%
S3-37	Position Deviation Level to Apply ARB Torque Bias 1	Sets the position deviation level to active at Anti-Rollback Torque Bias 1 (S3-34).	Default: 0 Min: 0 Max: 32767
S3-38	Position Deviation Level to Apply ARB Torque Bias 2	Determines the position deviation level for when the drive should switch from the torque bias set in S3-34 to the torque bias set in S3-35.	Default: 0 Min: 0 Max: 32767
S3-39	Anti-Rollback Integral Gain	Determines the drive's responsiveness for Anti-Rollback during Position Lock.	Default: 0.00 Min: –30.00 Max: 30.00
S3-40	Anti-Rollback Movement Detection	Sets the amount of pulses for movement detection during Anti-Rollback.	Default: 1 pulse Min: 0 pulse Max: 100 pulses
S3-41	Position Lock Gain at Start 2 Reduction	Sets a reduction factor for the Position Lock Gain at Start 2 (Anti-Rollback Gain) set in parameter S3-02.	Default: 0.50 Min: 0.00 Max: 1.00

■ S4: Rescue Operation

No.	Name	Description	Setting
S4-01	Light Load Direction Search Selection	0: Disabled 1: Enabled 2: Enabled for Motor 1 only	Default: 0 Min: 0 Max: 2
S4-02	Light Load Direction Search Method	Determines how the drive detects the light load direction. 0: Output Current 1: Regenerative direction detection	Default: 1 Min: 0 Max: 1
S4-03	Light Load Direction Search Time	Sets the time to perform Light Load Direction Search.	Default: 1.0 s Min: 0.0 s Max: 5.0 s
S4-04	Light Load Direction Search Speed Reference	Sets the speed reference to use during Light Load Direction Search.	Default: <5> Min: 0.00% Max: 20.00%

No.	Name	Description	Setting
S4-05	Rescue Operation Torque Limit	Sets the torque limit used during Rescue Operation.	Default: 100% Min: 0% Max: 300%
S4-06	Rescue Operation Power Supply Selection	0: Battery 1: UPS (single-phase) 2: UPS (3-phase)	Default: 0 Min: 0 Max: 2
S4-07	UPS Power	Sets the capacity of the UPS.	Default: 0.0 kVA Min: 0.0 kVA Max: 100.0 kVA
S4-08	UPS Operation Speed Limit Selection	Determines how a speed limit should be applied to the Rescue Operation speed (S4-15) when operating from a UPS. 0: Disabled 1: Enabled until Light Load Direction Search is complete 2: Enabled until stop	Default: 2 Min: 0 Max: 2
S4-12	DC Bus Voltage during Rescue Operation	Sets the DC bus voltage during Rescue Operation.	Default: 0 V Min: 0 V Max: 1150 V
S4-13	Rescue Operation Power Supply Deterioration Detection Level	Determines at which level of backup power supply deterioration a PF5 fault is triggered.	Default: 80% Min: 10% Max: 100%
S4-15 <39>	Speed Reference Selection for Rescue Operation	Selects the speed reference used for Rescue Operation.	Default: 0 Min: 0 Max: 1

<5> Default setting is determined by the control mode (A1-02).
<39> Available in drive software versions PRG: 7016 or later.

■ S5: Short Floor Operation

No.	Name	Description	Setting
S5-01	Short Floor Operation Selection	0: Disabled 1: Enabled (Short Floor) 2: Enabled (Advance Short Floor)	Default: 0 Min: 0 Max: 2
S5-02	Nominal Speed for Short Floor Calculation	When d1-18 (Speed Priority Selection) is set to 0 or 3, S5-02 determines the rated speed used during Short Floor.	Default: 0.0% Min: 0.0% Max: 100.0%
S5-03	Short Floor Minimum Constant Speed Time	Sets the minimum operation time when the Advanced Short Floor function is enabled (S5-01 = 2).	Default: 0.0 s Min: 0.0 s Max: 2.0 s
S5-04	Distance Calculation Acceleration Time Gain	Set for acceleration jerk compensation in Distance Calculation.	Default: 150.0% Min: 50.0% Max: 200.0%
S5-05	Distance Calculation Deceleration Time Gain	Set for deceleration jerk compensation in Distance Calculation.	Default: 150.0% Min: 50.0% Max: 200.0%
S5-10	Stopping Method Selection	0: Disabled 1: Direct Landing 2: Leveling Distance Control	Default: 0 Min: 0 Max: 2
S5-11	Deceleration Distance	Sets the deceleration distance when Stop Distance Control is enabled.	Default: 0 mm Min: 0 mm Max: 32767 mm <36>
S5-12	Stop Distance	Sets the stopping distance when Stop Distance Control is enabled.	Default: 0 mm Min: 0 mm Max: 10000 mm <37>

No.	Name	Description	Setting
S5-13	Direct Landing Minimum Speed Level	Sets the speed level for the start of Direct Landing. Direct Landing is essentially disabled if the starting speed for Direct Landing is less than the maximum output speed multiplied by this parameter (E1-04 × S5-13).	Default: 20% Min: 0% Max: 100%

<36> When the length units are set for inches (o1-12 = 1), the setting range becomes 0.00 to 650.00 inches.
<37> When the length units are set for inches (o1-12 = 1), the setting range becomes 0.00 to 393.00 inches.

■ S6: Error Detection

No.	Name	Description	Setting
S6-01	Motor Contactor Response Error (SE1) Detection/ Reset Selection	0: Detect during stop, SE1 must be manually reset 1: Detect during stop, SE1 can be automatically reset 2: No SE1 detection	Default: 0 Min: 0 Max: 2
S6-02	Starting Current Error (SE2) Detection Delay Time	Sets a delay time for detecting SE2.	Default: 200 ms Min: 0.00 ms Max: [S1-04]-[S1-06]
S6-03 <44>	SE2 Detect Current Level	Sets the level of current applied to the motor when the Brake Control command is activated, as a percentage of the Motor No-load Current (E2-03).	Default: 25% Min: 0% Max: 100%
S6-04	Output Current Error (SE3) Detection Delay Time	Sets a delay time for detecting SE3.	Default: 200 ms Min: 0 ms Max: 5000 ms
S6-05	Brake Response Error (SE4) Detection Time	Sets a delay time for detecting SE4.	Default: 500 ms Min: 0 ms Max: 10000 ms
S6-10	Overacceleration Detection Level	If the elevator car accelerates at an abnormal rate, the drive triggers an overspeed fault (dv6) and has the motor coast to stop. Parameter S6-10 determines the acceleration rate that triggers a fault.	Default: <7> Min: 0.0 m/s^2 Max: 20.0 m/s^2 <7>
S6-11	Overacceleration Detection Time	Sets a primary delay for detecting overacceleration.	Default: 50 ms Min: 0 ms Max: 5000 ms
S6-12	Overacceleration Detection Selection	0: Always enabled 1: During run only	Default: 0 Min: 0 Max: 1
S6-15	Speed Reference Loss Detection	Enabled or disables detection for speed reference missing (FrL). 0: Disabled 1: Enabled	Default: 1 Min: 0 Max: 1
S6-16	Restart after Baseblock Selection	0: No restart after Baseblock/Safe Torque-Off 1: Restart after Baseblock/Safe Torque-Off	Default: 0 Min: 0 Max: 1

<7> Default setting value is determined by the digital operator display unit selection (o1-03). The default is normally 1.5 m/s2, but when o1-03 = 6, the default becomes 5.0 ft/s^2 (Setting Range: 0.0 to 50.0 ft/s^2).
<44> Available in drive software versions PRG: 7017 or later.

◆ T: Motor Tuning

Enter data into the following parameters to tune the motor and drive for optimal performance.

■ T1: Induction Motor Auto-Tuning

No.	Name	Description	Setting
T1-01	Auto-Tuning Mode Selection	0: Rotational Auto-Tuning 1: Stationary Auto-Tuning 1 2: Stationary Auto-Tuning for Line-to-Line Resistance 4: Stationary Auto-Tuning 2	Default: 0 <5> Min: 0 Max: 4 <18>
T1-02	Motor Rated Power	Sets the motor rated power as specified on the motor nameplate. **Note:** Use the following formula to convert horsepower into kilowatts: kW = HP × 0.746.	Default: <4> Min: 0.00 kW Max: 650.00 kW
T1-03	Motor Rated Voltage	Sets the motor rated voltage as specified on the motor nameplate.	Default: 200.0 V <9> Min: 0.0 V Max: 255.0 V <9>
T1-04	Motor Rated Current	Sets the motor rated current as specified on the motor nameplate.	Default: <4> Min: 10% of drive rated current Max: 200% of drive rated current <10>
T1-05	Motor Base Frequency	Sets the rated frequency of the motor as specified on the motor nameplate.	Default: 50.0 Hz Min: 0.0 Hz Max: 200.0 Hz
T1-06	Number of Motor Poles	Sets the number of motor poles as specified on the motor nameplate.	Default: 4 Min: 2 Max: 48
T1-07	Motor Base Speed	Sets the rated speed of the motor as specified on the motor nameplate.	Default: 1450 r/min Min: 0 r/min Max: 24000 r/min
T1-08	Encoder Resolution (pulses per revolution)	Set the number of pulses per revolution for the PG being used (pulse generator or encoder).	Default: 1024 ppr Min: 0 ppr Max: 60000 ppr
T1-09	Motor No-Load Current (Stationary Auto-Tuning 1 and 2)	Sets the no-load current for the motor. After setting the motor capacity to T1-02 and the motor rated current to T1-04, this parameter will automatically display the no-load current for a standard 4 pole Yaskawa motor. Enter the no-load current as indicated on the motor test report.	Default: – Min: 0 A Max: Up to T1-04 <10>
T1-10	Motor Rated Slip (Stationary Auto-Tuning 2)	Sets the motor rated slip. After setting the motor capacity to T1-02, this parameter will automatically display the motor slip for a standard 4 pole Yaskawa motor. Enter the motor slip as indicated on the motor test report.	Default: – Min: 0.00 Hz Max: 20.00 Hz

<4> Default setting value varies by the drive model (o2-04).
<5> Default setting is determined by the control mode (A1-02).
<9> Values shown here are for 200 V class drives. Double the value when using a 400 V class drive. Multiply value by 2.875 for 600 V class drives.
<10> The display resolution depends on the rated output power of the drive. Models CIMR-LU2A0008 to 2A0033, 4A0005 to 4A0018, and 5A0003 to 5A0013 display values in 0.01 A units, while models CIMR-LU2A0047 to 2A0415, 4A0024 to 4A0605, and 5A0017 to 5A0200 display values in 0.1 A units.
<18> The variety of Auto-Tuning methods depends on the control mode setting. V/f Control allows T1-01 to be set to 2 or 3, while vector control modes (OLV and CLV) allow T1-01 to be set to 0 through 4.

■ T2: PM Motor Auto-Tuning

No.	Name	Description	Setting
T2-01	Motor Auto-Tuning Mode Selection	0: Motor Data input 1: Stationary Auto-Tuning 2: Stationary stator resistance Auto-Tuning 3: Initial magnet pole search parameters Auto-Tuning 4: Encoder offset stationary Auto-Tuning 10: Encoder offset rotational Auto-Tuning 11: Rotational back EMF constant Auto-Tuning 12: Auto-Tuning of PG-E3 encoder characteristics Setting 12 is available in drive software versions PRG: 7017 or later. Auto-Tuning of PG-E3 encoder characteristics requires a PG-E3 option with software version 1102 or later. To identify the PG-E3 software version, refer to the PG-E3 labeling on the option, in the field designated “C/N” (S + four digit number).	Default: 0 Min: 0 Max: 12
T2-04	Motor Rated Power	Sets the motor rated power as indicated on the motor nameplate.	Default: <4> Min: 0.00 kW Max: 650.00 kW
T2-05	Motor Rated Voltage	Enter the motor rated voltage as indicated on the motor nameplate.	Default: 200.0 V <9> Min: 0.0 V Max: 255.0 V <9>
T2-06	Motor Rated Current	Enter the motor rated current as indicated on the motor nameplate.	Default: <4> Min: 10% of drive rated current Max: 200% of drive rated current <10>
T2-08	Number of Motor Poles	Enter the number of motor poles for the motor as indicated on the motor nameplate.	Default: 6 Min: 2 Max: 120 <43>
T2-09	Motor Base Speed	Enter the base speed for the motor as indicated on the motor nameplate.	Default: 150 r/min Min: 0 r/min Max: 24000 r/min
T2-10	Single Phase Stator Resistance	Enter the 1-phase resistance of the stator winding.	Default: – Min: 0.000 Ω Max: 65.000 Ω
T2-11	Motor d-Axis Inductance	Enter the d-axis inductance for the motor as indicated on the motor nameplate.	Default: – Min: 0.00 mH Max: 600.00 mH
T2-12	Motor q-Axis Inductance	Enter the q-axis inductance for the motor as indicated on the motor nameplate.	Default: – Min: 0.00 mH Max: 600.00 mH
T2-13	Induced Voltage Constant Unit Selection	0: mV/(r/min). E5-09 will automatically be set to 0.0, and E5-24 will be used. 1: mV/(rad/sec). E5-24 will automatically be set to 0.0, and E5-09 will be used.	Default: 1 Min: 0 Max: 1
T2-14	Motor Induced Voltage Constant	Enter the induced voltage coefficient for the motor as indicated on the motor nameplate.	Default: – Min: 0.0 Max: 6500.0 <30>
T2-16	Encoder Resolution	Sets the number of pulses per revolution for the PG being used (pulse generator or encoder).	Default: 1024 ppr Min: 1 ppr Max: 15000 ppr
T2-17	Encoder Offset	Sets the offset between encoder offset and the rotor magnetic axis.	Default: 0.0 deg Min: -180.0 deg Max: 180.0 deg
T2-18 <44>	Speed Reference for Auto-Tuning of PG-E3 Encoder Characteristics	Sets the speed reference for execution of Auto-Tuning of PG-E3 encoder characteristics (T2-01 = 12).	Default: 10 r/min Min: 1 r/min Max: 30 r/min

No.	Name	Description	Setting
T2-19 <44>	Rotation Direction for Auto-Tuning of PG-E3 Encoder Characteristics	Sets the direction of motor rotation for execution of Auto-Tuning of PG-E3 encoder characteristics (T2-01 = 12). 0: Forward (Up) 1: Reverse (Down)	Default: 0 Min: 0 Max: 1

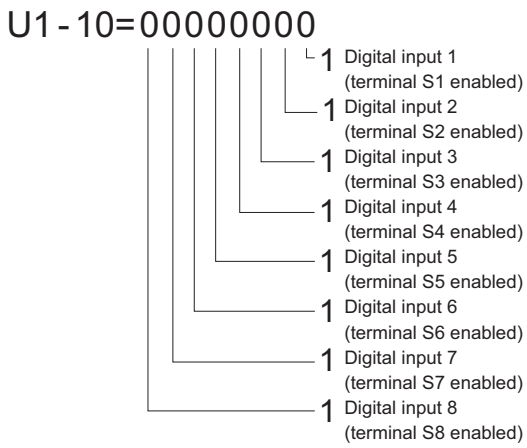
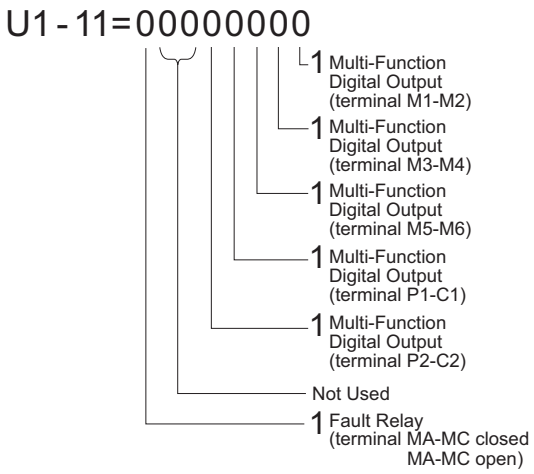
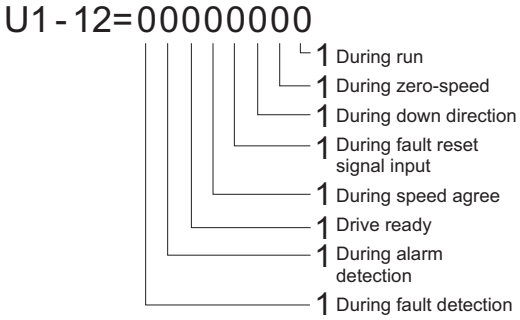
<4> Default setting value varies by the drive model (o2-04).
<9> Values shown here are for 200 V class drives. Double the value when using a 400 V class drive. Multiply value by 2.875 for 600 V class drives.
<10> The display resolution depends on the rated output power of the drive. Models CIMR-LU2A0008 to 2A0033, 4A0005 to 4A0018, and 5A0003 to 5A0013 display values in 0.01 A units, while models CIMR-LU2A0047 to 2A0415, 4A0024 to 4A0605, and 5A0017 to 5A0200 display values in 0.1 A units.
<30> Setting units are determined by the induced voltage constant unit selection for PM motors set to T2-13.
<43> When PG-E3 option connected: Max setting = 48
<44> Available in drive software versions PRG: 7017 or later.

◆ U: Monitors

Monitor parameters allow the user to view drive status, fault information, and other data concerning drive operation.

■ U1: Operation Status Monitors

No.	Name	Description	Analog Output Level	Unit
U1-01	Speed Reference	Monitors the speed reference.	10 V: Max frequency (-10 to +10 V)	0.01% <29>
U1-02	Output Speed	Displays the output speed.	10 V: Max frequency (-10 to +10 V)	0.01% <29>
U1-03	Output Current	Displays the output current.	10 V: Drive rated current	<10> <40>
U1-04	Control Method	0: V/f Control 2: Open Loop Vector Control 3: Closed Loop Vector Control 7: Closed Loop Vector Control for PM	No signal output available	–
U1-05	Speed Feedback	Displays the motor speed feedback.	10 V: Max Frequency (-10 to +10 V)	0.01% <29>
U1-06	Output Voltage Reference	Displays the output voltage.	10 V: 200 Vrms <9>	0.1 Vac
U1-07	DC Bus Voltage	Displays the DC bus voltage.	10 V: 400 V <9>	1 Vdc
U1-08	Output Power	Displays the output power (this value is calculated internally).	10 V: Drive rated power (kW) (-10 to +10 V)	<12>
U1-09	Torque Reference	Monitors the internal torque reference.	10 V: Motor rated torque (-10 to +10 V)	0.1%

No.	Name	Description	Analog Output Level	Unit
U1-10	Input Terminal Status	Displays the input terminal status. 	No signal output available	–
U1-11	Output Terminal Status	Displays the output terminal status. 	No signal output available	–
U1-12	Drive Status	Displays the drive operation status. 	No signal output available	–
U1-13	Terminal A1 Input Voltage	Displays the voltage input to terminal A1.	10 V: 100% (-10 to +10 V)	0.1%
U1-14	Terminal A2 Input Voltage	Displays the voltage input to terminal A2.	10 V: 100% (-10 to +10 V)	0.1%
U1-16	Output Speed after Soft Start	Displays output speed with ramp time and jerk settings. Units determined by o1-03.	10 V: Max frequency (-10 to +10 V)	0.01% <29>
U1-17	DI-A3 Option Card Input Status	Displays the reference value input from the DI-A3 option card. Display will appear in hexadecimal as determined by the digital card input selection in F3-01. 3FFFF: Set (1 bit) + sign (1 bit) + 16 bit	No signal output available	–

No.	Name	Description	Analog Output Level	Unit
U1-18	oPE Fault Parameter	Displays the parameter number that caused the oPE02 or oPE08 (Operation error).	No signal output available	–
U1-19	MEMOBUS/Modbus Error Code	Displays the contents of a MEMOBUS/Modbus error. U1-19=00000000 1 CRC Error 1 Data Length Error 0 Not Used 1 Parity Error 1 Overrun Error 1 Framing Error 1 Timed Out 0 Not Used	No signal output available	–
U1-25	Software Number (Flash)	FLASH ID	No signal output available	–
U1-26	Software No. (ROM)	ROM ID	No signal output available	–

<9> Values shown here are for 200 V class drives. Double the value when using a 400 V class drive. Multiply value by 2.875 for 600 V class drives.
<10> The display resolution depends on the rated output power of the drive. Models CIMR-LU2A0008 to 2A0033, 4A0005 to 4A0018, and 5A0003 to 5A0013 display values in 0.01 A units, while models CIMR-LU2A0047 to 2A0415, 4A0024 to 4A0605, and 5A0017 to 5A0200 display values in 0.1 A units.
<12> The display resolution depends on the rated output power of the drive. Models CIMR-LU2A0008 to 2A0033, 4A0005 to 4A0018, and 5A0003 to 5A0013 display values in 0.01 kW units, while models CIMR-LU2A0047 to 2A0415, 4A0024 to 4A0605, and 5A0017 to 5A0200 display values in 0.1 kW units.
<29> Setting units are determined by the digital operator display unit selection (o1-03). When o1-03 = 0, the value is set in Hertz. When o1-03 = 4 or 5, the value is displayed in m/s. When o1-03 = 6, the value is displayed in ft/min.
<40> When checking the values of U1-03, U2-05 and U4-13 with the digital operator they are displayed in units of amperes, but when they are checked using MEMOBUS communications, the monitor value in MEMOBUS communications is: displayed numeric value / 8192 × drive's rated current (A), from the condition "8192 (maximum value) = drive's rated current (A)".

■ U2: Fault Trace

No.	Name	Description	Analog Output Level	Unit
U2-01	Current Fault	Displays the current fault.	No signal output available	–
U2-02	Previous Fault	Displays the previous fault.	No signal output available	–
U2-03	Speed Reference at Previous Fault	Displays the speed reference at the previous fault.	No signal output available	0.01% <29>
U2-04	Output Speed at Previous Fault	Displays the output speed at the previous fault.	No signal output available	0.01% <29>
U2-05	Output Current at Previous Fault	Displays the output current at the previous fault.	No signal output available	<10> <40>
U2-06	Motor Speed at Previous Fault	Displays the motor speed at the previous fault.	No signal output available	0.01% <29>
U2-07	Output Voltage at Previous Fault	Displays the output voltage at the previous fault.	No signal output available	0.1 Vac
U2-08	DC Bus Voltage at Previous Fault	Displays the DC bus voltage at the previous fault.	No signal output available	1 Vdc
U2-09	Output Power at Previous Fault	Displays the output power at the previous fault.	No signal output available	0.1 kW
U2-10	Torque Reference at Previous Fault	Displays the torque reference at the previous fault.	No signal output available	0.1%
U2-11	Input Terminal Status at Previous Fault	Displays the input terminal status at the previous fault. Displayed as in U1-10.	No signal output available	–
U2-12	Output Terminal Status at Previous Fault	Displays the output status at the previous fault. Displayed as in U1-11.	No signal output available	–
U2-13	Drive Operation Status at Previous Fault	Displays the operation status of the drive at the previous fault. Displayed as in U1-12.	No signal output available	–
U2-14	Cumulative Operation Time at Previous Fault	Displays the cumulative operation time at the previous fault.	No signal output available	1 h
U2-15	Soft Starter Output at Previous Fault	Displays the run speed after a soft start when a previous fault occurred. Displayed as in U1-16.	No signal output available	0.01% <29>
U2-16	Motor q-Axis Current at Previous Fault	Displays the q-axis current for the motor at the previous fault. Displayed as in U6-01.	No signal output available	0.1%
U2-17	Motor d-Axis Current at Previous Fault	Displays the d-axis current for the motor at the previous fault. Displayed as in U6-02.	No signal output available	0.1%
U2-20	Heatsink Temperature at Previous Fault	Displays the temperature of the heatsink when the most recent fault occurred. Displayed as in U4-08.	No signal output available	1°C
U2-21	Peak Hold Current during Fault	Displays the peak current that occurred just prior to the previous fault.	No signal output available	0.01 A
U2-22	Peak Hold Frequency during Fault	Displays the output frequency when the peak current displayed in U2-21 occurred.	No signal output available	0.01 Hz

<10> The display resolution depends on the rated output power of the drive. Models CIMR-LU2A0008 to 2A0033, 4A0005 to 4A0018, and 5A0003 to 5A0013 display values in 0.01 A units, while models CIMR-LU2A0047 to 2A0415, 4A0024 to 4A0605, and 5A0017 to 5A0200 display values in 0.1 A units.

<29> Setting units are determined by the digital operator display unit selection (o1-03). When o1-03 = 0, the value is set in Hertz. When o1-03 = 4 or 5, the value is displayed in m/s. When o1-03 = 6, the value is displayed in ft/min.

<40> When checking the values of U1-03, U2-05 and U4-13 with the digital operator they are displayed in units of amperes, but when they are checked using MEMOBUS communications, the monitor value in MEMOBUS communications is: displayed numeric value / 8192 × drive's rated current (A), from the condition "8192 (maximum value) = drive's rated current (A)".

■ U3: Fault History

No.	Name	Description	Analog Output Level	Unit
U3-01 to U3-04	First to 4th Most Recent Fault	Displays the first to the fourth most recent faults.	No signal output available	–
U3-05 to U3-10	5th to 10th Most Recent Fault	Displays the fifth to the tenth most recent faults. After ten faults have occurred in the drive, data for the oldest fault is deleted. The most recent fault appears in U3-01, with the next most recent fault appearing in U3-02. The data is moved to the next monitor parameter every time a fault occurs.	No signal output available	–
U3-11 to U3-14	Cumulative Operation Time at 1st to 4th Most Recent Fault	Displays the cumulative operation time when the first to the fourth most recent faults occurred.	No signal output available	1 h
U3-15 to U3-20	Cumulative Operation Time at 5th to 10th Most Recent Fault	Displays the cumulative operation time when the fifth to the tenth most recent faults occurred.	No signal output available	1 h

■ U4: Maintenance Monitors

No.	Name	Description	Analog Output Level	Unit
U4-01 <41>	Cumulative Operation Time	Displays the cumulative operation time of the drive. The value for the cumulative operation time counter can be reset in parameter o4-01. Use parameter o4-02 to determine if the operation time should start as soon as the power is switched on or only while the Up/Down command is present. The maximum number displayed is 99999, after which the value is reset to 0.	No signal output available	1 h
U4-03 <42>	Cooling Fan Operation Time	Displays the cumulative operation time of the cooling fan. The default value for the fan operation time is reset in parameter o4-03. This value will reset to 0 and start counting again after reaching 99999.	No signal output available	1 h
U4-04	Cooling Fan Maintenance	Displays main cooling fan usage time in as a percentage of its expected performance life. Parameter o4-03 can be used to reset this monitor. The fan should be replaced when this monitor reaches 90%.	No signal output available	1%
U4-05	Capacitor Maintenance	Displays main circuit capacitor usage time in as a percentage of their expected performance life. The capacitors should be replaced when this monitor reaches 90%. Parameter o4-05 can be used to reset this monitor.	No signal output available	1%
U4-06	Soft Charge Bypass Relay Maintenance	Displays the soft charge bypass relay maintenance time as a percentage of its estimated performance life. The soft charge relay should be replaced when this monitor reaches 90%. Parameter o4-07 can be used to reset this monitor.	No signal output available	1%
U4-07	IGBT Maintenance	Displays IGBT usage time as a percentage of the expected performance life. The IGBTs should be replaced when this monitor reaches 90%. Parameter o4-09 can be used to reset this monitor.	No signal output available	1%
U4-08	Heatsink Temperature	Displays the heatsink temperature.	10 V: 100°C	1°C
U4-09	LED Check	Lights all segments of the LED to verify that the display is working properly.	No signal output available	–
U4-10	kWh, Lower 4 Digits	Monitors the drive output power. The value is shown as a 9 digit number displayed across two monitor parameters, U4-10 and U4-11. Example: 12345678.9 kWh is displayed as: U4-10: 678.9 kWh U4-11: 12345 MWh	No signal output available	1 kWh
U4-11	kWh, Upper 5 Digits		No signal output available	1 MWh
U4-13	Peak Hold Current	Displays the highest current value that occurred during a ride.	No signal output available	0.01 A <40>
U4-14	Peak Hold Output Frequency	Displays the output frequency when the current value shown in U4-13 occurred.	No signal output available	0.01 Hz
U4-16	Motor Overload Estimate (oL1)	Shows the value of the motor overload detection accumulator. 100% is equal to the oL1 detection level.	10 V: 100%	0.1%

No.	Name	Description	Analog Output Level	Unit
U4-17	Drive Overload Calculations (OL2)	Displays the level of the drive overload detection (oL2). A value of 100% is equal to the oL2 detection level.	10 V = 100%	0.1%
U4-18	Speed Reference Selection Results	Displays the source for the speed reference as XY-nn. X: indicates which reference is used: 1 = Reference 1 (b1-01) Y-nn: indicates the reference source 0-01 = Digital operator 1-01 = Analog (terminal A1) 1-02 = Analog (terminal A2) 2-02 to 8 = Digital Inputs (d1-02 to 8) 3-01 = MEMOBUS/Modbus communications 4-01 = Communication option card	No signal output available	–
U4-19	Speed Reference from MEMOBUS/Modbus Comm.	Displays the speed reference provided by MEMOBUS/Modbus (decimal).	No signal output available	0.01% <29>
U4-20	Speed Reference From Option Card	Displays the speed reference input by an option card (decimal).	No signal output available	0.01% <29>
U4-21	Up/Down Command Source Selection	Displays the source for the Up/Down command as XY-nn. X: Indicates which Up/Down command source is used: 1 = Reference 1 (b1-02) Y: Input power supply data 0 = Digital operator 1 = External terminals 3 = MEMOBUS/Modbus communications 4 = Communication option card nn: Up/Down command limit status data 00: No limit status. 01: Up/Down command was left on when stopped in the PRG mode 02: Up/Down command was left on when switching from LOCAL to REMOTE operation 03: Waiting for soft charge bypass contactor after power up (Uv or Uv1 flashes after 10 s) 04: Waiting for "Up/Down Command Prohibited" time period to end 05: Fast Stop (multi-function input, operator) 07: During baseblock while coast to stop with timer 08: Speed reference is below minimal reference during baseblock 09: Waiting for Enter command	No signal output available	–
U4-22	MEMOBUS/Modbus Communications Reference	Displays the drive control data set by MEMOBUS/Modbus communications register no. 0001H as a four-digit hexadecimal number.	No signal output available	–
U4-23	Communication Option Card Reference	Displays drive control data set by an option card as a four-digit hexadecimal number.	No signal output available	–
U4-24	Number of Travels (Lower 4 digit)	Displays the lower four digits for the number of trips the drive has made.	No signal output available	1 time
U4-25	Number of Travels (Higher 4 digit)	Displays the upper four digits for the number of trips the drive has made.	No signal output available	1 time
U4-26	Max. Current during Acceleration	Shows the maximum current that occurred during acceleration.	No signal output available	0.1 A
U4-27	Max. Current during Deceleration	Shows the maximum current that occurred during deceleration.	No signal output available	0.1 A
U4-28	Max. Current during Constant Speed	Shows the maximum current that occurred during ride at top speed.	No signal output available	0.1 A
U4-29	Max. Current during Leveling Speed	Shows the maximum current that occurred during ride at leveling speed.	No signal output available	0.1 A
U4-30	Slip Compensation Value	Shows the slip compensation value.	No signal output available	0.01%

No.	Name	Description	Analog Output Level	Unit
U4-31	Car Acceleration Rate	Shows the car acceleration rate.	No signal output available	0.01 m/s^2
U4-40	Speed Reference Limit at Rescue Operation	Displays the speed limit for Rescue Operation based on how much power the backup battery or UPS has. Displays 0% when Rescue Operation is not being performed.	No signal output available	1%
U4-42 <35>	Remaining Distance	Displays the remaining distance according to the stopping method selected.	10 V: S5-10 = 1: S5-11 S5-10 = 2: S5-12	1 mm
U4-43 <35>	Minimum Deceleration Distance	Displays the Minimum Deceleration Distance calculated by E1-04.	No signal output available	1 mm
U4-44 <35>	Minimum Stop Distance	Displays the Minimum Stop Distance calculated by d1-26.	No signal output available	1 mm

<29> Setting units are determined by the digital operator display unit selection (o1-03). When o1-03 = 0, the value is set in Hertz. When o1-03 = 4 or 5, the value is displayed in m/s. When o1-03 = 6, the value is displayed in ft/min.
<35> o1-12 (Length Units) determines the units. When o1-12 is set to 0, the unit is millimeters. When o1-12 is set to 1, the unit is inch.
<40> When checking the values of U1-03, U2-05 and U4-13 with the digital operator they are displayed in units of amperes, but when they are checked using MEMOBUS communications, the monitor value in MEMOBUS communications is: displayed numeric value / 8192 × drive's rated current (A), from the condition "8192 (maximum value) = drive's rated current (A)".
<41> The MEMOBUS communications data is in 10 h units. If data in 1 h units are also required, refer to register number 0099H.
<42> The MEMOBUS communications data is in 10 h units. If data in 1 h units are also required, refer to register number 009BH.

Note: Fault trace (i.e., the fault history) is not maintained when CPF00, CPF01, CPF06, CPF24, oFA00, oFb00, oFC00, Uv1, Uv2, or Uv3 occur.

■ U6: Control Monitors

No.	Name	Description	Analog Output Level	Unit
U6-01	Motor Secondary Current (Iq)	Displays the value of the motor secondary current (Iq). Motor rated secondary current is 100%.	10 V: Motor secondary rated current (-10 to +10 V)	0.1%
U6-02	Motor Excitation Current (Id)	Displays the value calculated for the motor excitation current (Id). Motor rated secondary current is 100%.	10 V: Motor secondary rated current (-10 to +10 V)	0.1%
U6-03	Speed Control Loop Input	Displays the input and output values of the speed control loop.	10 V: Max frequency (-10 to +10 V)	0.01%
U6-04	Speed Control Loop Output		10 V: Motor secondary rated current (-10 to +10 V)	
U6-05	Output Voltage Reference (Vq)	Output voltage reference (Vq) for the q-axis.	10 V: 200 Vrms <9> (-10 to +10 V)	0.1 Vac
U6-06	Output Voltage Reference (Vd)	Output voltage reference (Vd) for the d-axis.	10 V: 200 Vrms <9> (-10 to +10 V)	0.1 Vac
U6-07	q-Axis Current Controller Output	Displays the output value for current control relative to motor secondary current (q-axis).	10 V: 200 Vrms <9> (-10 to +10 V)	0.1%
U6-08	d-Axis Current Controller Output	Displays the output value for current control relative to motor secondary current (d-axis).	10 V: 200 Vrms <9> (-10 to +10 V)	0.1%
U6-13	Flux Position Detection (sensor)	Monitors the value of the flux position detection (sensor).	10 V: 180 deg -10 V: -180 deg	0.1 deg
U6-18	Speed Detection PG1 Counter	Monitors the number of pulses for speed detection (PG1).	10 V: 65536	1 pulse
U6-22	Position Lock Deviation Counter	Displays how far the rotor has moved from its last position in PG pulses (multiplied by 4).	10 V: No. of pulses per revolution (-10 to +10 V)	1 pulse
U6-25	Feedback Control Output	Output monitor for the speed control loop.	10 V: Motor secondary rated current (-10 to +10 V)	0.01%
U6-26	Inertia Compensation Output	Output monitor for Inertia Compensation.	10 V: Motor secondary rated current (-10 to +10 V)	0.01%
U6-56	Speed Feedback Compensation Output	Displays observed speed when n5-07=1 or 2.	10 V: Max output frequency	0.01%
U6-80 to U6-99	Option Monitor 1 to 20	Monitors reserved to display data from option cards.	No signal output available	–

<9> Values shown here are for 200 V class drives. Double the value when using a 400 V class drive. Multiply value by 2.875 for 600 V class drives.

◆ Defaults and Setting Ranges by Display Unit Selection (o1-03)

Table 58 shows parameters, default settings, and setting ranges that change according to parameter o1-03, Display Unit Selection.

Table 58 Defaults and Setting Ranges by Display Unit Selection (o1-03)

No.	Name	o1-03 (Digital Operator Display Unit Selection)							Default
		0 (0.01 Hz)	1 (0.01%)	2 (r/min)	3 (User-set)	4 (Elevator units 1)	5 (Elevator units 2)	6 (Elevator units 3)	
C1-01	Acceleration Ramp 1	0.00 to 600.00 s					0.00 to <1> m/s²	0.00 to <1> ft/s²	1.50 s
C1-02	Deceleration Ramp 1								
C1-03	Acceleration Ramp 2								
C1-04	Deceleration Ramp 2								
C1-05	Acceleration Ramp 3								
C1-06	Deceleration Ramp 3								
C1-07	Acceleration Ramp 4								
C1-08	Deceleration Ramp 4								
C1-09	Fast Stop Time								
C1-15	Inspection Run Deceleration Ramp								0.00 s
C2-01	Jerk at Accel Start	0.00 to 10.00 s					0.00 to <1> m/s³	0.00 to <1> ft/s³	0.50 s
C2-02	Jerk at Accel End								
C2-03	Jerk at Decel Start								
C2-04	Jerk at Decel End								
C2-05	Jerk below leveling speed								
C1-11	Accel/Decel Switching Speed	0.00 to [E1-04] Hz	0.00 to 100.00%	0.00 to <2> r/min	User define	0.00 to <1> m/s		0.00 to <1> ft/min	0.0%
d1-01	Speed Reference 1								0.00%
d1-02	Speed Reference 2								
d1-03	Speed Reference 3								
d1-04	Speed Reference 4								
d1-05	Speed Reference 5								
d1-06	Speed Reference 6								
d1-07	Speed Reference 7								
d1-08	Speed Reference 8								
d1-19	Nominal Speed								100.0%
d1-20	Intermediate Speed 1								0.00%
d1-21	Intermediate Speed 2								
d1-22	Intermediate Speed 3								
d1-23	Releveling Speed								
d1-24	Inspection Operation Speed								50.00%
d1-25	Rescue Operation Speed								10.00%
d1-26	Leveling Speed								8.00%

<1> Automatically calculated according to the values set to o1-20, o1-21, o1-22, and E2-☐☐/E5-☐☐ parameters.
<2> Automatically calculated according to the values set to the E2-☐☐/E5-☐☐ parameters.

C Standards Compliance

◆ European Standards

Figure 101 CE Mark

The CE mark indicates compliance with European safety and environmental regulations. It is required for engaging in business and commerce in Europe.

European standards include the Machinery Directive for machine manufacturers, the Low Voltage Directive for electronics manufacturers, and the EMC guidelines for controlling noise.

This drive displays the CE mark based on the EMC guidelines and the Low Voltage Directive.

- **Low Voltage Directive:** 2006/95/EC
- **EMC Guidelines:** 2004/108/EC

Devices used in combination with this drive must also be CE certified and display the CE mark. When using drives displaying the CE mark in combination with other devices, it is ultimately the responsibility of the user to ensure compliance with CE standards. After setting up the device, verify that conditions meet European standards.

Note: 600 V class drives (models 5□□□□□□) are not compliant with European Standards.

■ CE Low Voltage Directive Compliance

This drive has been tested according to European standard IEC/EN 61800-5-1, and it fully complies with the Low Voltage Directive.

To comply with the Low Voltage Directive, be sure to meet the following conditions when combining this drive with other devices:

Area of Use

Do not use drives in areas with pollution higher than severity 2 and overvoltage category 3 in accordance with IEC/EN 664.

Factory Recommended Branch Circuit Protection

Table 59 Recommended Input Fuse Selection

Drive Model CIMR-LU	L1000					
	Nominal Output Power HP	AC Drive Input Amps	MCCB Rating Amps <1>	Time Delay Fuse Rating Amps <2>	Non-time Delay Fuse Rating Amps <3>	Bussmann Semi-conductor Fuse Rating (Fuse Ampere) <4>
Three-Phase 200 V Class						
2A0008	2	7.5	15	12	20	FWH-70B (70)
2A0011	3	11	20	17.5	30	FWH-70B (70)
2A0014	3	15.6	25	25	40	FWH-90B (90)
2A0018	5	18.9	35	30	50	FWH-90B (90)
2A0025	7.5	28	50	40	75	FWH-100B (100)
2A0033	10	37	60	60	100	FWH-200B (200)
2A0047	15	52	100	90	150	FWH-200B (200)
2A0060	20	68	125	110	200	FWH-200B (200)
2A0075	25	80	150	125	225	FWH-300A (300)
2A0085	30	82	150	125	225	FWH-300A (300)
2A0115	40	111	200	175	250	FWH-350A (350)
2A0145	50	136	250	225	350	FWH-400A (400)
2A0180	60	164	300	250	450	FWH-400A (400)
2A0215	75	200	400	350	600	FWH-600A (600)
2A0283	100	271	500	450	800	FWH-700A (700)
2A0346	125	324	600	500	900 <5>	FWH-800A (800)
2A0415	150	394	700	600	1100 <5>	FWH-1000A (1000)
Three-Phase 400 V Class						
4A0005	3	4.4	15	7	12	FWH-70B (70)
4A0006	3	6	15	10	17.5	FWH-70B (70)
4A0007	5	8.2	15	12	20	FWH-90B (90)
4A0009	5	10.4	20	17.5	30	FWH-90B (90)
4A0015	7.5	15	30	25	40	FWH-80B (80)
4A0018	10	20	40	35	60	FWH-100B (100)
4A0024	15	29	50	50	80	FWH-125B (125)
4A0031	20	39	75	60	110	FWH-200B (200)
4A0039	25	47	75	75	125	FWH-250A (250)
4A0045	30	43	75	75	125	FWH-250A (250)
4A0060	40	58	100	100	150	FWH-250A (250)
4A0075	60	71	125	110	200	FWH-250A (250)
4A0091	60	86	150	150	250	FWH-250A (250)
4A0112	75	105	175	175	300	FWH-350A (350)
4A0150	100	142	225	225	400	FWH-400A (400)
4A0180	125	170	250	250	500	FWH-500A (500)
4A0216	150	207	350	350	600	FWH-600A (600)
4A0260	200	248	400	400	700	FWH-700A (700)
4A0304	250	346	600	600	1000 <5>	FWH-800A (800)
4A0370	300	410	800	700	1200 <5>	FWH-800A (800)
4A0450	350	465	900	800	1350 <5>	FWH-1000A (1000)
4A0605	400-450-500	657	1200	1100 <5>	1800 <5>	FWH-1200A (1200)
Three-Phase 600 V Class						
5A0003 <6>	2	3.6	15	6.25	10	FWP-50B (50)
5A0004 <6>	3	5.1	15	8	15	FWP-60B (60)
5A0006 <6>	5	8.3	15	12	20	FWP-60B (60)

Drive Model CIMR-LU	L1000					
	Nominal Output Power HP	AC Drive Input Amps	MCCB Rating Amps <1>	Time Delay Fuse Rating Amps <2>	Non-time Delay Fuse Rating Amps <3>	Bussmann Semi-conductor Fuse Rating (Fuse Ampere) <4>
5A0010 <6>	7.5	12	20	20	35	FWP-70B (70)
5A0013 <6>	10	16	30	25	45	FWP-100B (100)
5A0017 <6>	15	23	40	40	60	FWP-100B (100)
5A0022 <6>	20	31	60	50	90	FWP-125A (125)
5A0027 <6>	25	38	75	60	100	FWP-125A (125)
5A0032 <6>	25-30	33	60	50	90	FWP-175A (175)
5A0041 <6>	40	44	75	75	125	FWP-175A (175)
5A0052 <6>	50-60	54	100	90	150	FWP-250A (250)
5A0062 <6>	50-60	66	125	110	175	FWP-250A (250)
5A0077 <6>	75	80	150	125	225	FWP-250A (250)
5A0099 <6>	100	108	175	175	300	FWP-350A (350)
5A0130 <6>	125	129	250	225	350	FWP-350A (350)
5A0172 <6>	150	158	300	250	400	FWP-600A (600)
5A0200 <6>	200	228	400	350	600	FWP-600A (600)

<1> Maximum MCCB Rating is 15 A, or 200% of drive input current rating, whichever is larger. MCCB voltage rating must be 600 VAC or greater.
<2> Maximum Time Delay fuse is 175% of drive input current rating. This covers any Class CC, J or T class fuse.
<3> Maximum Non-time Delay fuse is 300% of drive input current rating. This covers any CC, J or T class fuse.
<4> When using semiconductor fuses, Bussmann FWH and FWP are required for UL compliance. Select FWH for 240 V and 480 V models and FWP fuses for 600 V models.
<5> Class L fuse is also approved for this rating.
<6> 600 V class drives are not compliant with European Standards.

Grounding

The drive is designed to be used in T-N (grounded neutral point) networks. If installing the drive in other types of grounded systems, contact your Yaskawa representative for instructions.

CE Standards Compliance for DC Power Supply Input

To meet CE standards, the following fuses should be installed. For details, refer to *Figure 102*.

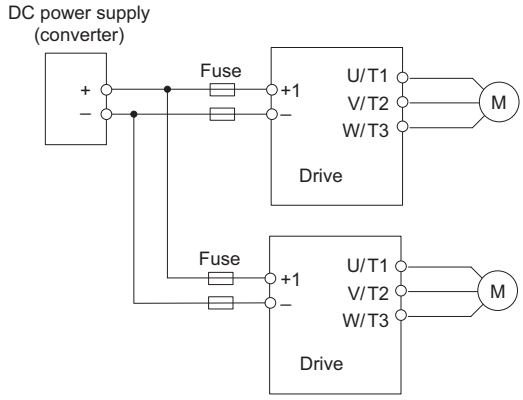


Figure 102 Example of DC Power Supply Input (two L1000A drives connected in series)

Note: **1.** When connecting multiple drives together, make sure that each drive has its own fuse. If any one fuse blows, all fuses should be replaced.
2. For an AC power supply, refer to *Standard Connection Diagram on page 25*.
Note: The recommended fuses and fuse holders are made by Fuji Electric.

Table 60 Fuses and Fuse Holders

Drive Model CIMR-LU	DC Power Supply Input <1>				
	Fuse			Fuse Holder	
	Type	Rated Short-circuit Breaking Current (kA)	Qty.	Type	Qty.
200 V Class					
2A0008	CR2LS-50	100	2	CM-1A	1
2A0011					
2A0014	CR2LS-75				
2A0018	CR2LS-100				
2A0025	CR2L-125		2	CM-2A	1
2A0033	CR2L-150				
2A0047	CR2L-175				
2A0060	CR2L-225		2	<2>	
2A0075	CR2L-260				
2A0085	CR2L-300				
2A0115	CR2L-350				
2A0145	CR2L-400				
2A0180	CR2L-450				
2A0215	CR2L-600				
2A0283					
2A0346	CS5F-800	200			
2A0415	CS5F-1200				

Drive Model CIMR-LU	DC Power Supply Input <1>				
	Fuse			Fuse Holder	
	Type	Rated Short-circuit Breaking Current (kA)	Qty.	Type	Qty.
400 V Class					
4A0005	CR6L-50	100	2	CMS-4	2
4A0006					
4A0007					
4A0009					
4A0015	CR6L-75		2	CMS-5	2
4A0018					
4A0024	CR6L-100				
4A0031	CR6L-150				
4A0039					
4A0045	CR6L-200		2	<2>	
4A0060	CR6L-250				
4A0075					
4A0091	CR6L-300				
4A0112	CR6L-350				
4A0150	CR6L-400				
4A0180	CS5F-600	200			
4A0216					
4A0260					
4A0304	CS5F-800	200	2	<2>	
4A0370					
4A0450	CS5F-1200				
4A0605	CS5F-1500				

<1> DC is not available for UL standards.
<2> Manufacturer does not recommend a specific fuse holder for this fuse. Contact Yaskawa or your nearest sales representative on fuse dimensions.

Guarding Against Harmful Materials

When installing IP00 enclosure drives, use an enclosure that prevents foreign material from entering the drive from above or below.

■ EMC Guidelines Compliance

This drive is tested according to European standards IEC/EN 61800-3: 2004, and complies with the European standards IEC/EN 12015 (requires an optional AC reactor) and IEC/EN 12016.

Note: Make sure the protective earthing conductor complies with technical standards and local safety regulations. Because the leakage current exceeds 3.5 mA when an EMC filter is installed, IEC/EN 61800-5-1 states that either the power supply must be automatically disconnected in case of discontinuity of the protective earthing conductor or a protective earthing conductor with a cross-section of at least 10 mm^2 (Cu) or 16 mm^2 (Al) must be used.

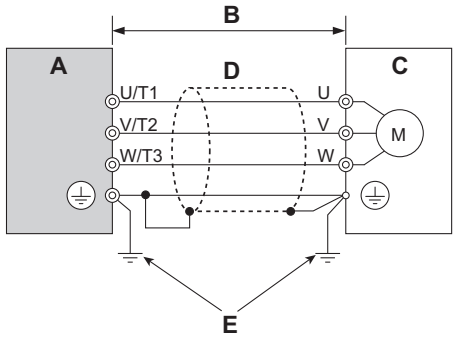
EMC Filter Installation

The following conditions must be met to ensure continued compliance with European standards IEC/EN 12015 and IEC/EN 12016. *Refer to EMC Filters on page 221* for EMC filter selection.

Installation Method

Verify the following installation conditions to ensure that other devices and machinery used in combination with this drive also comply with EMC guidelines.

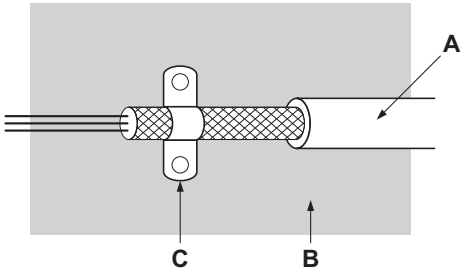
1. Install an EMC noise filter to the input side specified by Yaskawa for compliance with European standards.
2. Place the drive and EMC noise filter in the same enclosure.
3. Use braided shield cable for the drive and motor wiring, or run the wiring through a metal conduit.
4. Keep wiring as short as possible. Ground the shield on both the drive side and the motor side.



A – Drive
B – 10 m max cable length between drive and motor
C – Motor
D – Metal conduit
E – Ground wire should be as short as possible.

Figure 103 Installation Method

5. Make sure the ground conductor complies with technical standards and local safety rules. When an EMC filter is installed, the leakage current exceeds 3.5 mA. Therefore according to IEC/EN 61800-5-1, at least one of the conditions below must be satisfied:
   a) The cross-section of the protective earthing conductor must be at least 10 mm^2 (Cu) or 16 mm^2 (Al).
   b) The power supply must be disconnected automatically in case of discontinuity of the protective earthing conductor.



A – Braided shield cable
B – Metal panel
C – Cable clamp (conductive)

Figure 104 Ground Area

6. Connect an AC reactor or a DC link choke to minimize harmonic distortion.

Three-Phase 200 V / 400 V Class

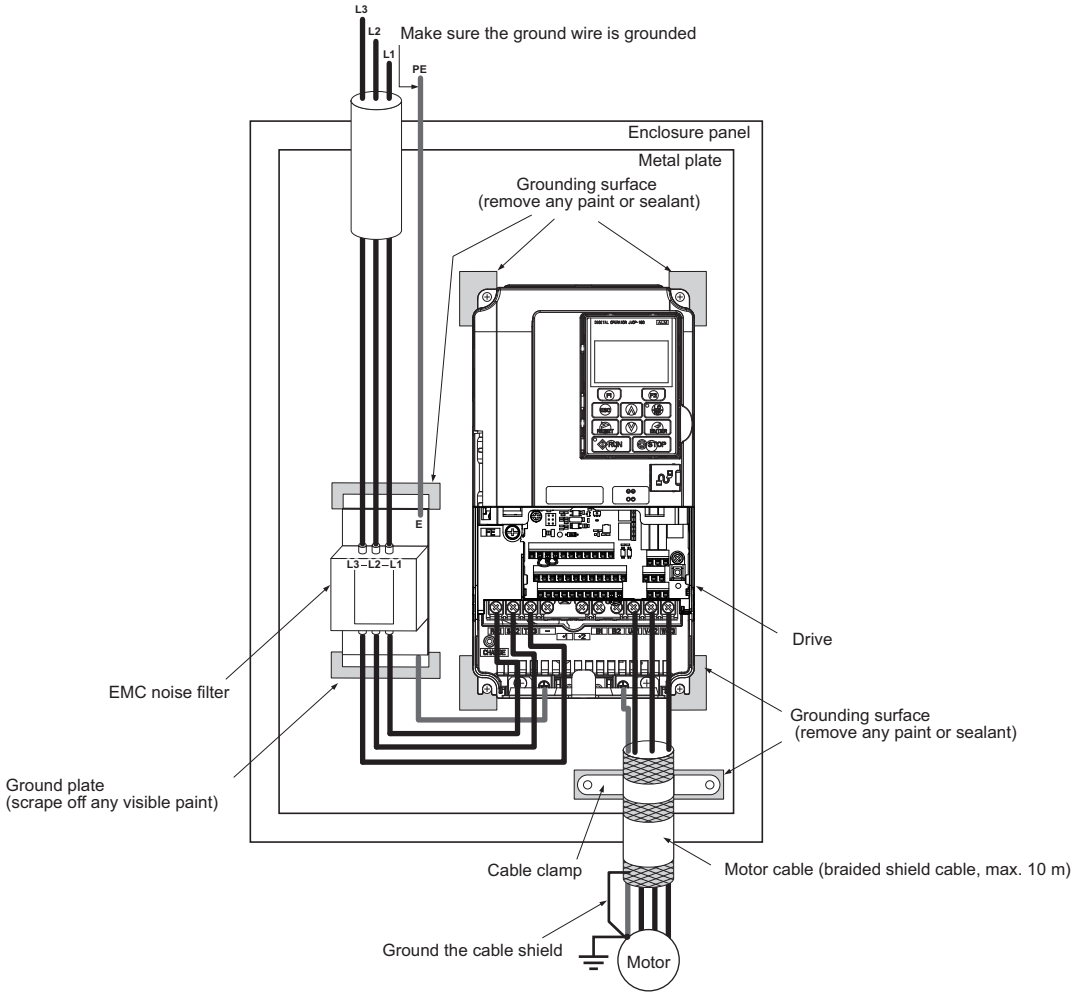


Figure 105 EMC Filter and Drive Installation for CE Compliance (Three-Phase 200 V / 400 V Class)

EMC Filters

Install the drive with the EMC filters to comply with the IEC/EN 61800-3 and IEC/EN 12015 requirements.

Note: If the Safe Disable function of the drive is part of the safety concept of a machine or installation and used for a safe stop according to EN 60204-1, stop category 0, use these filters recommended by Yaskawa. For all other EMC filters, additional measurements must be performed to prove EMC compatibility. This also applies when using the safe disable function in one motor contactor installations as described in *Safe Disable Input Function on page 236*.

Table 61 IEC/EN 61800-3 Filters

Model CIMR-LU	Filter Data (Manufacturer: Schaffner)					
	Type	Rated Current (A)	Weight (lb)	Dimensions [W x D x H] (in)	Y x X (in)	Figure
Three-Phase 200 V Class						
2A0008	FS5972-18-07	18	2.9	5.6 × 1.8 × 13.0	4.5 × 12.3	1
2A0011						
2A0014	FS5972-35-07	35	4.6	8.1 × 2.0 × 14.0	6.9 × 13.2	
2A0018						
2A0025						
2A0033	FS5972-60-07	60	8.8	9.3 × 2.6 × 16.1	8.1 × 15.4	
2A0047						
2A0060	FS5972-100-35	100	7.5	3.5 × 5.9 × 13.0	2.6 × 10.0	2
2A0075						
2A0185	FS5972-170-40	170	13.2	4.7 × 6.7 × 17.8	4.0 × 14.4	
2A0115						
2A0145	FS5972-250-37	250	25.8	5.1 × 9.5 × 24.0	3.5 × 19.6	
2A0180						
2A0215	FS5972-410-99	410	23.1	10.2 × 4.5 × 15.2	9.3 × 4.7	3
2A0283						
2A0346	FS5972-600-99	600	24.3	10.2 × 5.3 × 15.2	9.3 × 4.7	
2A0415						
Three-Phase 400 V Class						
4A0005	FS5972-10-07	10	2.6	5.6 × 13.0 × 1.8	4.5 × 12.3	1
4A0006						
4A0007	FS5972-18-07	18	2.9	5.6 × 1.8 × 13.0	4.5 × 12.3	
4A0009						
4A0015	FS5972-35-07	35	4.6	8.1 × 2.0 × 14.0	6.9 × 13.2	
4A0018						
4A0024						
4A0031	FS5972-60-07	60	8.8	9.3 × 2.6 × 16.1	8.0 × 15.4	
4A0039						
4A0045						
4A0060	FS5972-100-35	100	16.5	3.5 × 5.9 × 13.0	2.6 × 10.0	2
4A0075						
4A0091	FS5972-170-35	170	10.4	4.7 × 6.7 × 17.8	4.0 × 14.4	
4A0112						
4A0150						
4A0180	FS5972-250-37	250	25.8	5.1 × 9.5 × 24.0	3.5 × 19.6	
4A0216	FS5972-410-99	410	23.1	10.2 × 4.5 × 15.2	9.3 × 4.7	3
4A0260						
4A0304						
4A0370	FS5972-600-99	600	24.3	10.2 × 5.3 × 15.2	9.3 × 4.7	
4A0450						
4A0605	FS5972-800-99	800	69.4	11.8 × 28.2 × 6.3	10.8 × 8.3	

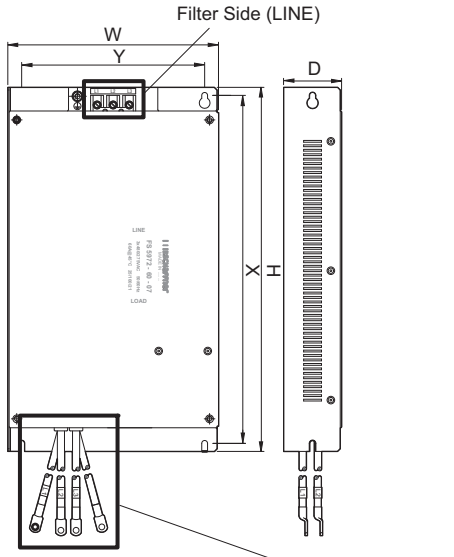


Figure 1

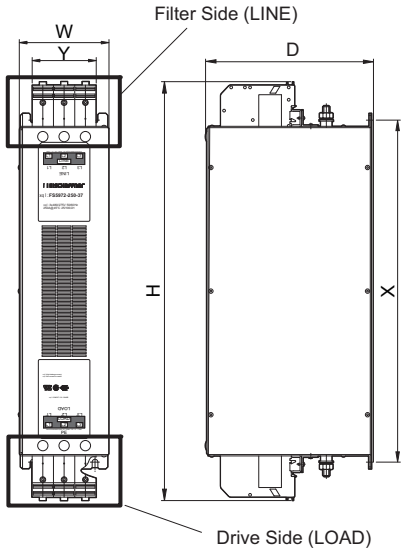


Figure 2

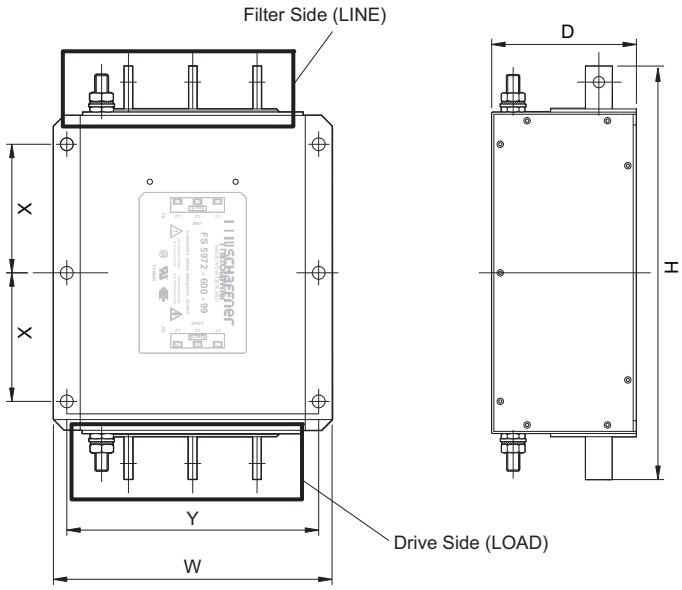


Figure 3

Figure 106 EMC Filter Dimensions

AC Reactors for IEC/EN 12015 Compliance

Contact Yaskawa for information about reactors.

◆ UL and CSA Standards

■ UL Standards Compliance

The UL/cUL mark applies to products in the United States and Canada. It indicates that UL has performed product testing and evaluation, and determined that their stringent standards for product safety have been met. For a product to receive UL certification, all components inside that product must also receive UL certification.

Figure 107 UL/cUL Mark

This drive is tested in accordance with UL standard UL508C and complies with UL requirements. To ensure continued compliance when using this drive in combination with other equipment, meet the following conditions:

Installation Area

Do not install the drive to an area greater than pollution severity degree 2 (UL standard).

Ambient Temperature

IP00 enclosure with top protective cover: -10 to +40°C (14 to 104°F)

IP00 enclosure: -10 to +50°C (14 to 122°F)

Main Circuit Terminal Wiring

Yaskawa recommends using closed-loop crimp terminals on all drive models. UL/cUL approval requires the use of UL Listed closed-loop crimp terminals when wiring the drive main circuit terminals on models CIMR-LU2A0085 through 2A0415, 4A0045 through 4A0605, and 5A0032 to 5A0200. Use only the tools recommended by the terminal manufacturer for crimping.

The wire gauges listed in *Table 62* and *Table 63* are Yaskawa recommendations. Refer to local codes for proper wire gauge selections.

Note: The mark ⏚ indicates the terminals for protective ground connection. (as defined in IEC/EN 60417-5019)
Grounding impedance;
200 V: 100 Ω or less
400 V: 10 Ω or less
600 V class: 10 Ω or less

Table 62 Wire Gauge and Torque Specifications (Three-Phase 200 V Class)

Model CIMR-LU	Terminal	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
2A0008	R/L1, S/L2, T/L3	14	14 to 10	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	14	14 to 10		
	–, +1, +2	–	14 to 10		
	B1, B2	–	14 to 10		
	⏚	10 <1>	14 to 10		
2A0011	R/L1, S/L2, T/L3	12	14 to 10	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	14	14 to 10		
	–, +1, +2	–	14 to 10		
	B1, B2	–	14 to 10		
	⏚	10 <1>	14 to 10		

Model CIMR-LU	Terminal	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
2A0014	R/L1, S/L2, T/L3	10	12 to 10	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	10	14 to 10		
	–, +1, +2	–	14 to 10		
	B1, B2	–	14 to 10		
	⏚	10 <1>	14 to 10		
2A0018	R/L1, S/L2, T/L3	10	12 to 10	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	10	12 to 10		
	–, +1, +2	–	12 to 10		
	B1, B2	–	14 to 10		
	⏚	10 <1>	12 to 10		
2A0025	R/L1, S/L2, T/L3	8	10 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	U/T1, V/T2, W/T3	8	10 to 6		
	–, +1, +2	–	10 to 6		
	B1, B2	–	14 to 10		
	⏚	8 <1>	10 to 8	M5	2.0 to 2.5 (17.7 to 22.1)
2A0033	R/L1, S/L2, T/L3	6	8 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	U/T1, V/T2, W/T3	8	8 to 6		
	–, +1, +2	–	6		
	B1, B2	–	12 to 10		
	⏚	8 <1>	10 to 8	M5	2.0 to 2.5 (17.7 to 22.1)
2A0047	R/L1, S/L2, T/L3	4	6 to 4	M6	5.4 to 6.0 (47.8 to 53.1)
	U/T1, V/T2, W/T3	4	6 to 4		
	–, +1, +2	–	6 to 4		
	B1, B2	–	10 to 6	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	6	8 to 6	M6	5.4 to 6.0 (47.8 to 53.1)
2A0060	R/L1, S/L2, T/L3	3	4 to 3	M8	9.9 to 11.0 (87.6 to 97.4)
	U/T1, V/T2, W/T3	3	4 to 3		
	–, +1, +2	–	4 to 3		
	B1, B2	–	8 to 6	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	6	6 to 4	M6	5.4 to 6.0 (47.8 to 53.1)
2A0075	R/L1, S/L2, T/L3	2	3 to 2	M8	9.9 to 11.0 (87.6 to 97.4)
	U/T1, V/T2, W/T3	2	3 to 2		
	–, +1, +2	–	3 to 2		
	B1, B2	–	6	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	6	6 to 4	M6	5.4 to 6.0 (47.8 to 53.1)
2A0085 <2>	R/L1, S/L2, T/L3	1/0	3 to 1/0	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	1/0	3 to 1/0		
	–, +1	–	2 to 1/0		
	B1, B2	–	6 to 1/0		
	⏚	6	6 to 4		

Model CIMR-LU	Terminal	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
2A0115 <2>	R/L1, S/L2, T/L3	2/0	1 to 2/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	2/0	1 to 2/0		
	–, +1	–	1/0 to 3/0		
	B1, B2	–	4 to 2/0		
	⏚	4	4	M8	9 to 11 (79.7 to 97.4)
2A0145 <2>	R/L1, S/L2, T/L3	4/0	2/0 to 4/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	4/0	3/0 to 4/0		
	–, +1	–	1 to 4/0		
	+3	–	1/0 to 4/0		
	⏚	4	4 to 2		9 to 11 (79.7 to 97.4)
2A0180 <2>	R/L1, S/L2, T/L3	1/0 × 2P	1/0 to 2/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	1/0 × 2P	1/0 to 2/0		
	–, +1	–	1 to 4/0		
	+3	–	1/0 to 4/0		
	⏚	4	4 to 1/0		9 to 11 (79.7 to 97.4)
2A0215 <2>	R/L1, S/L2, T/L3	3/0 × 2P	3/0 to 300	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	3/0 × 2P	3/0 to 300		
	–, +1	–	3/0 to 300		
	+3	–	2 to 300	M10	18 to 23 (159 to 204)
	⏚	3	3 to 300	M12	32 to 40 (283 to 354)
2A0283 <2>	R/L1, S/L2, T/L3	4/0 × 2P	3/0 to 300	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	3/0 × 2P	3/0 to 300		
	–, +1	–	3/0 to 300		
	+3	–	3/0 to 300	M10	18 to 23 (159 to 204)
	⏚	2	2 to 300	M12	32 to 40 (283 to 354)
2A0346 <2>	R/L1, S/L2, T/L3	250 × 2P	4/0 to 600	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	4/0 × 2P	4/0 to 600		
	–, +1	–	250 to 600		
	+3	–	3/0 to 600	M10	18 to 23 (159 to 204)
	⏚	1	1 to 350	M12	32 to 40 (283 to 354)
2A0415 <2>	R/L1, S/L2, T/L3	350 × 2P	250 to 600	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	300 × 2P	300 to 600		
	–, +1	–	300 to 600		
	+3	–	3/0 to 600	M10	18 to 23 (159 to 204)
	⏚	1	1 to 350	M12	32 to 40 (283 to 354)

<1> When an EMC filter is installed, additional measures must be taken in order to comply with IEC/EN 61800-5-1. Refer to *EMC Filter Installation on page 219*.

<2> Drive models CIMR-LU2A0085 to 2A0415 require the use of closed-loop crimp terminals for UL/cUL compliance. Use only the tools recommended by the terminal manufacturer for crimping.

Note: Use crimp insulated terminals or insulated tubing for wiring these connections. Wires should have a continuous maximum allowable temperature of 75°C (167°F) 600 V UL approved vinyl sheathed insulation. Ambient temperature should not exceed 40°C (104°F).

Table 63 Wire Gauge and Torque Specifications (Three-Phase 400 V Class)

Model CIMR-LU	Terminal	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
4A0005 4A0006 4A0007	R/L1, S/L2, T/L3	14	14 to 10	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	14	14 to 10		
	–, +1, +2	–	14 to 10		
	B1, B2	–	14 to 10		
	⏚	10	14 to 10		
4A0009	R/L1, S/L2, T/L3	12	14 to 10	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	14	14 to 10		
	–, +1, +2	–	14 to 10		
	B1, B2	–	14 to 10		
	⏚	10	14 to 10		
4A0015	R/L1, S/L2, T/L3	10	12 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	U/T1, V/T2, W/T3	10	12 to 6		
	–, +1, +2	–	12 to 6		
	B1, B2	–	12 to 10		
	⏚	10	14 to 10	M5	2.0 to 2.5 (17.7 to 22.1)
4A0018	R/L1, S/L2, T/L3	10	10 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	U/T1, V/T2, W/T3	10	10 to 6		
	–, +1, +2	–	12 to 6		
	B1, B2	–	12 to 10		
	⏚	10	12 to 10	M5	2.0 to 2.5 (17.7 to 22.1)
4A0024	R/L1, S/L2, T/L3	8	8 to 6	M5	3.6 to 4.0 (31.8 to 35.4)
	U/T1, V/T2, W/T3	8	10 to 6		
	–, +1, +2	–	10 to 6		
	B1, B2	–	10 to 8	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	8	10 to 8	M6	5.4 to 6.0 (47.8 to 53.1)
4A0031	R/L1, S/L2, T/L3	6	8 to 6	M5	3.6 to 4.0 (31.8 to 35.4)
	U/T1, V/T2, W/T3	8	8 to 6		
	–, +1, +2	–	6		
	B1, B2	–	10 to 8	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	6	10 to 6	M6	5.4 to 6.0 (47.8 to 53.1)
4A0039	R/L1, S/L2, T/L3	6	6 to 4	M6	5.4 to 6.0 (47.8 to 53.1)
	U/T1, V/T2, W/T3	6	6 to 4		
	–, +1, +2	–	6 to 4		
	B1, B2	–	10 to 8	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	6	8 to 6	M6	5.4 to 6.0 (47.8 to 53.1)
4A0045 <1>	R/L1, S/L2, T/L3	4	6 to 4	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	4	6 to 4		
	–, +1	–	6 to 1		
	B1, B2	–	8 to 4		
	⏚	6	8 to 6		

Model CIMR-LU	Terminal	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
4A0060 <1>	R/L1, S/L2, T/L3	3	4 to 3	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	3	4 to 3		
	–, +1	–	4 to 1		
	B1, B2	–	6 to 3		
	⏚	6	6		
4A0075 <1>	R/L1, S/L2, T/L3	2	3 to 1/0	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	2	3 to 1/0		
	–, +1	–	3 to 1/0		
	+3	–	6 to 1/0		
	⏚	4	6 to 4		
4A0091 <1>	R/L1, S/L2, T/L3	1/0	2 to 1/0	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	1	2 to 1/0		
	–, +1	–	3 to 1/0		
	+3	–	4 to 1/0		
	⏚	4	6 to 4		
4A0112 <1>	R/L1, S/L2, T/L3	3/0	1/0 to 4/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	2/0	1/0 to 4/0		
	–, +1	–	1/0 to 4/0		
	+3	–	3 to 4/0		
	⏚	4	4		
4A0150 <1>	R/L1, S/L2, T/L3	4/0	3/0 to 4/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	4/0	3/0 to 4/0		
	–, +1	–	1 to 4/0		
	+3	–	1/0 to 4/0		
	⏚	4	4 to 2		
4A0180 <1>	R/L1, S/L2, T/L3	300	2 to 300	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	300	2 to 300		
	–, +1	–	1 to 250		
	+3	–	3 to 3/0		
	⏚	4	4 to 300		
4A0216 <1>	R/L1, S/L2, T/L3	400	1 to 600	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	400	1/0 to 600		
	–, +1	–	3/0 to 600		
	+3	–	1 to 325		
	⏚	2	2 to 350		
4A0260 <1>	R/L1, S/L2, T/L3	500	2/0 to 600	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	500	2/0 to 600		
	–, +1	–	3/0 to 600		
	+3	–	1 to 325	M10	18 to 23 (159 to 204)
	⏚	2	2 to 350	M12	32 to 40 (283 to 354)
4A0304 <1>	R/L1, S/L2, T/L3	4/0 × 2P	3/0 to 600	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	4/0 × 2P	3/0 to 600		
	–, +1	–	4/0 to 600		
	+3	–	3/0 to 600	M10	18 to 23 (159 to 204)
	⏚	1	1 to 350	M12	32 to 40 (283 to 354)

Model CIMR-LU	Terminal	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
4A0370 <1> <2>	R/L1, S/L2, T/L3	300 × 2P	4/0 to 300	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	300 × 2P	4/0 to 300		
	–, +1	–	3/0 to 300		
	+3	–	3/0 to 300		
	⏚	1	1 to 3/0		
4A0450 <1> <2>	R/L1, S/L2, T/L3	3/0 × 4P	3/0 to 300	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	4/0 × 4P	3/0 to 300		
	–, +1	–	1/0 to 300		
	+3	–	1/0 to 300		
	⏚	1/0	1/0 to 300		
4A0605 <1> <2>	R/L1, S/L2, T/L3	300 × 4P	4/0 to 300	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	300 × 4P	4/0 to 300		
	–, +1	–	1/0 to 300		
	+3	–	1/0 to 300		
	⏚	2/0	2/0 to 300		

<1> Drive models CIMR-LU4A0045 to 4A0260 require the use of closed-loop crimp terminals for UL/cUL compliance. Use only the tools recommended by the terminal manufacturer for crimping.
<2> When an EMC filter is installed, take additional measures to comply with IEC/EN 61800-5-1. Refer to *EMC Filter Installation on page 219* for details.

Note: Use crimp insulated terminals or insulated tubing for wiring these connections. Wires should have a continuous maximum allowable temperature of 75°C (167°F) 600 V UL approved vinyl sheathed insulation. Ambient temperature should not exceed 40°C (104°F).

Table 64 Wire Gauge and Torque Specifications (Three-Phase 600 V Class)

Model CIMR-LU	Terminal	Recomm. Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
5A0003 5A0004	R/L1, S/L2, T/L3	14	14 to 10	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	14	14 to 10		
	–, +1, +2	–	14 to 10		
	B1, B2	–	14 to 10		
	⏚	10	14 to 10		
5A0006	R/L1, S/L2, T/L3	14	14 to 10	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	14	14 to 10		
	–, +1, +2	–	14 to 10		
	B1, B2	–	14 to 10		
	⏚	10	12 to 10		
5A00010	R/L1, S/L2, T/L3	10	14 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	U/T1, V/T2, W/T3	14	14 to 6		
	–, +1, +2	–	14 to 6		
	B1, B2	–	14 to 10		
	⏚	8	12 to 8	M5	2.0 to 2.5 (17.7 to 22.1)
5A0013	R/L1, S/L2, T/L3	10	10 to 6	M5	3.6 to 4.0 (31.8 to 35.4)
	U/T1, V/T2, W/T3	10	10 to 6		
	–, +1, +2	–	10 to 6		
	B1, B2	–	10 to 8		2.7 to 3.0 (23.9 to 26.6)
	⏚	8	12 to 8	M6	5.4 to 6.0 (47.8 to 53.1)

Model CIMR-LU	Terminal	Recomm. Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
5A0017	R/L1, S/L2, T/L3	8	10 to 6	M5	3.6 to 4.0 (31.8 to 35.4)
	U/T1, V/T2, W/T3	10	10 to 6		
	–, +1, +2	–	10 to 6		
	B1, B2	–	10 to 8		2.7 to 3.0 (23.9 to 26.6)
	⏚	8	10 to 8	M6	5.4 to 6.0 (47.8 to 53.1)
5A0022 5A0027	R/L1, S/L2, T/L3	6	6 to 4	M6	5.4 to 6.0 (47.8 to 53.1)
	U/T1, V/T2, W/T3	6	6 to 4		
	–, +1, +2	–	6 to 4		
	B1, B2	–	10 to 8	M5	2.7 to 3.0 (23.9 to 26.6)
	⏚	6	10 to 6	M6	5.4 to 6.0 (47.8 to 53.1)
5A0032	R/L1, S/L2, T/L3	6	10 to 3	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	6	10 to 3		
	–, +1	–	6 to 1		
	B1, B2	–	12 to 3		
	⏚	6	6		
5A0041	R/L1, S/L2, T/L3	4	10 to 3	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	6	10 to 3		
	–, +1	–	6 to 1		
	B1, B2	–	8 to 3		
	⏚	6	6		
5A0052	R/L1, S/L2, T/L3	4	10 to 4/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	4	10 to 4/0		
	–, +1	–	4 to 4/0		
	+3	–	6 to 4/0		
	⏚	4	4		
5A0062	R/L1, S/L2, T/L3	3	10 to 4/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	3	10 to 4/0		
	–, +1	–	3 to 4/0		
	+3	–	6 to 4/0		
	⏚	4	4		
5A0077	R/L1, S/L2, T/L3	1/0	10 to 4/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	1	10 to 4/0		
	–, +1	–	2 to 4/0		
	+3	–	4 to 4/0		
	⏚	4	4		
5A0099	R/L1, S/L2, T/L3	2/0	1 to 300	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	2/0	1 to 300		
	–, +1	–	2/0 to 3/0		
	+3	–	1 to 1/0		
	⏚	3	4 to 300		
5A0130	R/L1, S/L2, T/L3	3/0	2/0 to 300	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	3/0	2/0 to 300		
	–, +1	–	3/0 to 4/0		
	+3	–	1/0 to 2/0		
	⏚	3	4 to 300		

Model CIMR-LU	Terminal	Recomm. Gauge AWG, kcmil	Wire Range AWG, kcmil	Screw Size	Tightening Torque N·m (lb.in.)
5A0172	R/L1, S/L2, T/L3	300	2/0 to 600	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	250	2/0 to 600		
	–, +1	–	2/0 to 400		
	+3	–	2/0 to 250	M10	18 to 23 (159 to 204)
	⏚	1	1 to 350	M12	32 to 40 (283 to 354)
5A0200	R/L1, S/L2, T/L3	400	2/0 to 600	M12	32 to 40 (283 to 354)
	U/T1, V/T2, W/T3	350	2/0 to 600		
	–, +1	–	2/0 to 500		
	+3	–	250 to 300	M10	18 to 23 (159 to 204)
	⏚	1	1 to 350	M12	32 to 40 (283 to 354)

Closed-Loop Crimp Terminal Recommendations

Yaskawa recommends using closed-loop crimp terminals on all drive models. UL approval requires the use of UL Listed crimp terminals when wiring the drive main circuit terminals on Models CIMR- LU2A0085 to 2A0415, 4A0045 to 4A0605, and 5A0032 to 5A0200. Use only crimping tools as specified by the crimp terminal manufacturer. Yaskawa recommends crimp terminals made by JST and Tokyo DIP (or equivalent) for the insulation cap.

Table 65 matches the wire gauges and terminal screw sizes with Yaskawa - recommended crimp terminals, tools, and insulation caps. Refer to the appropriate Wire Gauge and Torque Specifications table for the wire gauge and screw size for your drive model. Place orders with a Yaskawa representatives the Yaskawa sales department.

Table 65 Closed-Loop Crimp Terminal Size

Wire Gauge	Terminal Screws	Crimp Terminal Model Number	Tool		Insulation Cap Model No.	Code <1>
			Machine No.	Die Jaw		
14 AWG	M4	R2-4	YA-4	AD-900	TP-003	100-054-028
12 / 10 AWG	M4	R5.5-4	YA-4	AD-900	TP-005	100-054-029
	M5	R5.5-5	YA-4	AD-900	TP-005	100-054-030
8 AWG	M4	8-4	YA-4	AD-901	TP-008	100-054-031
	M5	R8-5	YA-4	AD-901	TP-008	100-054-032
6 AWG	M4	14-NK4	YA-4	AD-902	TP-014	100-054-033
	M5	R14-5	YA-4	AD-902	TP-014	100-054-034
	M6	R14-6	YA-5	AD-952	TP-014	100-051-261
	M8	R14-8	YA-5	AD-952	TP-014	100-054-035
4 AWG	M6	R22-6	YA-5	AD-953	TP-022	100-051-262
	M8	R22-8	YA-5	AD-953	TP-022	100-051-263
3/2/1 AWG	M8	R38-8	YA-5	AD-954	TP-038	100-051-264
	M10	R38-10	YA-5	AD-954	TP-038	100-061-114
1/0 AWG 1/0 AWG × 2P	M8	R60-8	YA-5	AD-955	TP-060	100-051-265
	M10	R60-10	YF-1, YET-300-1	TD-321, TD-311	TP-060	100-051-266
2/0 AWG 2/0 AWG × 2P	M10	70-10	YF-1, YET-300-1	TD-323, TD-312	TP-080	100-054-036
1 AWG × 2P 2 AWG × 2P	M10	38-L10	YF-1, YET-150-1	TD-224, TD-212	TP-038	100-051-556
3/0 AWG	M10	80-10	YF-1, YET-300-1	TD-323, TD-312	TP-080	100-051-267
3/0 AWG × 2P	M10	80-L10	YF-1, YET-150-1	TD-227, TD-214	TP-080	100-051-557
	M12	80-L12	YF-1, YET-300-1	TD-323, TD-312	TP-080	100-051-558
4/0 AWG	M10	R100-10	YF-1, YET-300-1 YF-1, YET-150-1	TD-324, TD-312 TD-228, TD-214	TP-100	100-051-269

Wire Gauge	Terminal Screws	Crimp Terminal Model Number	Tool		Insulation Cap Model No.	Code <1>
			Machine No.	Die Jaw		
4/0 AWG × 2P	M10	100-L10	YF-1, YET-150-1	TD-228, TD-214	TP-100	100-051-559
	M12	100-L12	YF-1, YET-300-1	TD-324, TD-312	TP-100	100-051-560
250 / 300 kcmil	M10	R150-10	YF-1. YET-150-1	TD-229, TD-215	TP-150	100-051-272
	M12	R150-12	YF-1, YET-300-1	TD-325, TD-313	TP-150	100-051-273
250 kcmil × 2P 300 kcmil × 2P	M10	150-L10	YF-1, YET-150-1	TD-229, TD-215	TP-150	100-051-561
	M12	150-L12	YF-1, YET-300-1	TD-325, TD-313	TP-150	100-051-562
350 kcmil	M10	180-10	YF-1, YET-300-1	TD-326, TD-313	TP-200	100-066-687
400 kcmil	M10	200-10	YF-1, YET-300-1	TD-327, TD-314	TP-200	100-051-563
350 kcmil × 2P	M12	180-L12	YF-1, YET-300-1	TD-326, TD-313	TP-200	100-066-688
400 kcmil × 2P	M12	200-L12	YF-1, YET-300-1	TD-327, TD-314	TP-200	100-051-564
500 kcmil	M10	325-10	YF-1, YET-300-1	TD-328, TD-315	TP-325	100-051-565
600 / 650 kcmil 500 kcmil × 2P 600 kcmil × 2P	M12	325-12	YF-1, YET-300-1	TD-328, TD-315	TP-325	100-051-277

<1> Codes refer to a set of three crimp terminals and three insulation caps. Prepare input and output wiring using two sets for each connection.
Example 1: Models with 300 kcmil for both input and output require one set for input terminals and one set for output terminals, so the user should order two sets of [100-051-272].
Example 2: Models with 4/0 AWG × 2P for both input and output require two sets for input terminals and two sets for output terminals, so the user should order four sets of [100-051-560].

Note: Use crimp insulated terminals or insulated shrink tubing for wiring connections. Wires should have a continuous maximum allowable temperature of 75°C (167°F) 600 Vac UL-approved vinyl-sheathed insulation.

■ Installing Input Fuses

NOTICE: *If a fuse is blown or a Ground Fault Circuit Interrupter (GFCI) is tripped, check the wiring and the selection of the peripheral devices. Check the wiring and the selection of peripheral devices to identify the cause. Contact Yaskawa before restarting the drive or the peripheral devices if the cause cannot be identified.*

Factory Recommended Branch Circuit Protection

Yaskawa recommends installing one of the following types of branch circuit protection to maintain compliance with UL508C. Semiconductor protective type fuses are preferred. Alternate branch circuit protection devices are also listed in *Table 66*.

Table 66 Factory Recommended A1000 AC Drive Branch Circuit Protection

Drive Model CIMR-LU		L1000A in Heavy Duty Mode (C6-01 = 0)				
	Nominal Output Power HP	AC Drive Input Amps	MCCB Rating Amps <1>	Time Delay Fuse Rating Amps <2>	Non-time Delay Fuse Rating Amps <3>	Bussmann Semiconductor Fuse Rating (Fuse Ampere) <4>
Three-Phase 200 V Class						
2A0008	2	7.5	15	12	20	FWH-70B (70)
2A0011	3	11	20	17.5	30	FWH-70B (70)
2A0018	5	18.9	35	30	50	FWH-90B(90)
2A0025	7.5	28	50	40	75	FWH-100B (100)
2A0033	10	37	60	60	100	FWH-200B (200)
2A0047	15	52	100	90	150	FWH-200B (200)
2A0060	20	68	125	110	200	FWH-200B (200)
2A0075	25	80	150	125	225	FWH-300A (300)
2A0085	30	82	150	125	225	FWH-300A (300)
2A0115	40	111	200	175	250	FWH-350A (350)
2A0145	50	136	250	225	350	FWH-400A (400)
2A0180	60	164	300	250	450	FWH-400A (400)
2A0215	75	200	400	350	600	FWH-600A (600)
2A0283	100	271	500	450	800	FWH-700A (700)
2A0346	125	324	600	500	900 <4>	FWH-800A (800)
2A0415	150	394	700	600	1100 <4>	FWH-1000A (1000)
Three-Phase 400 V Class						
4A0005	3	4.4	15	7	12	FWH-70B (70)
4A0006	3	6	15	10	17.5	FWH-70B (70)
4A0009	5	10.4	20	17.5	30	FWH-90B (90)
4A0015	7.5 - 10	15	30	25	40	FWH-80B (80)
4A0018	10	20	40	35	60	FWH-100B (100)
4A0024	15	29	50	50	80	FWH-125B (125)
4A0031	20	39	75	60	110	FWH-200B (200)
4A0039	25 - 30	47	75	75	125	FWH-250A (250)
4A0045	30	43	75	75	125	FWH-250A (250)
4A0060	40	58	100	100	150	FWH-250A (250)
4A0075	60	71	125	110	200	FWH-250A (250)
4A0091	60	86	150	150	250	FWH-250A (250)
4A0112	75	105	175	175	300	FWH-350A (350)
4A0150	100	142	225	225	400	FWH-400A (400)
4A0180	125 - 150	170	250	250	500	FWH-500A (500)
4A0216	150	207	350	350	600	FWH-600A (600)
4A0304	250	300	500	500	800	FWH-800A (800)
4A0370	300	346	600	600	1000 <4>	FWH-800A (800)

Drive Model CIMR-LU		L1000A in Heavy Duty Mode (C6-01 = 0)				
	Nominal Output Power HP	AC Drive Input Amps	MCCB Rating Amps <1>	Time Delay Fuse Rating Amps <2>	Non-time Delay Fuse Rating Amps <3>	Bussmann Semiconductor Fuse Rating (Fuse Ampere) <4>
4A0450	350	410	700	700	1200 <4>	FWH-1000A (1000)
4A0605	400 - 500	584	1000	1000 <4>	1600 <4>	FWH-1200A (1200)
Three-Phase 600 V Class						
5A0003	2	3.6	15	6.25	10	FWP-50B (50)
5A0004	3	5.1	15	8	15	FWP-60B (60)
5A0006	5	8.3	15	12	20	FWP-60B (60)
5A0010	7.5	12	20	20	35	FWP-70B (70)
5A0013	10	16	30	25	45	FWP-100B (100)
5A0017	15	23	40	40	60	FWP-100B (100)
5A0022	20	31	60	50	90	FWP-125A (125)
5A0027	25	38	75	60	100	FWP-125A (125)
5A0032	30	33	60	50	90	FWP-175A (175)
5A0041	40	44	75	75	125	FWP-175A (175)
5A0052	50	54	100	90	150	FWP-250A (250)
5A0062	60	66	125	110	175	FWP-250A (250)
5A0077	75	80	150	125	225	FWP-250A (250)
5A0099	100	108	175	175	300	FWP-350A (350)
5A0130	125	129	250	225	350	FWP-350A (350)
5A0172	150	158	300	250	400	FWP-600A (600)
5A0200	200	228	400	350	600	FWP-600A (600)

<1> Maximum MCCB Rating is 15 A, or 200% of drive input current rating, whichever is larger. MCCB voltage rating must be 600 Vac or greater.
<2> Maximum Time Delay fuse is 175% of drive input current rating. This covers any Class CC, J or T class fuse.
<3> Maximum Non-time Delay fuse is 300% of drive input current rating. This covers any CC, J or T class fuse.
<4> Class L fuse is also approved for this rating.

Low Voltage Wiring for Control Circuit Terminals

Wire low voltage wires with NEC Class 1 circuit conductors. Refer to national state or local codes for wiring. If external power supply used, it shall be UL Listed Class 2 power source only or equivalent. Refer to NEC Article 725 Class 1, Class 2, and Class 3 Remote-Control, Signaling, and Power Limited Circuits for requirements concerning class 1 circuit conductors and class 2 power supplies.

Table 67 Control Circuit Terminal Power Supply

Input / Output	Terminal Signal	Power Supply Specifications
Open Collector Outputs	P1, C1, P2, C2, DM+, DM-	Requires class 2 power supply
Digital inputs	S1-S8, SN, SC, SP, HC, H1, H2	Use the internal LVLC power supply of the drive. Use class 2 for external power supply.
Analog inputs / outputs	+V, -V, A1, A2, AC, AM, FM	

Drive Short Circuit Rating

This drive is suitable for use on a circuit capable of delivering not more than 100,000 RMS symmetrical amperes, 600 Vac maximum (Up to 240 V in 200 V class drives, up to 480 V for 400 V class drives), when protected by Bussmann Type FWH fuses as specified in *Table 59*.

■ CSA Standards Compliance

CSA for Industrial Control Equipment

The L1000 is CSA certified as Industrial Control Equipment Class 3211.

Specifically, the L1000 is certified to: CAN/CSA C22.2 No.04-04 and CAN/CSA C22.2 No.14-05.

Figure 108 CSA Mark

CSA for Elevator Equipment

The L1000 is tested and complies with CSA B44.1-04/ASME A17.5-2004 standard. This standard is used by CSA to evaluate the L1000 to Class 2411 (Elevator Equipment).

Figure 109 CSA B44.1-04/ASME A17.5-2004 Mark

■ Drive Motor Overload Protection

Set parameter E2-01/E5-03 (motor rated current) to the appropriate value to enable motor overload protection. The internal motor overload protection is UL listed and in accordance with the NEC and CEC.

E2-01/E5-03: Motor Rated Current (IM Motor/PM Motor)

Setting Range: Model Dependent

Default Setting: Model Dependent

Parameter E2-01/E5-03 (motor rated current) protects the motor if parameter L1-01 is not set to 0 (default is 1, enabling protection for standard induction motors).

If Auto-Tuning has been performed successfully, the motor data entered to T1-04/T2-04 is automatically written into parameter E2-01/E5-03. If Auto-Tuning has not been performed, manually enter the correct motor rated current to parameter E2-01/E5-03.

L1-01: Motor Overload Protection Selection

The drive has an electronic overload protection function (oL1) based on time, output current, and output speed, which protects the motor from overheating. The electronic thermal overload function is UL-recognized, so it does not require an external thermal relay for single motor operation.

This parameter selects the motor overload curve used according to the type of motor applied.

Table 68 Overload Protection Settings

Setting	Description	
0	Disabled	Disabled the internal motor overload protection of the drive.
1	Standard fan-cooled motor (default)	Selects protection characteristics for a standard self cooled motor with limited cooling capabilities when running below the rated speed. The motor overload detection level (oL1) is automatically reduced when running below the motor rated speed.
2	Drive duty motor with a speed range of 1:10	Selects protection characteristics for a motor with self-cooling capability within a speed range of 10:1. The motor overload detection level (oL1) is automatically reduced when running below 1/10 of the motor rated speed.
3	Vector motor with a speed range of 1:100	Selects protection characteristics for a motor capable of cooling itself at any speed — including zero speed (externally cooled motor). The motor overload detection level (oL1) is constant over the entire speed range.
5	Permanent Magnet motor with constant torque	Selects protection characteristics for a constant torque PM motor. The motor overload detection level (oL1) is constant over the whole speed range.
6	Standard fan cooled motor (50 Hz)	Selects protection characteristics for a standard self cooled motor with limited cooling capabilities when running below the rated speed. The motor overload detection level (oL1) is automatically reduces when running below the motor rated speed.

When connecting the drive to more than one motor for simultaneous operation, disable the electronic overload protection (L1-01 = 0) and wire each motor with its own motor thermal overload relay.

Enable the motor overload protection (L1-01 = 1 to 3, 5) when connecting the drive to a single motor, unless another motor overload preventing device is installed. The drive electronic thermal overload function causes an oL1 fault, which shuts off the output of the drive and prevents additional overheating of the motor. The motor temperature is continually calculated while the drive is powered up.

L1-02: Motor Overload Protection Time

Setting Range: 0.1 to 5.0 min

Factory Default: 1.0 min

Parameter L1-02 determines how long the motor is allowed to operate before the oL1 fault occurs when the drive is running at 60 Hz and at 150% of the full load amp rating (E2-01/E5-03) of the motor. Adjusting the value of L1-02 can shift the set of oL1 curves up the y axis of the diagram below, but will not change the shape of the curves.

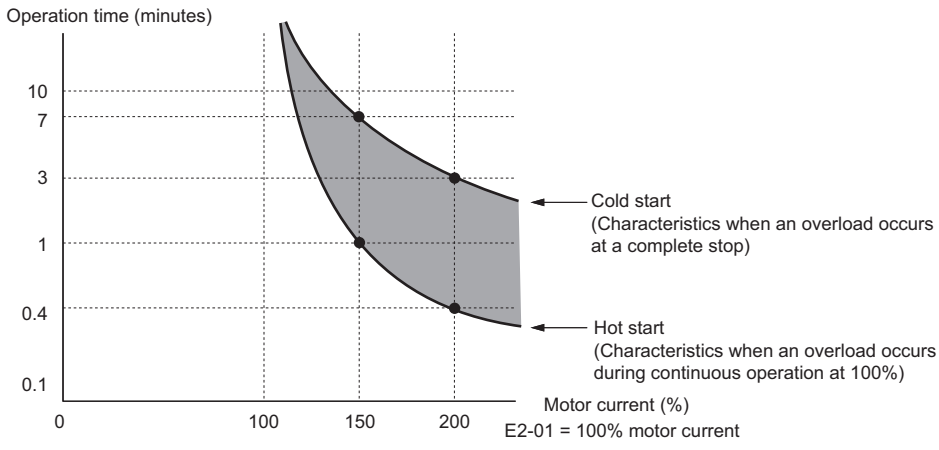


Figure 110 Protection Operation Time for General Purpose Motors at the Rated Output Frequency

L1-03 Motor Overload Alarm Operation Selection

Setting	Description
0	Ramp to Stop
1	Coast to Stop
2	Fast-Stop
3	Alarm Only (default setting)

L1-04 Motor Overload Fault Operation Selection

Setting	Description
0	Ramp to Stop
1	Coast to Stop (default setting)
2	Fast-Stop

◆ Safe Disable Input Function

This section explains the Safe Disable function and how to use it in an elevator installation. Contact Yaskawa if more information is required.

■ Specifications

The Safe Disable inputs provide a stop function in compliance with “Safe Torque Off” as defined in the IEC/EN 61800-5-2. Safe Disable inputs have been designed to meet the requirements of the ISO/EN 13849-1, Cat. 3 PLd and IEC/EN 61508, SIL2.

A Safe Disable Status Monitor for error detection in the safety circuit is also provided.

Inputs / Outputs		Two Safe Disable inputs and one EDM output according to ISO/EN 13849-1 Cat.3 PLd, IEC/EN 61508 SIL2. <1>
Operation Time		Time from input open to drive output stop is less than 1 ms.
Failure Probability	**Demand Rate Low**	PFD = $5.15E^{-5}$
	Demand Rate High or Continuous	PFH = $1.2E^{-9}$
Performance Level		The Safe Disable inputs satisfy all requirements of Performance Level (PL) d according to ISO/EN 13849-1 (DC from EDM considered). <1>

<1> Terminals H1, H2, DM+, and DM- on 600 V class models are designed to the functionality, but are not certified to IEC/EN 61800-5-1,ISO/EN 13849 Cat.3, IEC/EN 61508 SIL2, Insulation coordination: class 1.

■ Precautions

Note: Terminals H1, H2, DM+, and DM- on 600 V class models are designed to the functionality, but are not certified to IEC/EN 61800-5-1, ISO/EN 13849 Cat. 3, IEC/EN 61508 SIL2, Insulation coordination: class 1.

DANGER! *Sudden Movement Hazard. Improper use of the Safe Disable function will result in serious injury or death. Make sure the entire system or machinery uses the Safe Disable function in compliance with safety requirements. When implementing the Safe Disable function into the safety system of a machine, a thorough risk assessment for the whole system must be carried out to ensure it complies with relevant safety norms (e.g., ISO/EN 13849, IEC/EN 61508, IEC/EN 62061).*

DANGER! *Sudden Movement Hazard. When using a PM motor, even if the drive output is shut off by the Safe Disable function, a break down of two output transistors can cause current to flow through the motor winding, resulting in a rotor movement for a maximum angle of 180 degrees (electrically). Ensure this condition will not affect the safety of the application when using the Safe Disable function. Failure to comply will result in death or serious injury.*

DANGER! *Electrical Shock Hazard. The Safe Disable function can switch off the drive output, but does not cut the drive power supply and cannot electrically isolate the drive output from the input. Always shut off the drive power supply when performing maintenance or installations on the drive input side as well as the drive output side. Failure to comply will result in death or serious injury.*

WARNING! *Sudden Movement Hazard. When using the Safe Disable inputs, make sure to remove the wire links between terminals H1, H2, and HC that were installed prior to shipment. Failing to do so will keep the Safe Disable circuit from operating properly and can cause injury or even death.*

WARNING! *All safety features (including Safe Disable) should be inspected daily and periodically. If the system is not operating normally, there is a risk of serious personal injury.*

WARNING! *Only a qualified technician with a thorough understanding of the drive, the instruction manual, and safety standards should be permitted to wire, inspect, and maintain the Safe Disable input. Failure to comply may result in serious injury or death.*

NOTICE: *From the moment terminal inputs H1 and H2 have opened, it takes up to 1 ms for drive output to shut off completely. The sequence set up to trigger terminals H1 and H2 should make sure that both terminals remain open for at least 1 ms in order to properly interrupt drive output. This may result in the Safe Disable Input not activating.*

NOTICE: *The Safe Disable Monitor (output terminals DM+ and DM–) should not be used for any other purpose than to monitor the Safe Disable status or to discover a malfunction in the Safe Disable inputs. The monitor output is not considered a safe output.*

NOTICE: *When utilizing the Safe Disable function, use only the EMC filters recommended in* ***EMC Filter Installation on page 219****.*

■ Using the Safe Disable Function

Note: Terminals H1, H2, DM+, and DM- on 600 V class models are designed to the functionality, but are not certified to IEC/EN 61800-5-1, ISO/EN 13849 Cat. 3, IEC/EN 61508 SIL2, Insulation coordination: class 1.

The Safe Disable inputs provide a stop function in compliance with “Safe Torque Off” as defined in the IEC/EN 61800-5-2. Safe Disable inputs have been designed to meet the requirements of the ISO/EN 13849-1, Category 3 PLd, and IEC/EN 61508, SIL2.

A Safe Disable Status Monitor for error detection in the safety circuit is also provided.

Safe Disable Circuit

Note: Terminals H1, H2, DM+, and DM- on 600 V class models are designed to the functionality, but are not certified to IEC/EN 61800-5-1,ISO/EN 13849 Cat.3, IEC/EN 61508 SIL2, Insulation coordination: class 1.

The Safe Disable circuit consists of two independent input channels that can block the output transistors (terminals H1 and H2). The input can either use the drive internal power supply or an external power supply. Use jumper S3 on the terminal board to select between Sink or Source mode with either internal or external power supply.

A photocoupler output is available to monitor the status of the Safe Disable terminals. ***Refer to Output Terminals on page 48*** for signal specifications when using this output.

Additionally a Safe Disable monitor function can be assigned to one of the digital outputs (H2-☐☐ = 58).

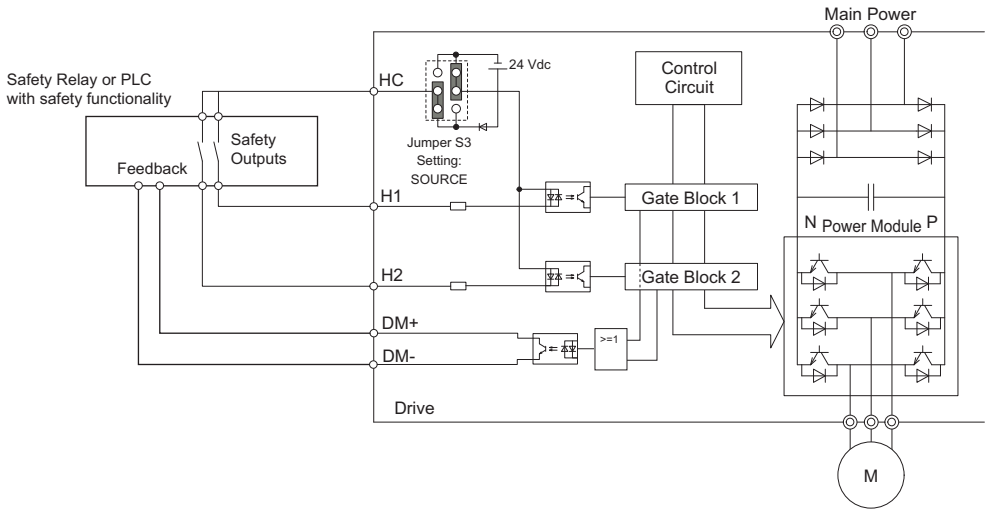


Figure 111 Safe Disable Function Wiring Example (Source Mode)

Disabling and Enabling the Drive Output (“Safe Torque Off”)

Note: Terminals H1, H2, DM+, and DM- on 600 V class models are designed to the functionality, but are not certified to IEC/EN 61800-5-1,ISO/EN 13849 Cat.3, IEC/EN 61508 SIL2, Insulation coordination: class 1.

Figure 112 illustrates a Safe Disable input operation example.

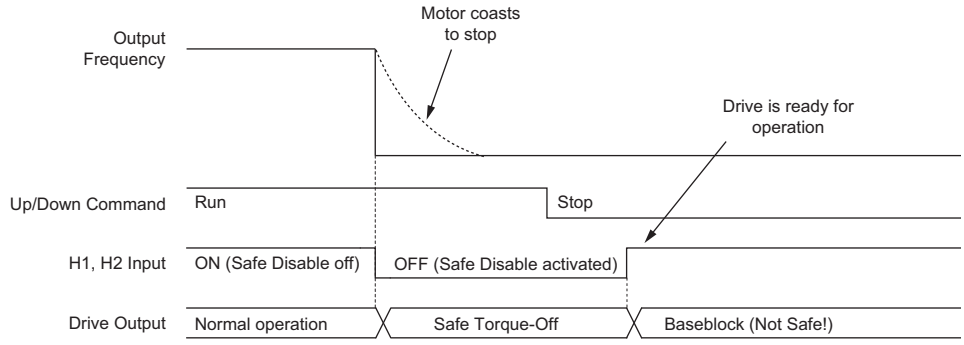


Figure 112 Safe Disable Operation

Entering the “Safe Torque Off” State

Note: Terminals H1, H2, DM+, and DM- on 600 V class models are designed to the functionality, but are not certified to IEC/EN 61800-5-1,ISO/EN 13849 Cat.3, IEC/EN 61508 SIL2, Insulation coordination: class 1.

Whenever either one Safe Disable input or both inputs open, the motor torque is shut off by switching off the drive output. If the motor was running before the Safe Disable inputs opened, it will coast to stop, regardless of the stopping method set in parameter b1-03.

Notice that the “Safe Torque Off” state can only be achieved using the Safe Disable function. Removing the Up/Down command stops the drive and shuts the output off (baseblock), but does not create a “Safe Torque Off” status.

Note: To avoid an uncontrolled stop during normal operation, make sure that the Safe Disable inputs are opened first when the motor has completely stopped.

Returning to Normal Operation after Safe Disable

Note: Terminals H1, H2, DM+, and DM- on 600 V class models are designed to the functionality, but are not certified to IEC/EN 61800-5-1,ISO/EN 13849 Cat.3, IEC/EN 61508 SIL2, Insulation coordination: class 1.

The Safe Torque-Off state can be left by simply closing both Safe-Disable inputs.
If the Up/Down command is issued before the Safe-Disable inputs are closed, then the drive operation depends on the setting of parameter L8-88.

- If L8-88 is set to 0, the Up/Down command needs to be cycled in order to start the motor.
- If L8-88 is set to 1 (default), the drive will start the motor immediately when the Safe Torque-Off mode is left, i.e., the Safe Disable inputs are enabled.

Additionally when L8-88 is set to 1, then parameter S6-16 (Restart after Baseblock Selection) can be used to determine how the drive behaves when the Safe-Disable inputs are opened and closed while the Up/Down command is kept active. When S6-16 is set to 0, the drive will not restart (default) and the Up/Down command needs to be cycled. When S6-16 is set to 1, then the drive will restart as soon as the Safe-Disable inputs are closed.

Safe Disable Monitor Output Function and Digital Operator Display

Note: Terminals H1, H2, DM+, and DM- on 600 V class models are designed to the functionality, but are not certified to IEC/EN 61800-5-1, ISO/EN 13849 Cat. 3, IEC/EN 61508 SIL2, Insulation coordination: class 1.

The table below explains the drive output and Safe Disable monitor state depending on the Safe Disable inputs.

Safe Disable Input Status		Safe Disable Status Monitor, DM+ - DM–	Safe Disable Status Monitor, H2-☐☐ = 58	Drive Output Status	Digital Operator Display
Input 1, H1-HC	Input 2, H2-HC				
Off	**Off**	Off	On	Safely disabled, “Safe Torque Off”	Hbb (flashes)
On	**Off**	On	On	Safely disabled, “Safe Torque Off”	HbbF (flashes)
Off	**On**	On	On	Safely disabled, “Safe Torque Off”	HbbF (flashes)
On	**On**	On	Off	Baseblock, ready for operation	Normal display

Safe Disable Status Monitor

Note: Terminals H1, H2, DM+, and DM- on 600 V class models are designed to the functionality, but are not certified to IEC/EN 61800-5-1, ISO/EN 13849 Cat. 3, IEC/EN 61508 SIL2, Insulation coordination: class 1.

With the Safe Disable monitor output (terminals DM+ and DM–), the drive provides a safety status feedback signal. This signal should be read by the device that controls the Safe Disable inputs (PLC or a safety relay) in order to prohibit leaving the “Safe Torque Off” status in case the safety circuit malfunctions. Refer to the instruction manual of the safety device for details on this function.

Digital Operator Display

Note: Terminals H1, H2, DM+, and DM- on 600 V class models are designed to the functionality, but are not certified to IEC/EN 61800-5-1, ISO/EN 13849 Cat. 3, IEC/EN 61508 SIL2, Insulation coordination: class 1.

In contrast to terminals DM+/DM-, the safe disable monitor function that can be programmed for a digital output (H2-☐☐ = 58) is a software function and can be used for EN81-1 conform one contactor solutions but not as an EDM signal according to IEC/EN 61800-5-1.

When both Safe Disable inputs are open, "Hbb" will flash in the digital operator display.

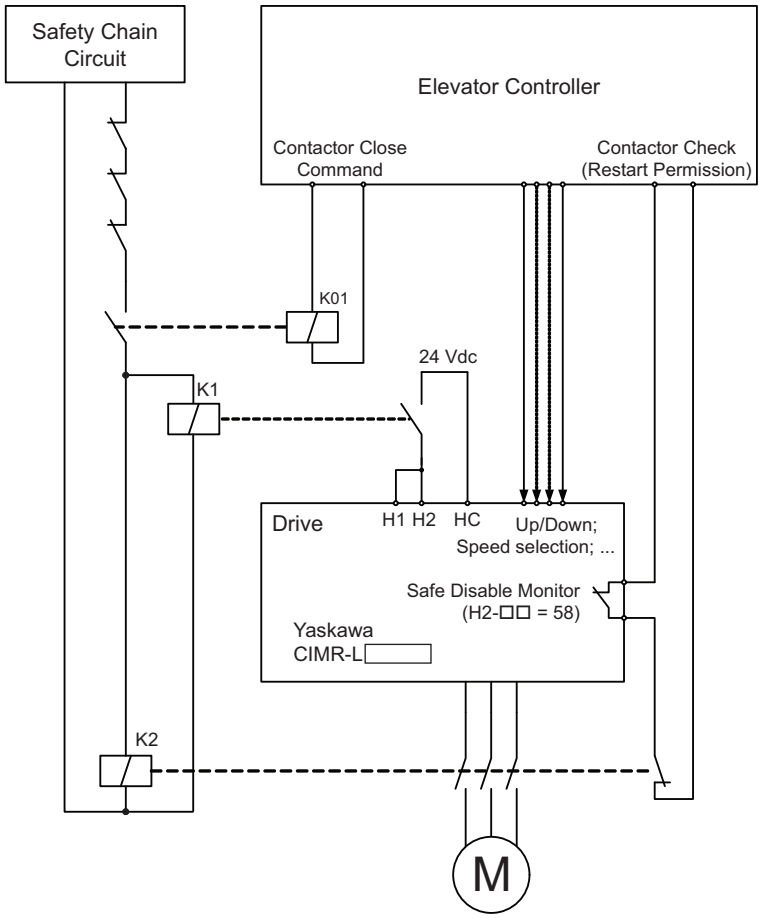
Should only one of the Safe Disable channels be on while the other is off, "HbbF" will flash in the display to indicate that there is a problem in the safety circuit or in the drive. This display should not appear under normal conditions if the Safe Disable circuit is utilized properly. *Refer to Alarm Codes, Causes, and Possible Solutions on page 134* to resolve possible errors.

◆ EN81-1 Conform Circuit with one Motor Contactor

The safe disable circuit can be utilized to install the drive in an elevator system using only one motor contactor instead of two. In such a system the following guidelines have to be followed for compliance to EN81-1:1998:

- The circuit must be designed so that the inputs H1 and H2 are opened and the drive output shuts off when the safety chain is interrupted.
- A drive digital output must be programmed as Safe Disable feedback (H2-☐☐ = 58). This feedback signal must be implemented in the contactor supervision circuit of the controller that prevents a restart in case of a fault in the Safe Disable circuit or the motor contactor.
- All contactors and wiring must be selected and installed in compliance with the EN81-1:1998.
- The safe disable inputs H1 and H2 must be used to enable/disable the drive. The input logic must be set to Source Mode. *Refer to Sinking/Sourcing Mode Selection for Safe Disable Inputs on page 54* for details on setting jumper S3.

The figure below shows a wiring example.

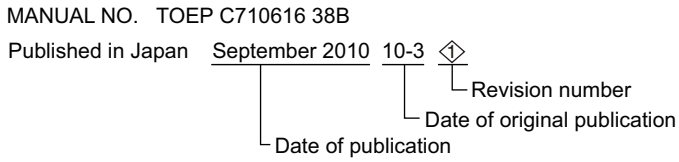


Note: **1.** The drive output will immediately shut off when either of the inputs H1 or H2 is opened. In this case the brake should apply immediately in order to prevent uncontrolled movement of the elevator.

2. The drive output can only be activated when neither an Up nor a Down command is active, i.e., terminals H1 and H2 must be closed prior to setting the Up/Down command.

Revision History

The revision dates and the numbers of the revised manuals appear on the bottom of the back cover.



Date of Publication	Revision Number	Section	Revised Content
December 2013	⑤	All	Addition: Larger drive capacities added along with corresponding data Three-phase 400 V: CIMR-LU4A0304 to 4A0605 Three-phase 600 V: CIMR-LU5A0003 to 5A0200 Revision: • Review and corrected entire documentation. • Upgraded the software version to PRG: 7017 and PRG: S7200.
		Back cover	Revision: Address
August 2012	④	All	Addition: Smaller drive capacities added along with corresponding data Three-phase 200 V: CIMR-LU2A0008 to 2A0014 Three-phase 400 V: CIMR-LU4A0005 to 4A0007
		Back cover	Revision: Address
February 2012	③	All	Revision: Reviewed and corrected entire documentation
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YASKAWA AC Drive-L1000A

AC Drive for Elevator Applications

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