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YASKAWA AC Drive L1000A

AC Drive for Elevator Applications

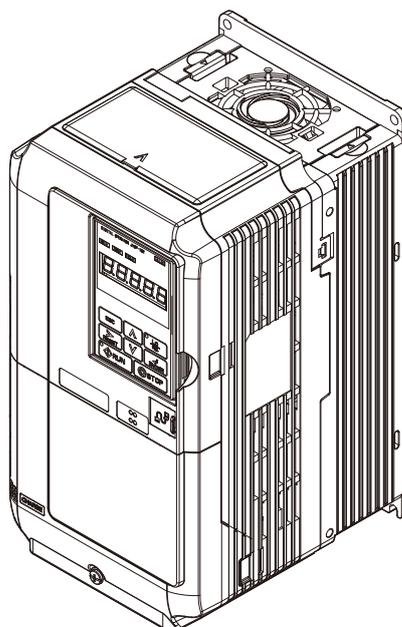
Technical Manual

Type: CIMR-LB□A , CIMR-LT□A

Models: 200 V Class: 3.7 to 45 kW

400 V Class: 3.7 to 75 kW

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



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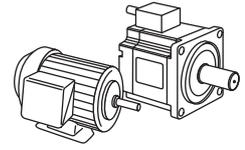
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◆ Quick Reference

Drive a Synchronous PM Motor

L1000A can operate synchronous PM motors. [Refer to Flowchart C: Auto-Tuning for PM Motors on page 94.](#)



Perform Auto-Tuning

Automatic tuning sets motor parameters. [Refer to Auto-Tuning on page 96.](#)

Maintenance Check Using Drive Monitors

Use drive monitors to check the if fans, capacitors, and other components may require maintenance. [Refer to Performance Life Monitors Maintenance Monitors on page 261.](#)

Fault Display and Troubleshooting

[Refer to Drive Alarms, Faults, and Errors on page 224](#) and [Refer to Common Problem during Setup and Possible Solutions on page 125.](#)

Standards Compliance

[Refer to European Standards on page 372](#) and [Refer to UL Standards on page 376.](#)







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Preface & General Safety

This section provides safety messages pertinent to this product that, if not heeded, may result in fatality, personal injury, or equipment damage. Yaskawa is not responsible for the consequences of ignoring these instructions.

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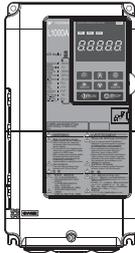
i.1 Preface

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, EXPRESSED 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 Variable 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 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. It is meant to get the drive ready for a trial run with the application and for basic operation.
	L1000A Series AC Drive Technical Manual (this book)
	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.

◆ Symbols

Note: Indicates a supplement or precaution that does not cause drive damage.



Indicates a term or definition used in this manual.

◆ Terms and Abbreviations



- **Drive:** Yaskawa L1000A Series Drive
- **V/f:** V/f Control
- **OLV:** Open Loop Vector Control
- **CLV:** Closed Loop Vector Control
- **CLV/PM:** Closed Loop Vector Control for PM
- **PM motor:** Permanent Magnet Synchronous motor (an abbreviation for IPM motor or SPM motor), Yaskawa Electric SSE4 Series
- **IPM motor:** Interior Permanent Magnet Motor (such as Yaskawa's SSR1 Series and SST4 Series motors)
- **SPM motor:** Surface mounted Permanent Magnet Motor (such as Yaskawa's SMRA Series motors)

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i.2 General Safety

◆ Supplemental Safety Information

General Precautions

- The diagrams in this manual may be indicated without covers or safety shields to show details. Restore 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 possibly even 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! will 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! will 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: will 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.

Ensuring Safety during Auto-Tuning

Before Auto-Tuning, make sure the area around the motor and elevator are clear.

The motor may suddenly rotate during the Auto-Tuning process, which can result in personal injury if proper safety measures are not taken beforehand.

DANGER

Rotational Auto-Tuning must always be performed with the motor disconnected from the load (ropes removed from traction sheave).

If the ropes are left mounted during Rotational Auto-Tuning, the drive will be unable to set motor parameters correctly. This will result in erroneous operation.

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 any 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.

The internal capacitor remains charged even after the power supply is turned off.

Failure to comply can result in serious electric shock.

WARNING

Sudden Movement Hazard

Drive settings and system design may cause the elevator to begin running as soon as the power to the drive is switched on. This can result in serious personal injury or even death.

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

A brake independent of drive circuitry must be prepared by the user prior to operation.

The holding brake should be wired so that it is applied by an external sequence when a fault occurs, the power is shut off, or an emergency switch is triggered.

When the drive faults out, the output is shut off. This, however, does not stop the motor immediately. Some type of mechanical brake may be needed if it is necessary to halt the motor faster than the Emergency Stop function is able to.

Failure to comply could result in death or serious injury.

A separate brake should be installed to prevent an external force from rotating the motor.

Even during operation, a vertical force external to the load (such as gravity) can rotate the motor unexpectedly. To ensure application safety, install a separate external brake.

Wire the brake sequence so that the brake applies as soon as baseblock shuts off drive output.

If the brake fails to apply immediately upon baseblock, the motor will begin to coast when baseblock shuts the drive output, causing the elevator car to free-fall.

Confirm the drive I/O signals and external sequence before starting test run.

Failure to comply may result in death or serious injury.

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.

Double check the emergency stop sequence once wiring is complete. The emergency stop circuitry is crucial for safety to ensure that the application can stop immediately.

Failing to properly verify all emergency stop wiring could result in serious personal injury.

The drive is capable of running the motor up to 120 Hz. Due to the danger of accidentally operating at high speed, be sure to set the upper limit for the frequency. The default setting for the maximum output frequency is 50 Hz.

Incorrect settings can cause the drive to accelerate to dangerously high speed.

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

Never set the stopping method to anything other than “Ramp to stop”. Parameter b1-03 should therefore always be set to 0.

Any other setting leaves the motor uncontrolled when the Up/Down command is removed and can cause the elevator car to free-fall.

To avoid the motor's coasting and to ensure the motor's stopping quickly and safely, set an appropriate Emergency Stop Ramp to C1-09.

Rapid deceleration can trigger an overvoltage fault. When faulted, the drive output shuts off, and the motor coasts.

Do not use the fault restart function unnecessarily.

Carelessly using the fault restart function leads to an unintended start of the elevator, resulting in death or serious injury.

Ensuring Safety during Auto-Tuning

When using a PM motor for the first time, or when replacing the drive or PM motor, always make sure that motor parameter have been set properly and the speed detection function accurately prior to operation.

Using a PM motor requires that the encoder offset be set correctly in addition to entering motor data to corresponding parameters. If the motor, encoder, or drive is ever replaced, be sure to perform Encoder Offset Auto-Tuning.

Insufficient torque can cause the elevator car to move in the direction of the load, or cause the motor to behave erratically (reverse operation, stand still, sudden accelerations, etc.).

For more information, refer to the instruction manual included with the motor.

When performing Stationary Auto-Tuning for Line-to-Line Resistance with the rope mounted on the motor, the brake must remain applied throughout the entire Auto-Tuning process. Make sure that a signal to release the brake cannot be issued by the digital output terminals during Stationary Auto-Tuning.

Failure to comply could result in death or serious injury.

During Stationary Auto-Tuning and Stationary Auto-Tuning for Line-to-Line Resistance, voltage is applied to the motor even before it rotates. Do not touch the motor until Auto-Tuning is completed.

Failure to comply may result in injury from electrical shock.

Ensuring Safety with PM Motors

When using a PM motor with a different speed feedback option than a PG-F3 card together with an external brake sequence, make sure the brake is not released before Initial Magnetic Pole Search has been finished. Use the Initial Pole Search Status signal (H2-□□ = 61) to interlock the brake.

Failure to comply can cause the counterweight to pull on the elevator car, resulting in personal injury.

Even when the power has been shut off for a drive running a motor, voltage continues to be generated at the motor terminals while the motor coasts to stop.

Failure to comply may result in injury from electrical shock.

Applications where the machine can still rotate even though the drive has fully stopped should have a magnetic contactor installed to the output side of the drive.

Failure to comply may result in injury from electrical shock.

Do not allow an external force to rotate the motor beyond the maximum allowable speed, also when the drive has been shut off.

Failure to comply may result in injury from electrical shock.

Whenever performing maintenance, inspection, or wiring on the motors, make sure to open the magnetic contactor on the output side and make sure the motor has come to a complete stop. Next wait for time specified in this manual before beginning to work on the motor.

Failure to comply may result in injury from electrical shock.

 **WARNING**

When closing the magnetic contactor while the motor is coasting, make sure the power to the drive is turned on and the drive output has completely stopped.

Failure to comply may result in injury from electrical shock.

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 motor contactor.

Failure to comply may result in injury from electrical shock.

Never attempt to change any wiring or remove any connectors while power is flowing through the motor.

Failure to comply may result in injury from electrical shock.

Electrical Shock Hazard

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

Failure to comply could result in death or serious injury.

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

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.

Turn the power on only after making sure that the front cover is properly attached. Never remove the front cover while power to the drive is on.

Failure to comply may result in injury from electrical shock.

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.

Wiring to the motor (U, V, W) should never come into contact with the external case of the drive.

Failure to comply could result in death or serious injury.

Do not remove covers or touch circuit boards while the power is on.

Failure to comply could result in death or serious injury.

Switch off the power supply and lock the switching device before wiring terminals.

Failure to comply would result in serious injury or death.

Keep the protective earthing conductor as short as possible.

Improper equipment grounding may cause dangerous electrical potentials on equipment chassis, which could result in death or serious injury.

Make sure all ground terminals have been properly grounded: Grounding resistance up to 100 Ω for the 200 V class, or up to 10 Ω for the 400 V class.

Improper equipment grounding could result in death or serious injury by contacting ungrounded electrical equipment.

Always ground the motor-side grounding terminal.

Improper equipment grounding could result in death or serious injury by contacting the motor case.

Do not allow unqualified personnel to use 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.

⚠ 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.

The braking resistor connection terminals are B1 and B2. Do not connect a braking resistor directly to any other terminals.

Improper wiring connections could result in death or serious injury by fire. Failure to comply may result in damage to the braking circuit or drive.

When installing a dynamic braking resistor or optional Braking Resistor Unit, perform all wiring exactly as specified in the wiring diagrams provided.

Failure to comply can result in fire. Improper wiring may damage braking components.

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 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.

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.

Confirm an actual motor overload condition is not present prior to increasing the thermal oL trip detection setting. Check local electrical codes before making adjustments to motor thermal overload settings.

Failure to comply can result in fire.

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.

⚠ CAUTION**Ensuring Safety during Auto-Tuning**

During the Rotational Auto-Tuning process, the drive will start and stop the motor. Never touch the motor while Auto-Tuning is being performed. Follow the directions below to ensure safety.

- **Remove any shaft lock keys**
- **Clear all personnel and equipment from the drive, motor, and elevator area**
- **Make sure the motor has come to a complete stop**

Failing to take proper safety measures can result in personal injury.

Preventing Injury

A separate emergency stop switch should be installed separately from drive circuitry (the drive's own emergency stop function is enabled only when it has been assigned to one of the input terminals).

Failure to comply may result in personal injury.

Whenever transporting the drive, make sure that the drive is held securely by outside case.

The drive cannot be held securely by simply grabbing on to the front cover or terminal cover. Dropping the drive can damage the drive itself and result in personal injury.

CAUTION

Check the area thoroughly around the motor and elevator before starting to operate the application.

Failure to comply can result in personal injury.

Reset alarms and faults only after making sure that the Up/Down command has also been removed.

Failure to comply can result in personal injury.

Preventing Burns

Never touch the heatsink on the drive, as it can reach high temperatures. When replacing the cooling fan, wait at least 15 minutes after power to the drive has been shut off before touching the fan to ensure that it has cooled off enough.

Failure to comply could result in burns.

NOTICE

Ensuring Safety during Auto-Tuning

Rotational Auto-Tuning will not function properly if a holding brake is applied on the motor. Ensure the motor can freely rotate before beginning Auto-Tuning.

Failure to comply could result in improper operation of the drive.

Ensuring Safety with PM Motors

When using a PM motor, never open or close the magnetic contactor while the motor is running.

Failure to comply could result in the drive damage.

Equipment Hazard

The drive's cooling fan may not run during Rescue Operation due to low voltage from the battery or UPS.

Using Rescue Operation for extended periods of time may result in an oH alarm as the heatsink temperature rises.

Set parameter E1-01 to match the input voltage of the drive. The drive input voltage (not motor voltage) must be set in E1-01 for the protective features to function properly.

Failure to set the correct drive input voltage may result in improper drive operation.

Use the torque detection function in the drive to notify the PLC of a potential overcurrent or overload situation before an overcurrent or overload fault is actually triggered. Use undertorque detection to detect any problems that develop on the application side.

If the drive faults out due to overcurrent or overload, the drive output will be interrupted. The motor will start coasting, potentially resulting in damage to the machinery or personal injury.

When replacing the control terminal board or removable terminal board, be sure to also check the value set to parameter o2-04.

If o2-04 is set incorrectly, drive performance may be poor and protection functions may not operate properly, potentially damaging 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) and 480 Vac maximum (400 V Class).

Inadequate wiring could result in damage to the drive.

For optimal performance life, make sure the maximum output current does not exceed 150% of the drive rated current.

Expected performance life estimates the number of drive starts at three million times. This assumes the carrier frequency is at its default setting (8 kHz for models CIMR-L□2A0018 to 2A0115, 4A0009 to 4A0091, and 5 kHz for models CIMR-L□2A0145, 2A0180, 4A0112, 4A0150) and a peak current of less than 150% of the drive rated current.

NOTICE

Never use a magnet contactor on the input side of the drive frequently to start and stop the motor.

Failure to comply could result in damage to the drive.

Follow cooling fan replacement instructions. The cooling fan cannot operate properly when it is installed incorrectly and could seriously damage the drive.

Follow the instructions in this manual to replace the cooling fan, making sure that the label is on top before inserting the cooling fan into the drive. To ensure maximum useful product life, replace both cooling fans when performing maintenance.

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.

Do not carelessly connect parts or devices to the drives braking transistor terminals.

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

Carefully review instruction manual TOBPC72060000 when connecting a braking option to the drive.

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 interrupter.

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.

Be sure the digital operator has been removed prior to opening the front cover or reattaching it.

Leaving the digital operator plugged into the drive when removing the front cover can result in erroneous operation caused by a poor connection. Before reattaching the operator, make sure the front cover has been firmly fastened back into place.

Do not connect control circuit ground terminals to the drive enclosure.

Improper drive grounding can cause control circuit malfunction.

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 not have the desired effect when the terminal is activated.

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.

Do not check signals while the drive is running.

The equipment may be damaged.

Make sure wiring to motor terminals U, V, and W connect the corresponding U/T1, V/T2, and W/T3 output terminals on the drive.

Wiring to the wrong terminals will reverse the phase order, causing the motor to operate in reverse. This could cause the elevator car to fall when attempting to go up.

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.

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

Separate wiring for digital output terminals MA, MB, MC and M1 to M6 from wiring to other control circuit lines.

Improper wiring practices could result in drive or equipment malfunction or nuisance trips.

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 perform a withstand voltage test on any part of the drive.

Failure to comply could result in damage to the sensitive devices within the drive.

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.

Never connect the power supply lines to output terminals U/T1, V/T2, or W/T3. Doing so will destroy the drive. Be sure to perform a final check of all sequence wiring and other connections before turning the power on.

Make sure there are no short circuits on the control terminals (+V, AC, etc.), as this could damage the drive.

Do not check signals while the drive is running.

The equipment may be damaged.

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.

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.

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.

Connect the shield of shielded cable to the appropriate ground terminal.

Improper equipment grounding could result in drive or equipment malfunction or nuisance trips.

Do not share ground wiring with devices requiring a large amount of current for operation.

Improper equipment grounding could result in drive or equipment malfunction due to electrical interference.

When using more than one drive, ground multiple drives according to instructions.

Improper equipment grounding could result in abnormal operation of drive or equipment.

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.

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.

Never connect or disconnect the motor from the drive while the drive is outputting voltage.

Improper equipment sequencing could result in damage to the drive.

When the input voltage is 440 V or higher or the wiring distance is greater than 100 meters, pay special attention to the motor insulation voltage or use a drive-rated motor with reinforced insulation.

Failure to comply could lead to motor winding failure.

NOTICE

The signal lines between the drive and the operator station or peripheral equipment should not exceed 50 meters when using an analog signal from a remote source to supply the speed reference.

Failure to comply could result in poor system performance.

Do not connect magnetic contactors to the output motor circuits without proper sequencing.

Improper sequencing of output motor circuits could result in damage to the drive.

Use a magnetic contactor (MC) to ensure that power to the drive can be completely shut off when necessary.

The MC should be wired so that it opens when a fault output terminal is triggered.

Prevent foreign matter such as metal shavings or wire clippings from falling into the drive during drive installation and project construction.

Failure to comply could result in damage to the drive.

Place a temporary cover over the top during installation. Be sure to remove the temporary cover before start-up, as the cover will reduce ventilation and cause the unit to overheat.

A motor connected to a PWM drive may operate at a higher temperature than motor supplied from the normal power supply and the wider operating speed range may affect the motor cooling capacity.

Ensure that the motor is suitable for drive duty and/or the motor service factor is adequate to accommodate the additional heating with the intended operating conditions.

Operating the motor in the low-speed range diminishes the cooling effects, increases motor temperature, and may lead to motor damage by overheating.

Reduce the motor torque in the low-speed range whenever using a standard blower cooled motor. If 100% torque is required continuously at low speed, consider using a special drive or vector-control motor. Select a motor that is compatible with the required load torque and operating speed range.

The speed range for continuous operation differs according to the lubrication method and motor manufacturer.

If the motor is to be operated at a speed higher than the rated speed, consult with the manufacturer. Continuously operating an oil-lubricated motor in the low-speed range may result in burning.

Motor vibration may increase when operating a machine in variable-speed mode, if that machine previously operated at a constant speed.

Install vibration-proof rubber on the motor base.

The motor may require more acceleration torque with drive operation than with a commercial power supply.

Set a proper V/f pattern by checking the load torque characteristics of the elevator to be used with the motor.

Never 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.

◆ Application Notes

■ 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 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.

■ Settings

DC Injection Braking

Motor overheat can result if there is too much current used during DC Injection Braking, or if the time for DC Injection Braking is too long.

Acceleration and Deceleration Ramp

Acceleration and deceleration ramp for the motor are determined by the how much torque can be generated, the amount of load torque, and the inertia moment ($\frac{GD^2}{4}$). A faster acceleration ramp may trigger the drive's Stall Prevention function, which in turn may lower the acceleration ramp. Lowering the acceleration ramp can eliminate the need for Stall Prevention, thus ensuring the elevator car moves at the designated acceleration ramp. For a higher acceleration ramp without triggering Stall Prevention, select a drive with a larger capacity.

■ General Handling

Selecting a Circuit Breaker or Earth Leakage Circuit Breaker

Yaskawa recommends installing an ELCB (Earth Leakage Circuit Breaker) to the power supply side. The ELCB should be designed for use with an AC drive (e.g. Type B according to IEC 60755).

Select a MCCB (Molded Case Circuit Breaker) or ELCB 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. Also refer to [Installing a Molded Case Circuit Breaker \(MCCB\) on page 284](#).

Magnetic Contactor Installation

Use a magnetic contactor (MC) on the power supply side to ensure that power to the drive can be completely shut off when necessary. The MC should be wired so that it opens when a fault output terminal is triggered.

Do not use a magnetic contactor on the power supply side to frequently start and stop the motor. Failure to comply could result in damage to the drive.

Inspection and Maintenance

Capacitors in the drive take time to discharge even after the power has been shut off. After shutting off the power, wait for at least the amount of time specified on the drive before touching any components.

The heatsink can become quite hot during operation, and proper precautions should be taken 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.

Even when the power has been shut off for a drive running a PM motor, voltage continues to be generated at the motor terminals while the motor coasts to stop. Take the precautions described below to prevent shock and injury:

- Applications where the machine can still rotate even though the drive has fully stopped should have a magnetic contactor installed to the output side of the drive.
- Do not allow an external force to rotate the motor beyond the maximum allowable speed, also when the drive has been shut off.

- Wait for at least the time specified on the warning label after opening the magnetic contactor 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 motor contactor.

Wiring

All wire ends should use ring terminals for UL/cUL compliance. Use only the tools recommended by the terminal manufacturer for crimping.

◆ Notes on Motor Operation

■ Using a Standard Motor

Insulation Tolerance

Consider voltage tolerance levels and insulation in applications with an input voltage of over 440 V or particularly long wiring distances. Contact Yaskawa or your Yaskawa agent for consultation.

High Speed Operation

Problems may occur with the motor bearings and dynamic balance of the machine when operating a motor beyond its rated speed. Contact the motor or machine manufacturer.

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

L1000A lets the user choose between high carrier PWM control and low carrier PWM. Selecting high carrier PWM can help reduce motor oscillation.

Take particular caution when using a variable speed drive for an elevator that is conventionally run from line power at a constant speed. If resonance occurs, shock-absorbing rubber should be installed around the base of the motor.

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.

■ Using a PM Motor

- 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.
- When using a PM motor for the first time, or when replacing the drive or PM motor, always make sure that motor parameter have been set properly and the speed detection function accurately prior to operation.
Using a PM motor requires that the encoder offset be set correctly in addition to entering motor data to corresponding parameters. If the motor, encoder, or drive is ever replaced, be sure to reset the value for the encoder offset.
- When using a PM motor with a different speed feedback option than a PG-F3 card together with an external brake sequence, make sure the brake is not released before Initial Magnetic Pole Search has been finished. Use the Initial Pole Search Status signal (H2-□□ = 61) to interlock the brake.
Failure to comply can cause the counterweight to pull on the elevator car, resulting in personal injury.
- 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.

◆ Drive Label Warnings

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

⚠ WARNING

⚡ Risk of electric shock.

- Read manual before installing.
- Wait 5 minutes for capacitor discharge after disconnecting power supply.
- To conform to CE requirements, make sure to ground the supply neutral for 400V class.
- After opening the manual switch between the drive and motor, please wait 5 minutes before inspecting, performing maintenance or wiring the drive.

🔥 Hot surfaces

- Top and Side surfaces may become hot. Do not touch.

Figure i.1 Warning Information

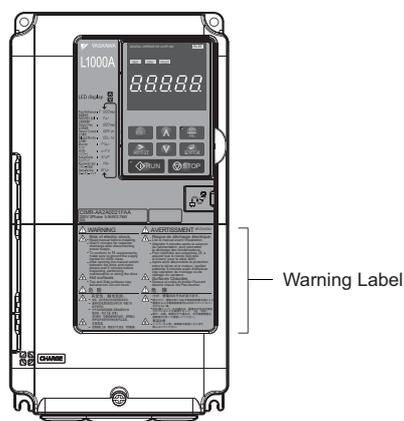


Figure i.2 Warning Information Position

◆ Warranty Information

■ Restrictions

L1000A was 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.

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.



Receiving

This chapter explains how to inspect the drive upon receipt, and gives an overview of the different enclosure types and components.

1.1 SECTION SAFETY	28
1.2 GENERAL DESCRIPTION	29
1.3 MODEL NUMBER AND NAMEPLATE CHECK	31
1.4 COMPONENT NAMES	33

1.1 Section Safety

CAUTION

Preventing Injury

Whenever transporting the drive, make sure that the drive is held securely by outside case.

The drive cannot be held securely by simply grabbing on to the front cover or terminal cover. Dropping the drive can damage the drive itself and result in personal injury.

NOTICE

Equipment Hazard

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.

A motor connected to a PWM drive may operate at a higher temperature than motor supplied from the normal power supply and the wider operating speed range may affect the motor cooling capacity.

Ensure that the motor is suitable for drive duty and/or the motor service factor is adequate to accommodate the additional heating with the intended operating conditions.

1.2 General Description

◆ L1000A Model Overview

L1000A models are offered in [Table 1.1](#).

Table 1.1 L1000A Models

Motor Power (kW)	3-Phase 200 V Class		3-Phase 400 V Class	
	Model CIMR-L□	Rated Output Current (A)	Model CIMR-L□	Rated Output Current (A)
3.7	2A0018	17.5 <1>	4A0009	9.2 <1>
5.5	2A0025	25 <1>	4A0015	14.8 <1>
7.5	2A0033	33 <1>	4A0018	18 <1>
11	2A0047	47 <1>	4A0024	24 <1>
15	2A0060	60 <1>	4A0031	31 <1>
18.5	2A0075	75 <1>	4A0039	39 <1>
22	2A0085	85 <1>	4A0045	45 <1>
30	2A0115	115 <1>	4A0060	60 <1>
37	2A0145	145 <2>	4A0075	75 <1>
45	2A0180	180 <2>	4A0091	91 <1>
55	–	–	4A0112	112 <2>
75	–	–	4A0150	150 <2>

<1> These values assume the carrier frequency is not set higher than 8 kHz.

<2> These values assume the carrier frequency is not set higher than 5 kHz.

Note: The drive automatically decreases the rated output current when setting higher carrier frequency.

1.2 General Description

◆ Control Mode Selection

Table 1.2 gives an overview of the L1000A control modes and their various features.

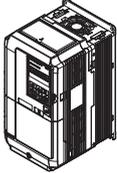
Table 1.2 Control Modes and their Features

Motor Type		Induction Motors			Permanent Magnet Motors	Comments
Control Mode		V/f	OLV	CLV	CLV/PM	–
Parameter Setting		A1-02 = 0	A1-02 = 2	A1-02 = 3	A1-02 = 7	Default Setting is V/f Control.
Basic Description		V/f control	Open Loop Vector control	Closed Loop Vector control	Closed Loop Vector control for PM motors	–
Type of Applications	Motor Type	IM	IM	IM	PM	–
PG Option Card		N/A	N/A	YES	YES	–
Control Characteristics	Speed Control Range	1:40	1:200	1:1500	1:1500	May fluctuate with characteristics and motor temperature.
	Speed Accuracy	±2 to 3%	±0.2%	±0.02%	±0.02%	Speed deviation when operating at constant speed. May fluctuate with characteristics and motor temperature.
	Speed Response	3 Hz (approx.)	10 Hz	50 Hz	50 Hz	Max. frequency of a speed reference signal that the drive can follow. May fluctuate with characteristics and motor temperature.
	Starting Torque	150% at 3 Hz	200% at 0.3 Hz	200% at 0 r/min	200% at 0 r/min	May fluctuate with characteristics and motor temperature. Performance may differ by capacity.
Application-Specific	Auto-Tuning	Line to line resistance	<ul style="list-style-type: none"> Rotational Stationary Line to line resistance 	<ul style="list-style-type: none"> Rotational Stationary Line to line resistance 	<ul style="list-style-type: none"> Stationary Stationary Stator Resistance Encoder Offset Rotational Back EMF Constant 	Automatically adjusts parameter settings that concern electrical characteristics of the motor.
	Torque Limit	N/A	YES	YES	YES	Sets the maximum torque for the motor to protect the load and connected machinery.
	Droop Function	N/A	N/A	YES	YES	Controls the load sharing between two motors that drive the same mechanical system.
	Energy-Saving Control	N/A	N/A	N/A	YES	Saves energy by always operating the motor at its maximum efficiency.
	Inertia Compensation	N/A	N/A	YES	YES	Improves speed accuracy when the load changes by compensating effects of the system inertia.
	DC Injection at Start and Stop/Position Lock	YES (DC injection braking at start and stop)	YES (DC injection braking at start and stop)	YES (Position Lock)	YES (Position Lock)	Builds up motor torque during stop in order to prevent movement of the elevator when the brake is released at start and applied at stop.
	Torque compensation	N/A	N/A	YES	YES	Avoids rollback at start using the analog signal from an external load cell connected to the drive.
	Anti roll back	N/A	N/A	N/A	YES	Prevents roll back at start without any external load signal.
	Slip compensation	YES	YES	N/A	N/A	Adjusts the leveling speed reference in order to improve the stopping accuracy.
Short floor	YES	YES	YES	YES	Optimizes the stopping time at rides where the nominal speed is not reached.	

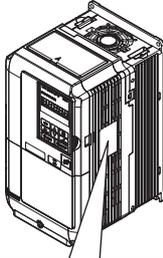
1.3 Model Number and Nameplate Check

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.

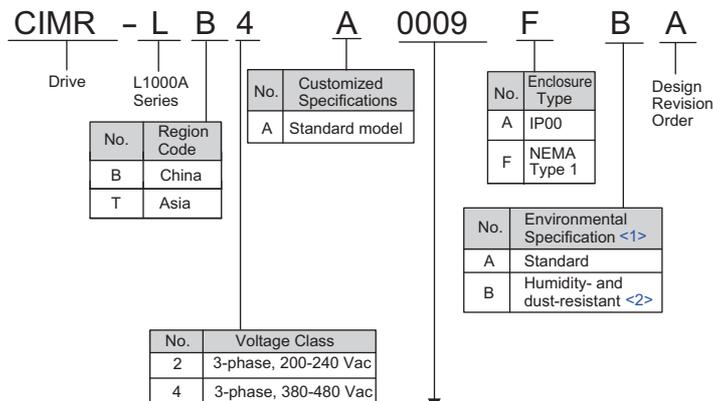
Description	Drive	Controller Power Supply Cable for Rescue Operation	Quick Start Guide
			
Quantity	1	1	1

◆ Nameplate



AC drive model	MODEL : CIMR-L□4A0009FAA		
	MAX APPL. MOTOR : 3.7kW REV : A		
Input specifications	INPUT : AC3PH 380-480V 50/60Hz 10.4A	IND. CONT. EQ.	
Output specifications	OUTPUT : AC3PH 0-480V 0-120Hz 9.2A	7J48 B	Software version
	MASS : 3.5 kg PRG : 7010		
Lot number	O/N :		
Serial number	S/N :		
	FILE NO : E131457 IP20		
	TYPE 1 ENCLOSURE		Enclosure type
	YASKAWA ELECTRIC CORPORATION	MADE IN JAPAN	

Figure 1.1 Nameplate Information



Refer to the following page.

1.3 Model Number and Nameplate Check

■ Model Code

Three-Phase 200 V			Three-Phase 400 V		
No.	Max. Motor Capacity kW	Rated Output Current A	No.	Max. Motor Capacity kW	Rated Output Current A
0018	3.7	17.5	0009	3.7	9.2
0025	5.5	25	0015	5.5	14.8
0033	7.5	33	0018	7.5	18
0047	11	47	0024	11	24
0060	15	60	0031	15	31
0075	18.5	75	0039	18.5	39
0085	22	85	0045	22	45
0115	30	115	0060	30	60
0145	37	145	0075	37	75
0180	45	180	0091	45	91
			0112	55	112
			0150	75	150

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

<2> The specification is for China localized drives only: CIMR-LB□□A

1.4 Component Names

This section gives an overview of the drive components described in this manual.

- Note:** 1. See [Using the Digital Operator on page 79](#) for a description of the operator keypad.
 2. The drive may have no cooling fans or only one cooling fan depending on the model.

◆ Exploded Views of Drive Components

- Three-Phase AC200 V CIMR-L□2A0018F to 0075F
- Three-Phase AC400 V CIMR-L□4A0009F to 0039F

Table 1.3 Exploded View of NEMA Type 1 Drive Components (CIMR-L□2A0025F)

	A - Fan cover <1>
	B - Cooling fan <1>
	C - Mounting hole
	D - Heatsink
	E - Port CN19 cover
	F - Terminal board
	G - Bottom cover
	H -Rubber bushing
	I - Top protective cover
	J - Front cover
	K - USB port (type-B)
	L - Digital Operator
	M - Terminal cover
	N - Terminal cover screw

<1> The following drive models have a single cooling fan: CIMR-L□2A0018F and 4A0009F.

◆ IP00 Enclosure

- Three-Phase AC200 V CIMR-L□2A0085A, 0115A
- Three-Phase AC400 V CIMR-L□4A0045A to 0091A

Table 1.4 Exploded View of IP00 Drive Components (CIMR-L□2A0085A)

	A - Fan cover
	B - Cooling fan
	C - Mounting hole
	D - Heatsink
	E - Port CN19 cover
	F - Terminal board
	G - Front cover
	H - USB port (type-B)
	I - Front cover screw
	J - Digital operator
	K - Drive Cover
	L - Terminal cover

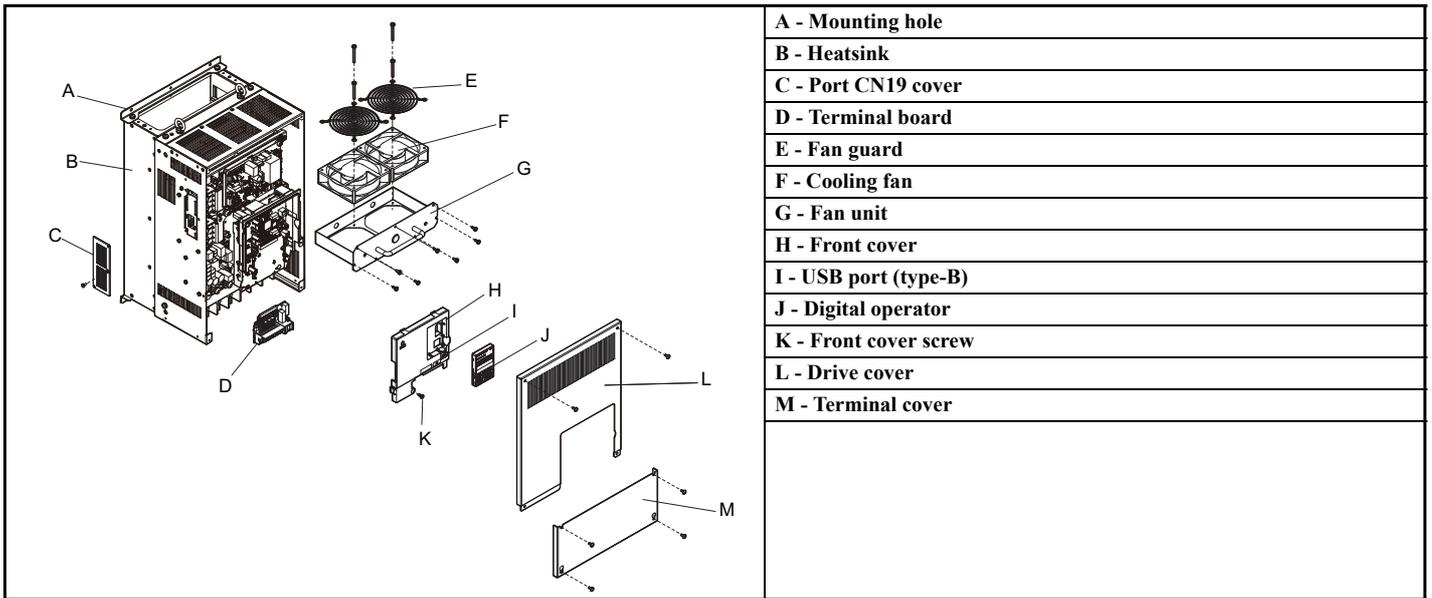
Receiving

1

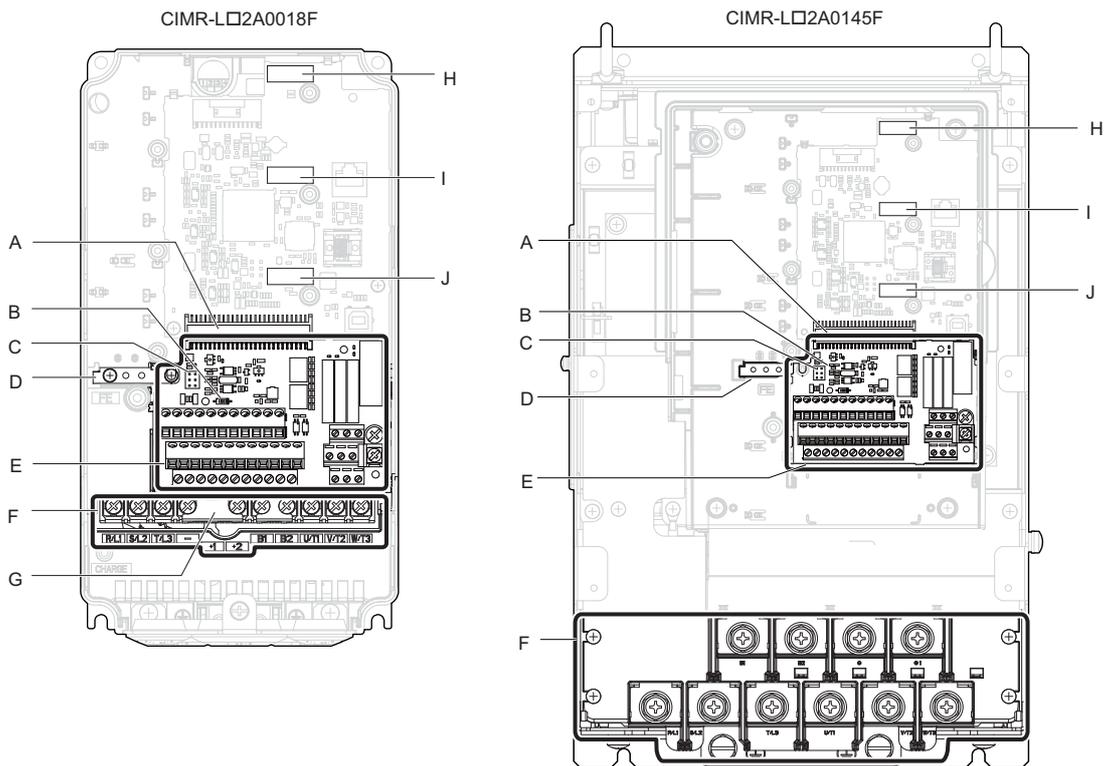
1.4 Component Names

■ Three-Phase AC200 V CIMR-L□2A0145A, 0180A Three-Phase AC400 V CIMR-L□4A0112A to 0150A

Table 1.5 Exploded view of IP00 Drive Type Components (CIMR-L□4A0150A)



◆ Front Views



- A – Terminal board connector
- B – DIP switch S2 (*Refer to MEMOBUS/ Modbus Termination on page 72*)
- C – Jumper S3 (*Refer to Sinking/Sourcing Mode Selection for Safe Disable Inputs on page 69*)
- D – Ground terminal
- E – Terminal board (*Refer to Control Circuit Wiring on page 64*)

- F – Main circuit terminal (*Refer to Wiring the Main Circuit Terminal on page 63*)
- G – Protecting cover to prevent miswiring
- H – Option card connector (CN5-C)
- I – Option card connector (CN5-B)
- J – Option card connector (CN5-A)

Figure 1.2 Front View of Drives



Mechanical Installation

This chapter explains how to properly mount and install the drive.

2.1 SECTION SAFETY	36
2.2 MECHANICAL INSTALLATION	37

2.1 Section Safety

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 multiple drives are placed inside the same enclosure panel, install proper cooling to ensure air entering the enclosure does not exceed 40°C.

CAUTION

Crush Hazard

Whenever transporting the drive, make sure that the drive is held securely by outside case.

The drive cannot be held securely by simply grabbing on to the front cover or terminal cover. Dropping the drive can damage the drive itself and result in personal injury.

NOTICE

Equipment Hazard

Prevent foreign matter such as metal shavings or wire clippings from falling into the drive during drive installation and project construction.

Failure to comply could result in damage to the drive.

Place a temporary cover over the top during installation. Be sure to remove the temporary cover before start-up, as the cover will reduce ventilation and cause the unit to overheat.

Observe proper electrostatic discharge (ESD) procedures when handling the drive.

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

Operating the motor in the low-speed range diminishes the cooling effects, increases motor temperature, and may lead to motor damage by overheating.

Reduce the motor torque in the low-speed range whenever using a standard blower cooled motor. If 100% torque is required continuously at low speed, consider using a special drive or vector-control motor. Select a motor that is compatible with the required load torque and operating speed range.

The speed range for continuous operation differs according to the lubrication method and motor manufacturer.

If the motor is to be operated at a speed higher than the rated speed, consult with the manufacturer.

Continuously operating an oil-lubricated motor in the low-speed range may result in burning.

When the input voltage is 440 V or higher or the wiring distance is greater than 100 meters, pay special attention to the motor insulation voltage or use a drive-rated motor with reinforced insulation.

Failure to comply could lead to motor winding failure.

Motor vibration may increase when operating a machine in variable-speed mode, if that machine previously operated at a constant speed.

Install vibration-proof rubber on the motor base.

The motor may require more acceleration torque with drive operation than with a commercial power supply.

Set a proper V/f pattern by checking the load torque characteristics of the machine to be used with the motor.

Never lift the drive up while the cover is removed.

This can damage the terminal board and other components.

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.

2.2 Mechanical Installation

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

◆ Installation Environment

To help prolong the optimum performance life of the drive, install the drive in an environment matching the specifications below.

Table 2.1 Installation Environment

Environment	Conditions
Installation Area	Indoors
Ambient Temperature	-10°C to +40°C (NEMA Type 1 enclosure) -10°C to +50°C (IP00 enclosure) 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
Surrounding Area	Install the drive in an area free from: <ul style="list-style-type: none"> • 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 (Refer to Drive Derating Data on page 297)
Vibration	10 to 20 Hz at 9.8 m/s ² 20 to 55 Hz at 5.9 m/s ²
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

■ Installation Orientation

Install the drive upright as illustrated in [Figure 2.1](#) to maintain proper cooling. Refer to [Mechanical Installation on page 37](#) for details on installing the drive.

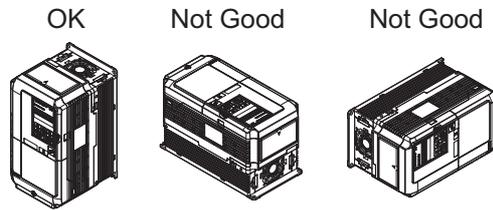


Figure 2.1 Correct Installation Orientation

■ Installation Spacing

[Figure 2.2](#) shows the installation distance required to maintain sufficient space for airflow and wiring.

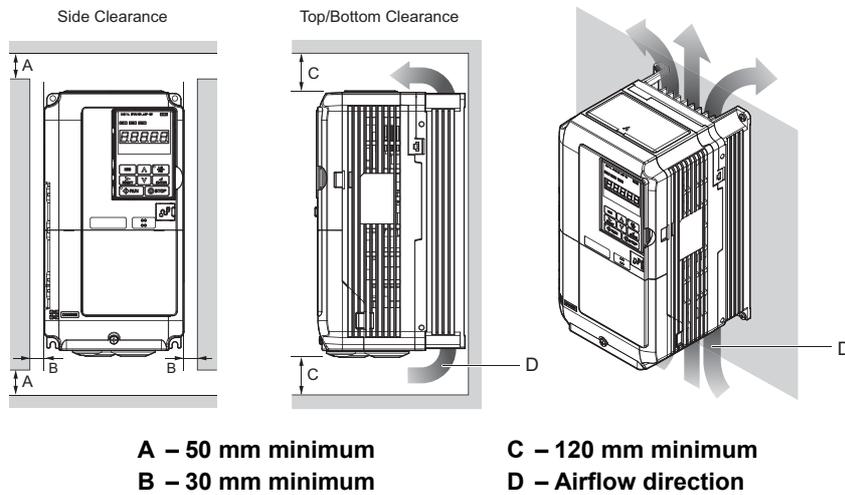


Figure 2.2 Correct Installation Spacing

Note: NEMA Type 1 enclosure and IP00 enclosure models require the same amount of space above and below the drive for installation.

◆ Top Protective Cover

Drive models CIMR-L□2A0018 to 0075 and 4A0009 to 0045 are designed with NEMA Type 1 specifications, and have a top protective cover on the top. Removing this top protective cover voids the NEMA Type 1 conformance but still keeps a protection degree in accordance with IP20 enclosure.

■ Removing the Top Protective Cover

Insert the tip of a straight-edge screwdriver into the small openings located on the front edge of the top protective cover. Gently apply pressure as shown in the figure below to free the cover from the drive.

Note: Removing the top protective cover from a NEMA Type 1 enclosure drive voids the NEMA Type 1 protection but still keeps IP20 conformity.

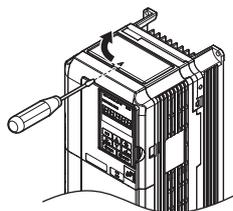


Figure 2.3 Removing the Top Protective Cover

■ Reattaching the Top Protective Cover

Align the small protruding hooks on the sides of the top protective cover with the corresponding mounting holes on the top of the drive. Pinch the hooks inward so that they connect with the mounting holes and fasten the top protective cover back into place.

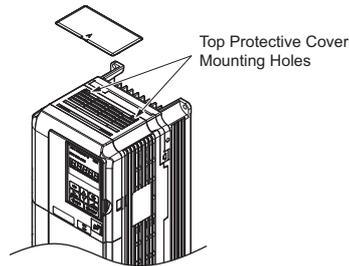


Figure 2.4 Reattaching the Top Protective Cover

◆ Digital Operator Remote Usage

■ Remote Operation

The digital operator mounted on the drive can be removed and connected to the drive using an extension cable up to 3 m long. This makes it easier to operate the drive when it is installed in a location where it can not be accessed easily.

The digital operator can also be permanently mounted in a remote location like a panel door. An extension cable and an installation support set (depending on the installation type) will be required.

Note: Refer to *Drive Options and Peripheral Devices* on page 278 for information on extension cables and installation support sets.

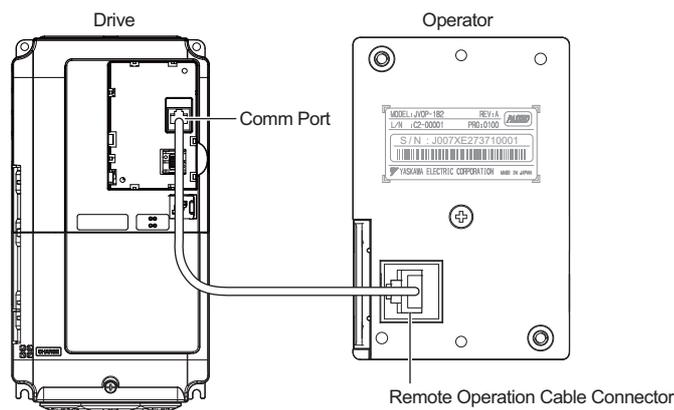


Figure 2.5 Remote Operation Cable Connection

2.2 Mechanical Installation

■ Digital Operator Remote Installation

Digital Operator Dimensions

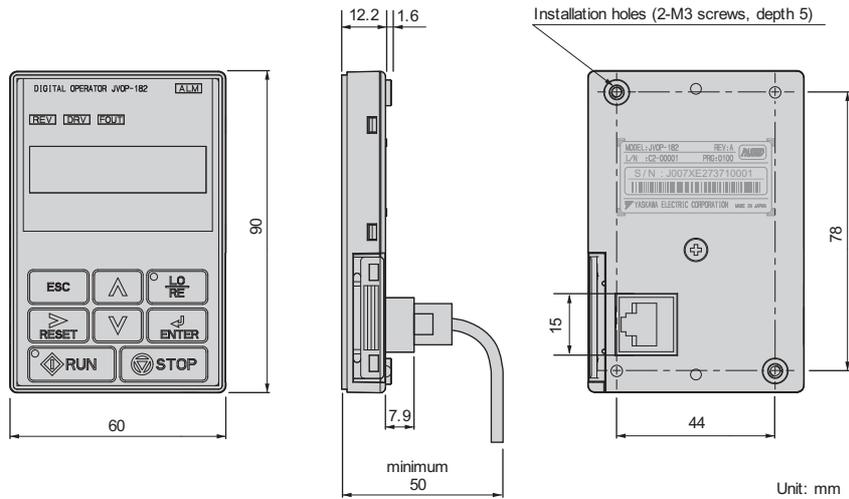


Figure 2.6 Digital Operator Dimensions

Installation Types and Required Materials

There are two ways the digital operator can be mounted to an enclosure:

1. External/face-mount installs the operator outside the enclosure panel
2. Internal/flush-mount installs the operator inside the enclosure panel

Table 2.2 Digital Operator Installation Methods and Required Tools

Installation Method	Description	Installation Support Sets	Model	Required Tools
External/Face-Mount	Simplified installation with the digital operator is mounted on the outside of the panel with two screws.	—	—	Phillips screwdriver (#1)
Internal/Flush-Mount	Encloses the digital operator in the panel. The digital operator is flush with the outside of the panel.	Installation Support Set A (for mounting with screws through holes in the panel)	EZZ020642A	Phillips screwdriver (#1, #2)
		Installation Support Set B (for use with threaded studs that are fixed to the panel)	EZZ020642B	Phillips screwdriver (#1) Wrench (7 mm)

Note: Prevent foreign matter such as metal shavings or wire clippings from falling into the drive during installation and project construction. 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.

External/Face-Mount

1. Cut an opening in the enclosure panel for the digital operator as shown in [Figure 2.8](#).
2. Position the digital operator so the display faces outwards, and mount it to the enclosure panel as shown in [Figure 2.7](#).

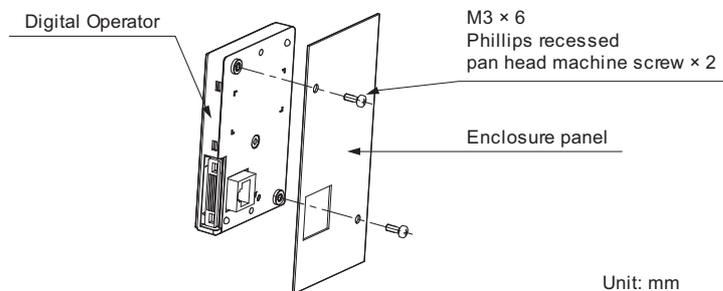
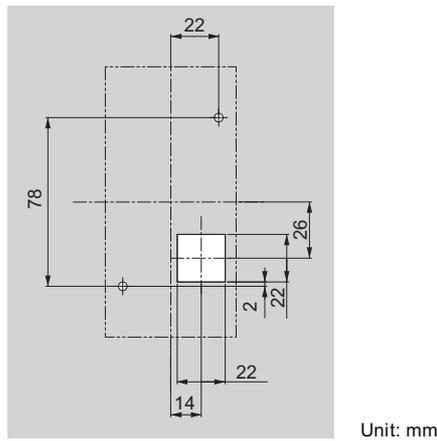


Figure 2.7 External/Face-Mount Installation



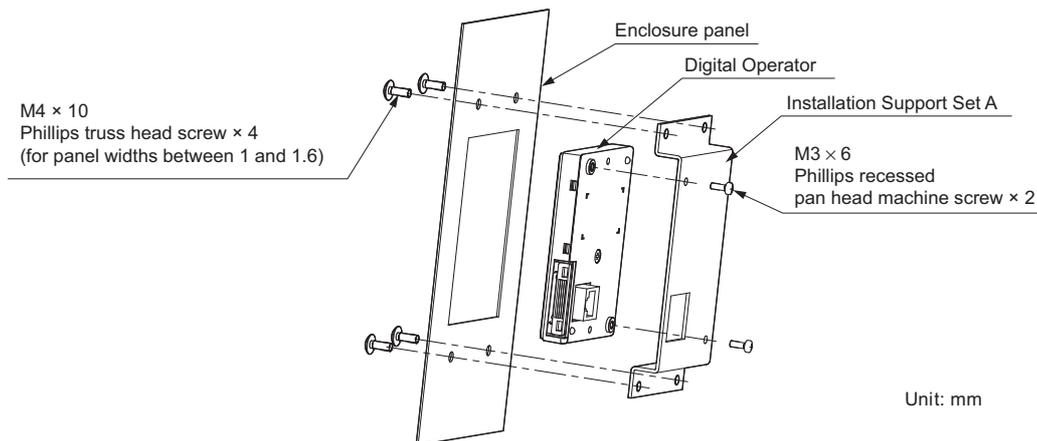
Unit: mm

Figure 2.8 Panel Cut-Out Dimensions (External/Face-Mount Installation)

Internal/Flush-Mount

An internal flush-mount requires an installation support set that must be purchased separately. Contact your Yaskawa representative to order an installation support set and mounting hardware. *Figure 2.9* illustrates how to attach the Installation Support Set A.

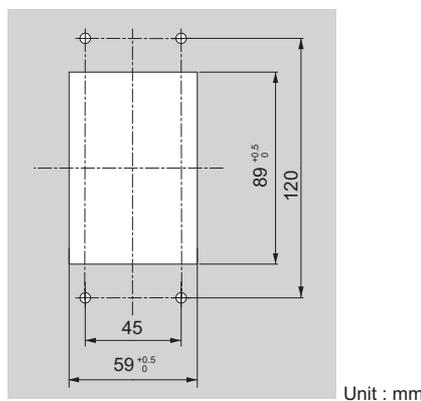
1. Cut an opening in the enclosure panel for the digital operator as shown in *Figure 2.10*.
2. Mount the digital operator to the installation support.
3. Mount the installation support set and digital operator to the enclosure panel.



Unit: mm

Figure 2.9 Internal/Flush Mount Installation

Note: For environments with a significant amount of dust or other airborne debris, use a gasket between the enclosure panel and the digital operator.



Unit : mm

Figure 2.10 Panel Cut-Out Dimensions (Internal/Flush-Mount Installation)

2.2 Mechanical Installation

◆ Exterior and Mounting Dimensions

■ NEMA Type 1 Enclosure Drives

Note: NEMA Type 1 enclosure drives are equipped with a top cover. Removing this cover voids NEMA Type 1 protection but still keeps IP20 conformity.

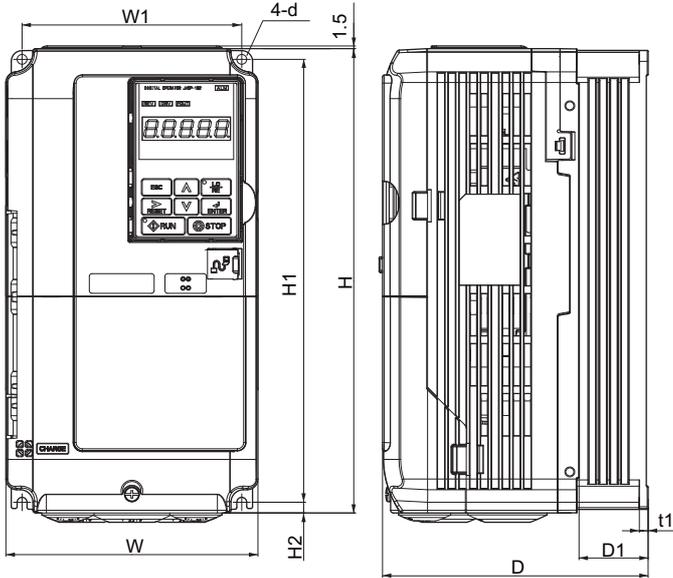


Figure 1

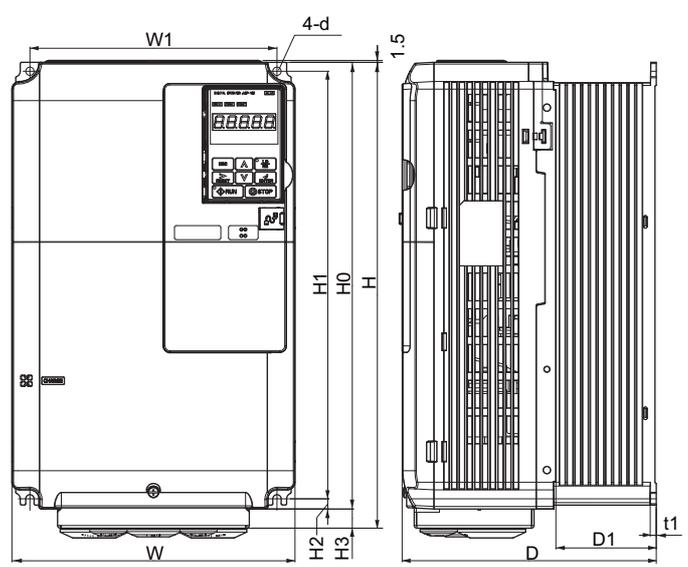


Figure 2

Table 2.3 Dimensions for NEMA Type 1 Enclosure: 200 V Class

Drive Model CIMR-L□2A	Dimensions (mm)													Weight (kg)
	Figure	W	H	D	W1	H1	H0	H2	H3	D1	t1	t2	d	
0018	1 <->	140	260	164	122	248	–	6	–	55	5	–	M5	3.5
0025		140	260	167	122	248	–	6	–	55	5	–	M5	4.0
0033		140	260	167	122	248	–	6	–	55	5	–	M5	4.0
0047		180	300	187	160	284	–	8	–	75	5	–	M5	5.6
0060		220	350	197	192	335	–	8	–	78	5	–	M6	8.7
0075	2	220	365	197	192	335	350	8	15	78	5	–	M6	9.7

<1> Removing the top protective cover from a NEMA Type 1 drive voids NEMA Type 1 protection but still keeps IP20 conformity.

Table 2.4 Dimensions for NEMA Type 1 Enclosure: 400 V Class

Drive Model CIMR-L□4A	Dimensions (mm)													Weight (kg)
	Figure	W	H	D	W1	H1	H0	H2	H3	D1	t1	t2	d	
0009	1 <->	140	260	164	122	248	–	6	–	55	5	–	M5	3.5
0015		140	260	167	122	248	–	6	–	55	5	–	M5	3.9
0018		140	260	167	122	248	–	6	–	55	5	–	M5	3.9
0024		180	300	167	160	284	–	8	–	55	5	–	M5	5.4
0031		180	300	187	160	284	–	8	–	75	5	–	M5	5.7
0039		220	350	197	192	335	–	8	–	78	5	–	M6	8.3

<1> Removing the top protective cover from a NEMA Type 1 drive voids NEMA Type 1 protection but still keeps IP20 conformity.

■ IP00 Enclosure Drives

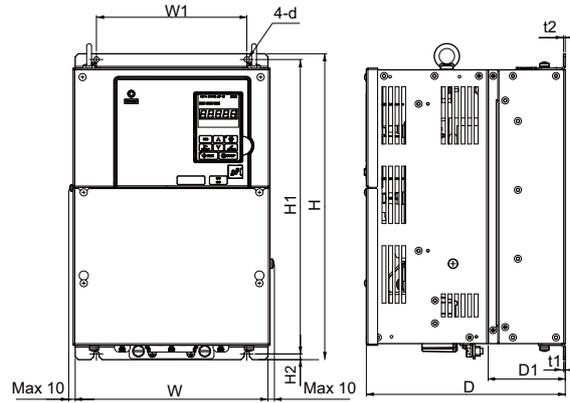


Figure 1

Table 2.5 Dimensions for IP00 Enclosure: 200 V Class

Drive Model CIMR-L□2A	Dimensions (mm)											
	Figure	W	H	D	W1	H1	H2	D1	t1	t2	d	Weight (kg)
0085	1	250	400	258	195	385	7.5	100	2.3	2.3	M6	21
0115		275	450	258	220	435	7.5	100	2.3	2.3	M6	25
0145		325	550	283	260	535	7.5	110	2.3	2.3	M6	37
0180		325	550	283	260	535	7.5	110	2.3	2.3	M6	38

Table 2.6 Dimensions for IP00 Enclosure: 400 V Class

Drive Model CIMR-L□4A	Dimensions (mm)											
	Figure	W	H	D	W1	H1	H2	D1	t1	t2	d	Weight (kg)
0045	1	250	400	258	195	385	7.5	100	2.3	2.3	M6	21
0060		275	450	258	220	435	7.5	100	2.3	2.3	M6	25
0075		325	510	258	260	495	7.5	105	2.3	3.2	M6	36
0091		325	510	258	260	495	7.5	105	2.3	3.2	M6	36
0112		325	550	283	260	535	7.5	110	2.3	2.3	M6	41
0150		325	550	283	260	535	7.5	110	2.3	2.3	M6	42



Electrical Installation

This chapter explains proper procedures for wiring the control circuit terminals, motor, and power supply.

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3.1 Section Safety

DANGER

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 any 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.

The internal capacitor remains charged even after the power supply is turned off.

Failure to comply can result in serious electric shock.

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.

Double check the emergency stop sequence once wiring is complete. The emergency stop circuitry is crucial for safety to ensure that the application can stop immediately.

Failing to properly verify all emergency stop wiring could result in serious personal injury.

Confirm the drive I/O signals and external sequence before starting test run.

Failure to comply may result in death or serious injury.

Ensuring Safety during Auto-Tuning

When using a PM motor for the first time, or when replacing the drive or PM motor, always make sure that motor parameters have been set properly and the speed detection function accurately prior to operation.

Using a PM motor requires that the encoder offset be set correctly in addition to entering motor data to corresponding parameters. If the motor, encoder, or drive is ever replaced, be sure to perform Encoder Offset Auto-Tuning.

Insufficient torque can cause the elevator car to move in the direction of the load, or cause the motor to behave erratically (reverse operation, stand still, sudden accelerations, etc.).

For more information, refer to the instruction manual included with the motor.

Electrical Shock Hazard

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.

Always ground the motor-side grounding terminal.

Improper equipment grounding could result in death or serious injury by contacting the motor case.

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.

Do not allow unqualified personnel to use 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.

⚠ WARNING**Keep the protective earthing conductor as short as possible.**

Improper equipment grounding may cause dangerous electrical potentials on equipment chassis, which could result in death or serious injury.

Make sure all ground terminals have been properly grounded: Grounding resistance up to 100 Ω for the 200 V class, or up to 10 Ω for the 400 V class.

Improper equipment grounding could result in death or serious injury by contacting ungrounded electrical equipment.

Do not remove covers or touch circuit boards while the power is on.

Failure to comply could result in death or serious injury.

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.

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.

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.

When installing a dynamic braking resistor or optional Braking Resistor Unit, perform all wiring exactly as specified in the wiring diagrams provided.

Failure to comply can result in fire. Improper wiring may damage braking components.

The braking resistor connection terminals are B1 and B2. Do not connect a braking resistor directly to any other terminals.

Improper wiring connections could result in death or serious injury by fire. Failure to comply may result in damage to the braking circuit or drive.

⚠ CAUTION**Crush Hazard****Whenever transporting the drive, make sure that the drive is held securely by outside case.**

The drive cannot be held securely by simply grabbing on to the front cover or terminal cover. Dropping the drive can damage the drive itself and result in personal injury.

NOTICE

Equipment Hazard

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.

Never connect the power supply lines to output terminals U/T1, V/T2, or W/T3. Doing so will destroy the drive.

Be sure to perform a final check of all sequence wiring and other connections before turning the power on.

Make sure there are no short circuits on the control terminals (+V, AC, etc.), as this could damage the drive.

Never connect or disconnect the motor from the drive while the drive is outputting voltage.

Improper equipment sequencing could result in damage to the drive.

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.

Do not carelessly connect parts or devices to the drives braking transistor terminals.

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

Carefully review instruction manual TOBPC72060000 when connecting a braking option to the drive.

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.

Check all the wiring 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.

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) and 480 Vac maximum (400 V Class).

Inadequate wiring could result in damage to the drive.

When the input voltage is 440 V or higher or the wiring distance is greater than 100 meters, pay special attention to the motor insulation voltage or use a drive-rated motor with reinforced insulation.

Failure to comply could lead to motor winding failure.

Do not connect control circuit ground terminals to the drive enclosure.

Improper drive grounding can cause control circuit malfunction.

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 not have the desired effect when the terminal is activated.

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.

Be sure the digital operator has been removed prior to opening the front cover or reattaching it.

Leaving the digital operator plugged into the drive when removing the front cover can result in erroneous operation caused by a poor connection. Before reattaching the operator, make sure the front cover has been firmly fastened back into place.

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.

Make sure wiring to motor terminals U, V, and W connect the corresponding U/T1, V/T2, and W/T3 output terminals on the drive.

Wiring to the wrong terminals will reverse the phase order, causing the motor to operate in reverse. This could cause the elevator car to fall when attempting to go up.

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 electric leakage circuit breaker.

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.

When using more than one drive, ground multiple drives according to instructions.

Improper equipment grounding could result in abnormal operation of drive or equipment.

Use a magnetic contactor (MC) to ensure that power to the drive can be completely shut off when necessary.

The MC should be wired so that it opens when a fault output terminal is triggered.

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.

Separate wiring for digital output terminals MA, MB, MC and M1 to M6 from wiring to other control circuit lines.

Improper wiring practices could result in drive or equipment malfunction or nuisance trips.

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.

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.

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.

The signal lines between the drive and the operator station or peripheral equipment should not exceed 50 meters when using an analog signal from a remote source to supply the speed reference.

Failure to comply could result in poor system performance.

3.2 Standard Connection Diagram

Connect the drive and peripheral devices as shown in [Figure 3.1](#). 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 75](#) for instructions on operating the drive.

WARNING! Make sure the elevator is stopped by the mechanical brake system in case of a drive fault or malfunction. A fault in the drive will cause the output to be shut off, leaving the motor in an uncontrolled state.

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) and 480 Vac maximum (400 V Class).

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

NOTICE: Do not connect control circuit ground terminals to the drive enclosure.

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.

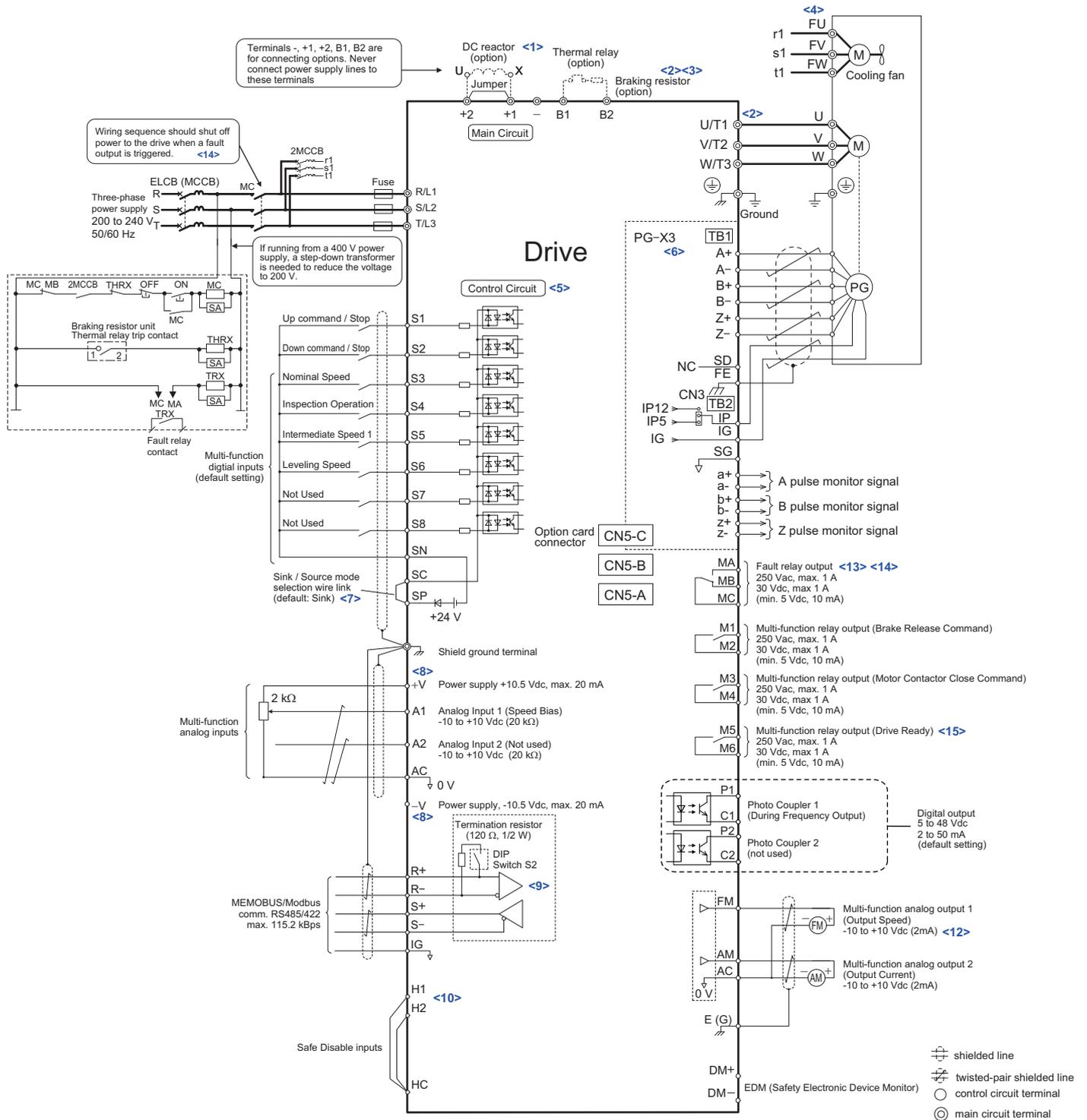


Figure 3.1 Drive Standard Connection Diagram (example: CIMR-L□2A0033)

- <1> Remove the jumper when installing a DC reactor. Models CIMR-L□2A0085 through 2A0180 and 4A0045 through 4A0150 come with a built-in DC reactor.
- <2> The drive's protection function for the internal braking transistor needs to be disabled (L8-55 = 0) if using a regen unit such as a regen converter or some type of braking option unit (and therefore not the internal braking transistor).
- <3> If the braking resistor is equipped with a thermal relay, use this thermal relay to shut off the drive power supply in case the braking resistor overheats.
- <4> Self-cooling motors do not require wiring that would be necessary with motors using a cooling fan.
- <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 shows 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 and SC-SN for Source mode. Leave it out for external power supply. Never short terminals SP and SN as doing so 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 this can cause erroneous operation or damage the drive.

Electrical Installation

3.2 Standard Connection Diagram

- <9> Enable the termination resistor in the last drive in a MEMOBUS network by setting DIP switch S2 to the ON position.
- <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 69](#) for instructions.
- <11> Disconnect the wire jumper between H1 - HC and H2 - HC when utilizing the Safe Disable input.
- <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> Note that if the drive is set to trigger a fault output whenever the fault restart function is activated ($L5-02 = 1$), then a sequence to interrupt power when a fault occurs will result in shutting off the power to the drive as the drive attempts to restart itself. The default setting for L5-02 is 0 (fault output not active during restart attempt).
- <14> Be sure to use fault contact outputs MA, MB, and MC. Wire these terminals so that a fault will open the safety chain and interrupt drive output.
- <15> When the Programming Mode and editing 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 but no fault is present, then use the "Drive ready" signal (the default setting for terminal M5-M6) to interlock components.
 - Note:** 1. The drive should be implemented in the system in a way so that a drive fault causes the safety chain to open. Always use terminal MA-MB-MC for this purpose.
 - 2. Even though no fault occurs, the drive can not be started under certain conditions, e.g. when the Digital Operator is left in the Programming Mode. Use the "Drive Ready" output (default set to terminals M5-M6) to interlock operation in such situations.

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.*

WARNING! *When using the automatic fault restart function while the wiring is made to shut off the power supply when a drive fault occurs, make sure the drive is set not to trigger a fault output during fault restart ($L5-02=0$, default). Otherwise the fault restart function can not work properly.*

3.3 Main Circuit Connection Diagram

Refer to diagrams in this section when wiring the drive's main circuit. 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.

◆ **Three-Phase 200 V Class (CIMR-L□2A0018 to 0075)**
Three-Phase 400 V Class (CIMR-L□4A0009 to 0039)

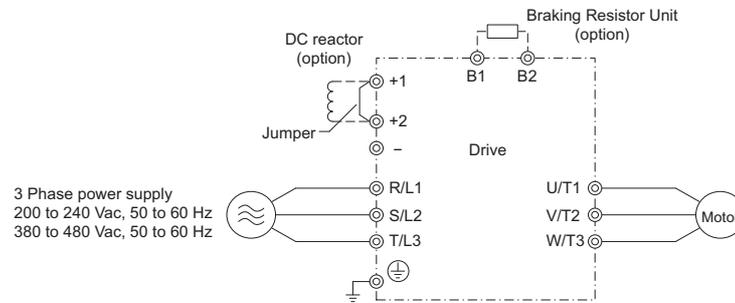


Figure 3.2 Connecting Main Circuit Terminals

◆ **Three-Phase 200 V Class (CIMR-L□2A0085, 0115)**
Three-Phase 400 V Class (CIMR-L□4A0045, 0060)

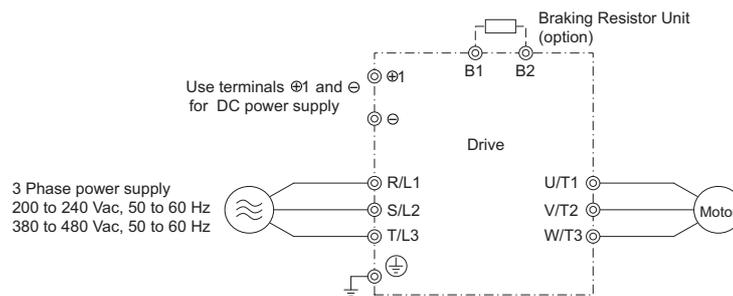


Figure 3.3 Connecting Main Circuit Terminals

◆ **Three-Phase 200 V Class (CIMR-L□2A0145, 0180)**
Three-Phase 400 V Class (CIMR-L□4A0075 to 0150)

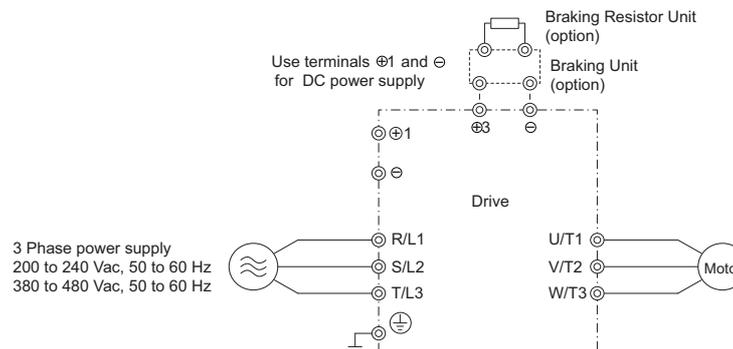


Figure 3.4 Connecting Main Circuit Terminals

3.4 Terminal Block Configuration

Figure 3.5 shows the different main circuit terminal arrangements for the drive capacities.

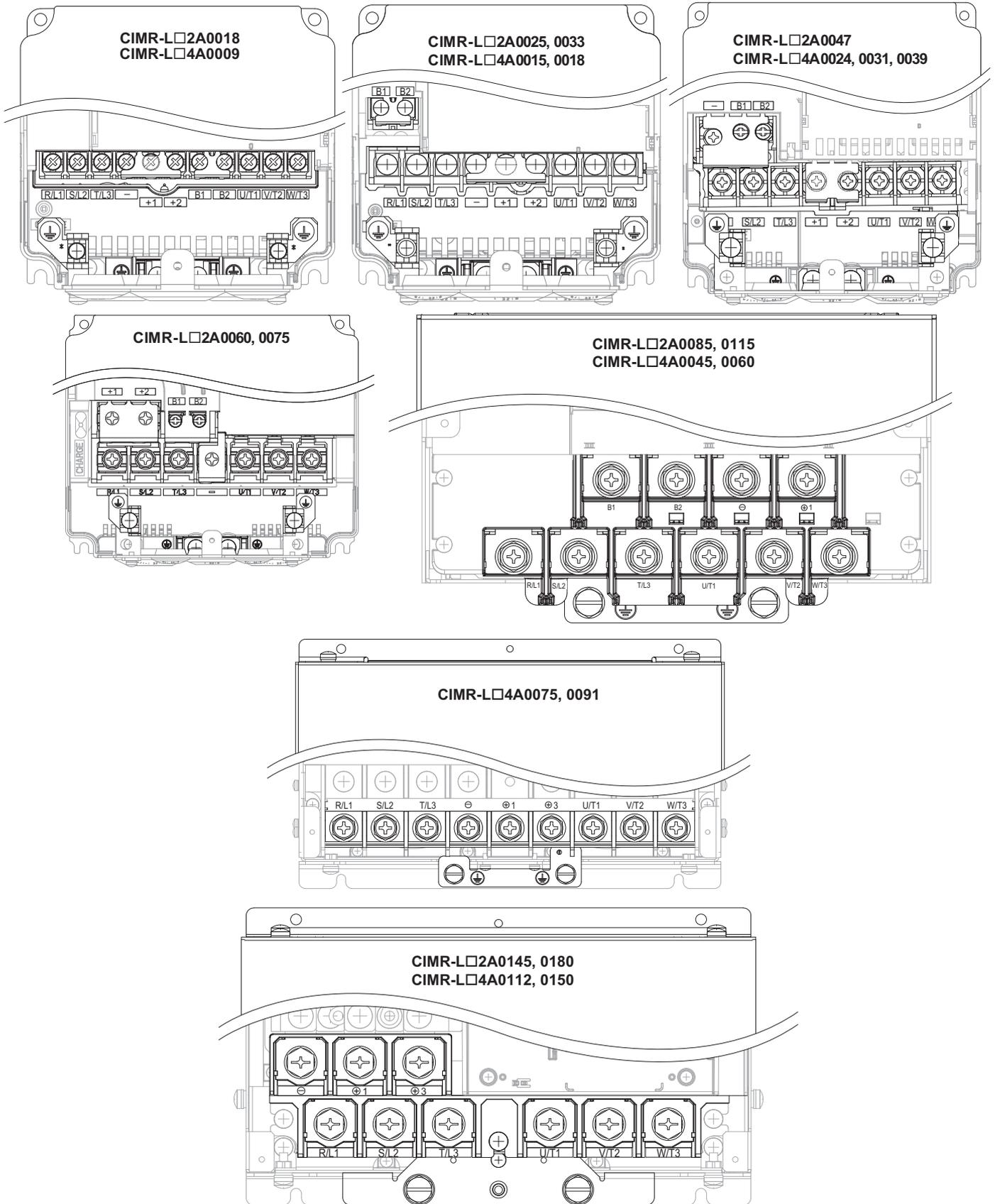


Figure 3.5 Main Circuit Terminal Block Configuration

3.5 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

2A0018 to 2A0075 and 4A0009 to 4A0039

1. Loosen the terminal cover screw.

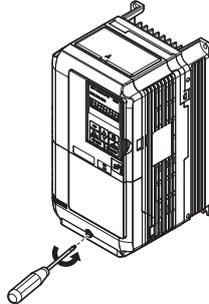


Figure 3.6 Removing the Terminal Cover on a NEMA Type 1 Enclosure Drive

2. Push in on the hook located on the bottom of the terminal cover, and gently pull forward. This should remove the terminal cover.

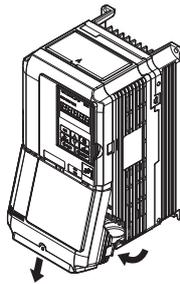


Figure 3.7 Removing the Terminal Cover on a NEMA Type 1 Enclosure Drive

2A0085 to 2A0180 and 4A0045 to 4A0150

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.

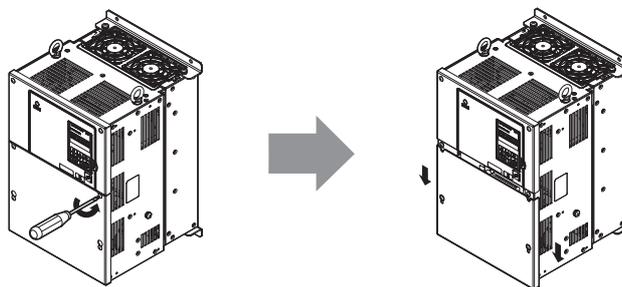


Figure 3.8 Removing the Terminal Cover on an IP00 Enclosure Drive

3.5 Terminal Cover

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

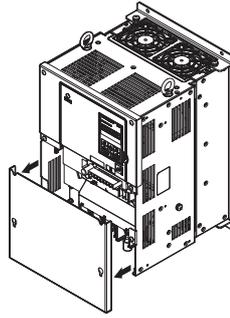


Figure 3.9 Removing the Terminal Cover on an IP00 Enclosure Drive

■ Reattaching the Terminal Cover

2A0018 to 2A0075 and 4A0009 to 4A0039

Power lines and signal wiring should pass through the opening provided. *Refer to Wiring the Main Circuit Terminal on page 63 and Wiring the Control Circuit Terminal on page 67* for details on wiring.

After all wiring to the drive and other devices is complete, reattach the terminal cover.

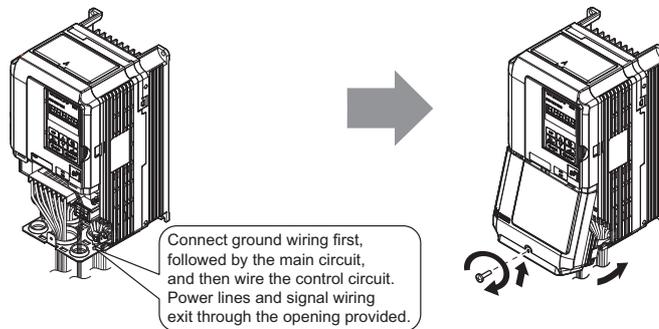


Figure 3.10 Reattaching the Terminal Cover on a NEMA Type 1 Enclosure Drive

2A0085 to 2A0180 and 4A0045 to 4A0150

Once wiring to the terminal board and other devices is complete, double check all connections and finally reattach the terminal cover. *Refer to Wiring the Main Circuit Terminal on page 63 and Wiring the Control Circuit Terminal on page 67* for details on wiring.

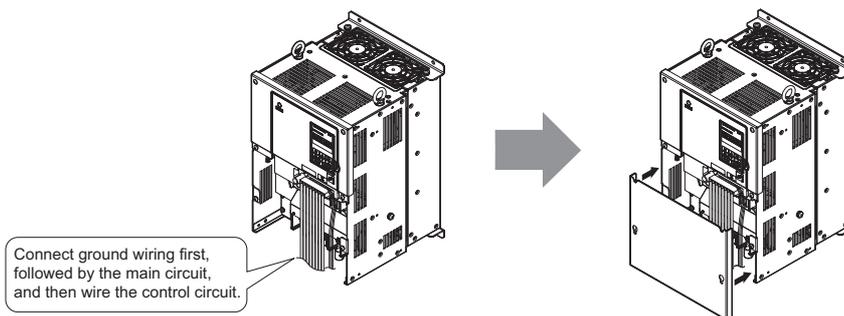


Figure 3.11 Reattaching the Terminal Cover on an IP00 Enclosure Drive

3.6 Digital Operator and Front Cover

The digital operator can be detached from the drive for remote operation, or when the front cover has to be opened to install an option card.

NOTICE: Be sure the digital operator has been removed prior to opening the front cover or reattaching it. Leaving the digital operator plugged into the drive when removing the front cover can result in erroneous operation caused by a poor connection. Before reattaching the operator make sure the front cover has been firmly fastened back into place.

◆ Removing/Reattaching the Digital Operator

■ Removing the Digital Operator

While pinching inwards on the hook located on the right side of the digital operator, pull forward and remove the operator from the drive.

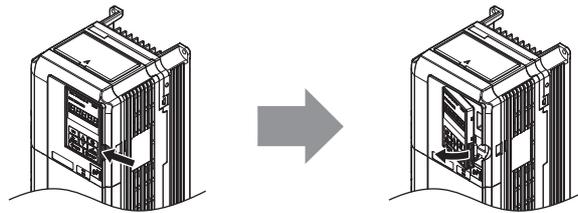


Figure 3.12 Removing the Digital Operator

■ Reattaching the Digital Operator

Insert the digital operator into the opening in the front 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.

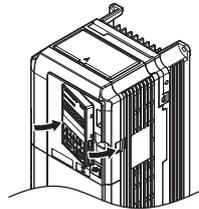


Figure 3.13 Reattaching the Digital Operator

◆ Removing/Reattaching the Front Cover

■ Removing the Front Cover

2A0018 to 2A0075 and 4A0009 to 4A0039

After removing the terminal cover and the digital operator, loosen the screw that affixes the front cover (model CIMR-L□2A0075 does not use a screw to affix the front cover). Pinch inwards on hooks found on each side of the front cover, then pull forward to remove it from the drive.

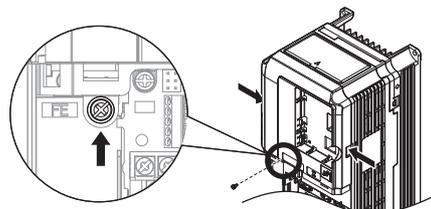


Figure 3.14 Remove the Front Cover (2A0018 to 2A0075 and 4A0009 to 4A0039)

2A0085 to 2A0180 and 4A0045 to 4A0150

1. Remove the terminal cover and the digital operator.
2. Loosen the installation screw on the front cover.

3.6 Digital Operator and Front Cover

3. Use a straight-edge screwdriver to loosen the hooks on each side of the cover that hold it in place.

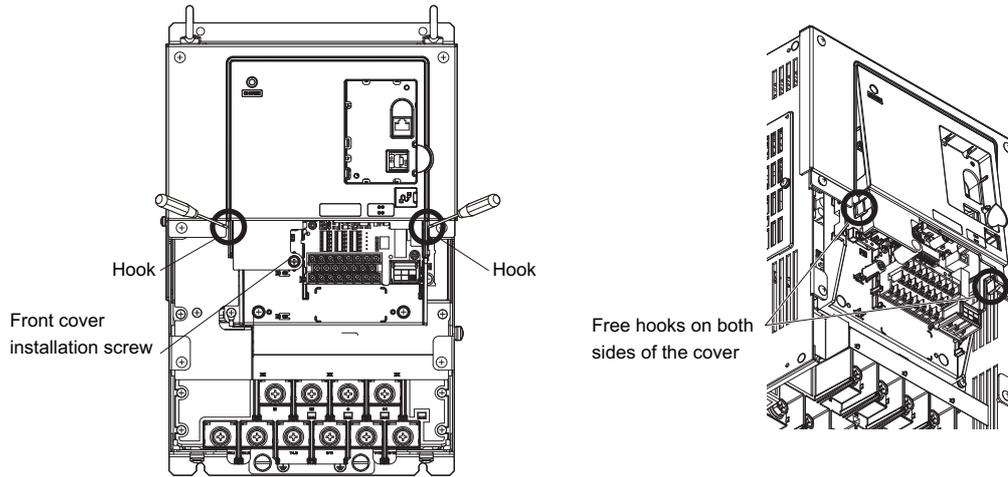


Figure 3.15 Remove the Front Cover (2A0085 to 2A0180 and 4A0045 to 4A0150)

4. First unhook the left side of the front cover, then swing the left side towards you as shown in the figure below until the cover comes off.

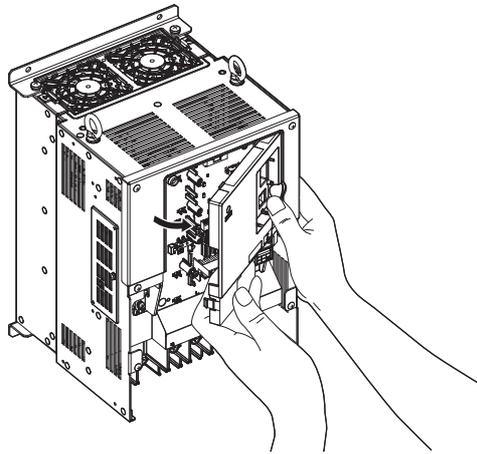


Figure 3.16 Remove the Front Cover (2A0085 to 2A0180 and 4A0045 to 4A0150)

■ Reattaching the Front Cover

2A0018 to 2A0075 and 4A0009 to 4A0039

Reverse the instructions given in [Remove the Front Cover \(2A0018 to 2A0075 and 4A0009 to 4A0039\) on page 57](#) 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.

2A0085 to 2A0180 and 4A0045 to 4A0150

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

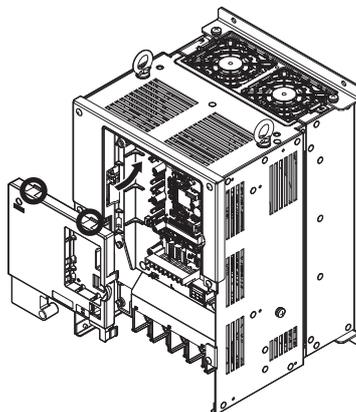


Figure 3.17 Reattach the Front Cover (2A0085 to 2A0180 and 4A0045 to 4A0150)

2. Once the hooks have connected to the drive, press firmly on the cover to make sure it locks into place.

3.7 Main Circuit Wiring

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

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.

◆ Main Circuit Terminal Functions

Table 3.1 Main Circuit Terminal Functions

Terminal		Type			Function	Page
200 V Class	Model CIMR-L□	2A0018 to 2A0075	2A0085, 2A0115	2A0145, 2A0180		
400 V Class		4A0009 to 4A0039	4A0045, 4A0060	4A0075 to 4A0150		
R/L1		Main circuit power supply input			Connects line power to the drive	51
S/L2						
T/L3						
U/T1		Drive output			Connects to the motor	51
V/T2						
W/T3						
B1		Braking resistor		not available	Available for connecting a braking resistor or a braking resistor unit option	283
B2						
+2	• DC reactor connection (+1, +2) (remove the shorting bar between +1 and +2) • DC power supply input (+1, -)	not available		• DC power supply input (+1, -) • Braking transistor connection (+3, -)	For connection • of the drive to a DC power supply (terminals +1 and - are not EU or UL approved) • of braking options • connection of a DC reactor	286
+1						
-						
+3		not available			Grounding terminal	63
⊕		For 200 V class: 100 Ω or less For 400 V class: 10 Ω or less				

◆ Wire Gauges and Tightening Torque

Select the appropriate wires and crimp terminals from [Table 3.2](#) through [Table 3.3](#).

- Note:**
- Wire gauge recommendations based on drive continuous current ratings using 75°C 600 Vac vinyl-sheathed wire assuming ambient temperature within 40°C and wiring distance less than 100 m.
 - Terminals B1, B2, +1, +2, and +3, are for connecting a DC reactor, 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) = $\sqrt{3} \times \text{wire resistance } (\Omega/\text{km}) \times \text{wire length (m)} \times \text{current (A)} \times 10^{-3}$
 - Refer to instruction manual TOBPC72060000 for braking unit or braking resistor unit wire gauges.
 - Use terminal +1 and the negative terminal when connecting a braking resistor, regenerative converter, or a regen unit.
 - Refer to [UL Standards Compliance on page 376](#) for information on UL compliance.

■ Three-Phase 200 V Class

Table 3.2 Wire Gauge and Torque Specifications (Three-Phase 200 V Class)

Model CIMR-L□	Terminal	For China and Europe <1>		For Asia <2>		For U.S.A <3>		Screw Size	Tightening Torque N·m (lb.in.)
		Recommended Gauge mm ²	Applicable Gauge mm ²	Recommended Gauge mm ²	Applicable Gauge mm ²	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil		
2A0018	R/L1, S/L2, T/L3	4	2.5 to 6	5.5	3.5 to 5.5	10	12 to 10	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	2.5	2.5 to 6	3.5	3.5 to 5.5	10	12 to 10		
	-, +1, +2	-	4 to 6	5.5	3.5 to 5.5	-	12 to 10		
	B1, B2	-	2.5 to 6	2	2 to 5.5	-	14 to 10		
	⊕	4	4 to 6	3.5	3.5 to 5.5	10	12 to 10		
2A0025	R/L1, S/L2, T/L3	6	4 to 16	14	5.5 to 14	8	10 to 6	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	6	4 to 16	8	5.5 to 14	8	10 to 6		
	-, +1, +2	-	6 to 16	14	5.5 to 14	-	10 to 6		
	B1, B2	-	4 to 6	3.5	2 to 5.5	-	14 to 10		
	⊕	6	6 to 10	5.5	5.5 to 8	8	10 to 8		

3.7 Main Circuit Wiring

Model CIMR-L□	Terminal	For China and Europe <1>		For Asia <2>		For U.S.A <3>		Screw Size	Tightening Torque N·m (lb.in.)
		Recommended Gauge mm ²	Applicable Gauge mm ²	Recommended Gauge mm ²	Applicable Gauge mm ²	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil		
2A0033	R/L1, S/L2, T/L3	10	6 to 16	14	14	6	8 to 6	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	10	6 to 16	14	8 to 14	8	8 to 6		
	-, +1, +2	-	16	14	14	-	6		
	B1, B2	-	4 to 6	5.5	3.5 to 5.5	-	12 to 10		
	⊕	10	6 to 10	5.5	5.5 to 8	8	10 to 8	M5	2 to 2.5 (17.7 to 22.1)
2A0047	R/L1, S/L2, T/L3	16	16 to 25	22	14 to 22	4	6 to 4	M6	4 to 6 (35.4 to 53.1)
	U/T1, V/T2, W/T3	16	16 to 25	14	14 to 22	4	6 to 4		
	-, +1, +2	-	16 to 25	22	14 to 22	-	6 to 4		
	B1, B2	-	6 to 10	14	5.5 to 14	-	10 to 6	M5	2 to 2.5 (17.7 to 22.1)
	⊕	16	10 to 16	8	8 to 14	6	8 to 6	M6	4 to 6 (35.4 to 53.1)
2A0060	R/L1, S/L2, T/L3	25	16 to 25	30	22 to 30	3	4 to 3	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	16	16 to 25	22	14 to 30	3	4 to 3		
	-, +1, +2	-	25	30	22 to 30	-	4 to 3		
	B1, B2	-	10 to 16	14	8 to 14	-	8 to 6	M5	2 to 2.5 (17.7 to 22.1)
	⊕	16	16 to 25	8	8 to 22	6	6 to 4	M6	4 to 6 (35.4 to 53.1)
2A0075	R/L1, S/L2, T/L3	35	25 to 35	38	30 to 38	2	3 to 2	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	25	25 to 35	30	22 to 38	2	3 to 2		
	-, +1, +2	-	25 to 35	38	30 to 38	-	3 to 2		
	B1, B2	-	16	14	14	-	6	M5	2 to 2.5 (17.7 to 22.1)
	⊕	16	16 to 25	14	14 to 22	6	6 to 4	M6	4 to 6 (35.4 to 53.1)
2A0085	R/L1, S/L2, T/L3	35	25 to 50	38	30 to 50	1/0	3 to 1/0	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	35	25 to 50	38	30 to 50	1/0	3 to 1/0		
	-, +1	-	35 to 50	60	38 to 60	-	2 to 1/0		
	B1, B2	-	16 to 50	22	14 to 50	-	6 to 1/0		
	⊕	16	16 to 25	14	14 to 38	6	6 to 4		
2A0115	R/L1, S/L2, T/L3	50	35 to 70	60	50 to 60	2/0	1 to 2/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	50	35 to 70	60	50 to 60	2/0	1 to 2/0		
	-, +1	-	50 to 70	80	60 to 80	-	1/0 to 3/0		
	B1, B2	-	25 to 70	30	22 to 60	-	4 to 2/0		
	⊕	25	25	22	22 to 38	4	4	M8	9 to 11 (79.7 to 97.4)
2A0145	R/L1, S/L2, T/L3	70	50 to 95	80	60 to 100	4/0	2/0 to 4/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	70	50 to 95	80	60 to 100	4/0	3/0 to 4/0		
	-, +1	-	35 to 95	50 × 2P	50 to 100	-	1 to 4/0		
	+3	-	50 to 95	60	50 to 100	-	1/0 to 4/0		
	⊕	35	25 to 35	22	22 to 60	4	4 to 2	M8	9 to 11 (79.7 to 97.4)
2A0180	R/L1, S/L2, T/L3	95	70 to 95	100	80 to 100	1/0 × 2P	1/0 to 2/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	95	70 to 95	50 × 2P	50 to 60	1/0 × 2P	1/0 to 2/0		
	-, +1	-	35 to 95	50 × 2P	50 to 100	-	1 to 4/0		
	+3	-	50 to 95	80	60 to 100	-	1/0 to 4/0		
	⊕	50	25 to 50	22	22 to 60	4	4 to 1/0	M8	9 to 11 (79.7 to 97.4)

<1> Gauges listed here are for use in China and Europe.

<2> Gauges listed here are for use in Asia except for China.

<3> Gauges listed here are for use in the United States.

■ Three-Phase 400 V Class

Table 3.3 Wire Gauge and Torque Specifications (Three-Phase 400 V Class)

Model CIMR-L□	Terminal	For China and Europe <1>		For Asia <2>		For U.S.A <3>		Screw Size	Tightening Torque N·m (lb.in.)
		Recommended Gauge mm ²	Applicable Gauge mm ²	Recommended Gauge mm ²	Applicable Gauge mm ²	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil		
4A0009	R/L1, S/L2, T/L3	2.5	2.5 to 6	2	2 to 5.5	12	14 to 10	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	2.5	2.5 to 6	2	2 to 5.5	14	14 to 10		
	-, +1, +2	-	2.5 to 6	2	2 to 5.5	-	14 to 10		
	B1, B2	-	2.5 to 6	2	2 to 5.5	-	14 to 10		
	⊕	2.5	2.5 to 6	3.5	2 to 5.5	10	14 to 10		
4A0015	R/L1, S/L2, T/L3	2.5	2.5 to 16	3.5	2 to 14	10	12 to 6	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	2.5	2.5 to 16	3.5	2 to 14	10	12 to 6		
	-, +1, +2	-	4 to 16	3.5	2 to 14	-	12 to 6		
	B1, B2	-	4 to 6	2	2 to 5.5	-	12 to 10		
	⊕	2.5	2.5 to 6	3.5	2 to 5.5	10	14 to 10	M5	2 to 2.5 (17.7 to 22.1)
4A0018	R/L1, S/L2, T/L3	4	2.5 to 16	5.5	3.5 to 14	10	10 to 6	M4	1.2 to 1.5 (10.6 to 13.3)
	U/T1, V/T2, W/T3	4	2.5 to 16	5.5	3.5 to 14	10	10 to 6		
	-, +1, +2	-	4 to 16	5.5	3.5 to 14	-	12 to 6		
	B1, B2	-	4 to 6	2	2 to 5.5	-	12 to 10		
	⊕	4	4 to 6	3.5	3.5 to 5.5	10	12 to 10	M5	2 to 2.5 (17.7 to 22.1)
4A0024	R/L1, S/L2, T/L3	6	6 to 16	14	5.5 to 14	8	8 to 6	M5	2 to 2.5 (17.7 to 22.1)
	U/T1, V/T2, W/T3	6	6 to 16	8	5.5 to 8	8	10 to 6		
	-, +1, +2	-	6 to 16	14	5.5 to 14	-	10 to 6		
	B1, B2	-	6 to 10	3.5	2 to 8	-	10 to 8		
	⊕	6	6 to 10	5.5	5.5 to 8	8	10 to 8	M6	4 to 6 (35.4 to 53.1)
4A0031	R/L1, S/L2, T/L3	10	10 to 16	14	14	6	8 to 6	M5	2 to 2.5 (17.7 to 22.1)
	U/T1, V/T2, W/T3	6	6 to 16	14	8 to 14	8	8 to 6		
	-, +1, +2	-	6 to 16	14	14	-	6		
	B1, B2	-	6 to 10	5.5	3.5 to 8	-	10 to 8		
	⊕	10	6 to 16	8	5.5 to 14	6	10 to 6	M6	4 to 6 (35.4 to 53.1)
4A0039	R/L1, S/L2, T/L3	16	16 to 25	14	14 to 22	6	6 to 4	M6	4 to 6 (35.4 to 53.1)
	U/T1, V/T2, W/T3	16	16 to 25	14	14 to 22	6	6 to 4		
	-, +1, +2	-	16 to 25	14	14 to 22	-	6 to 4		
	B1, B2	-	6 to 10	8	5.5 to 8	-	10 to 8	M5	2 to 2.5 (17.7 to 22.1)
	⊕	16	10 to 16	8	8 to 14	6	8 to 6	M6	4 to 6 (35.4 to 53.1)
4A0045	R/L1, S/L2, T/L3	16	10 to 16	14	14	4	6 to 4	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	16	10 to 16	14	14	4	6 to 4		
	-, +1	-	16 to 35	22	14 to 38	-	6 to 1		
	B1, B2	-	10 to 16	14	8 to 14	-	8 to 4		
	⊕	16	10 to 16	8	8 to 14	6	8 to 6		
4A0060	R/L1, S/L2, T/L3	16	16 to 25	22	14 to 22	3	4 to 3	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	25	16 to 25	22	14 to 22	3	4 to 3		
	-, +1	-	25 to 35	30	22 to 38	-	4 to 1		
	B1, B2	-	16 to 25	14	14 to 22	-	6 to 3		
	⊕	16	16 to 25	14	14 to 22	6	6		
4A0075	R/L1, S/L2, T/L3	25	16 to 50	30	22 to 50	2	3 to 1/0	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	25	25 to 50	30	22 to 50	2	3 to 1/0		
	-, +1	-	25 to 50	38	30 to 50	-	3 to 1/0		
	+3	-	16 to 50	22	14 to 50	-	6 to 1/0		
	⊕	16	16 to 25	22	14 to 22	4	6 to 4		
4A0091	R/L1, S/L2, T/L3	35	25 to 50	38	30 to 50	1/0	2 to 1/0	M8	9 to 11 (79.7 to 97.4)
	U/T1, V/T2, W/T3	35	25 to 50	38	30 to 50	1	2 to 1/0		
	-, +1	-	25 to 50	60	30 to 50	-	3 to 1/0		
	+3	-	25 to 50	30	22 to 50	-	4 to 1/0		
	⊕	16	16 to 25	22	14 to 22	4	6 to 4		

3.7 Main Circuit Wiring

Model CIMR-L□	Terminal	For China and Europe <1>		For Asia <2>		For U.S.A <3>		Screw Size	Tightening Torque N·m (lb.in.)
		Recommended Gauge mm ²	Applicable Gauge mm ²	Recommended Gauge mm ²	Applicable Gauge mm ²	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil		
4A0112	R/L1, S/L2, T/L3	50	35 to 95	60	38 to 100	3/0	1/0 to 4/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	50	35 to 95	60	50 to 100	2/0	1/0 to 4/0		
	-, +1	–	50 to 95	100	60 to 100	–	1/0 to 4/0		
	+3	–	25 to 95	50	30 to 100	–	3 to 4/0		
	⊕	25	25	22	22	4	4		
4A0150	R/L1, S/L2, T/L3	70	50 to 95	80	60 to 100	4/0	3/0 to 4/0	M10	18 to 23 (159 to 204)
	U/T1, V/T2, W/T3	70	70 to 95	80	80 to 100	4/0	3/0 to 4/0		
	-, +1	–	35 to 95	50 × 2P	50 to 100	–	1 to 4/0		
	+3	–	50 to 95	60	50 to 100	–	1/0 to 4/0		
	⊕	35	25 to 35	22	22 to 30	4	4 to 2		

<1> Gauges listed here are for use in China and Europe.

<2> Gauges listed here are for use in Asia except for China.

<3> Gauges listed here are for use in the United States.

◆ Main Circuit Terminal and Motor Wiring

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

NOTICE: Make sure wiring to motor terminals U, V, and W connect the corresponding U/T1, V/T2, and W/T3 output terminals on the drive. Wiring to the wrong terminals will reverse the phase order, causing the motor to operate in reverse. This could cause the elevator car to fall when attempting to go up.

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 electric leakage circuit breakers.

NOTICE: 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: Make sure the motor contactor sequence is designed to only open or close the motor contactor when there is no voltage output from 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 3.4](#). If the motor wiring distance exceeds 100 m because of the system configuration, reduce the ground currents. [Refer to C6-03: Carrier Frequency on page 149.](#)

Table 3.4 Cable Length Between Drive and Motor

Cable Length	50 m or less	100 m or less	Greater than 100 m
Carrier Frequency	15 kHz or less	5 kHz or less	2 kHz or less

■ Ground Wiring

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

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). Improper equipment grounding could result in death or serious injury by contacting ungrounded electrical equipment.

NOTICE: Do not share the ground wire with other devices requiring a large amount of current for operation. 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 3.18](#) when using multiple drives. Do not loop the ground wire.

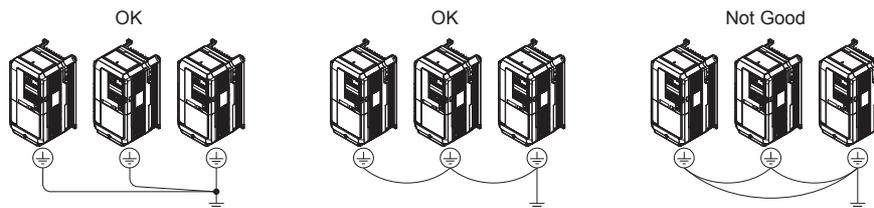


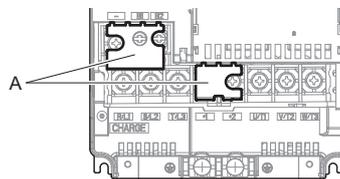
Figure 3.18 Multiple Drive Wiring

■ 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-L□2A0018 through 0075 and 4A0009 through 0039 have a cover placed over the DC bus and braking circuit terminals prior to shipment to help prevent miswiring. Cut away covers as needed for terminals using wire cutters.



A – Protecting Cover

Figure 3.19 Protecting Cover to Prevent Miswiring (CIMR-L□2A0047)

■ Main Circuit Connection Diagram

Refer to [Main Circuit Connection Diagram on page 53](#) when wiring terminals on the drive's main power circuit.

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.

3.8 Control Circuit Wiring

◆ Control Circuit Connection Diagram

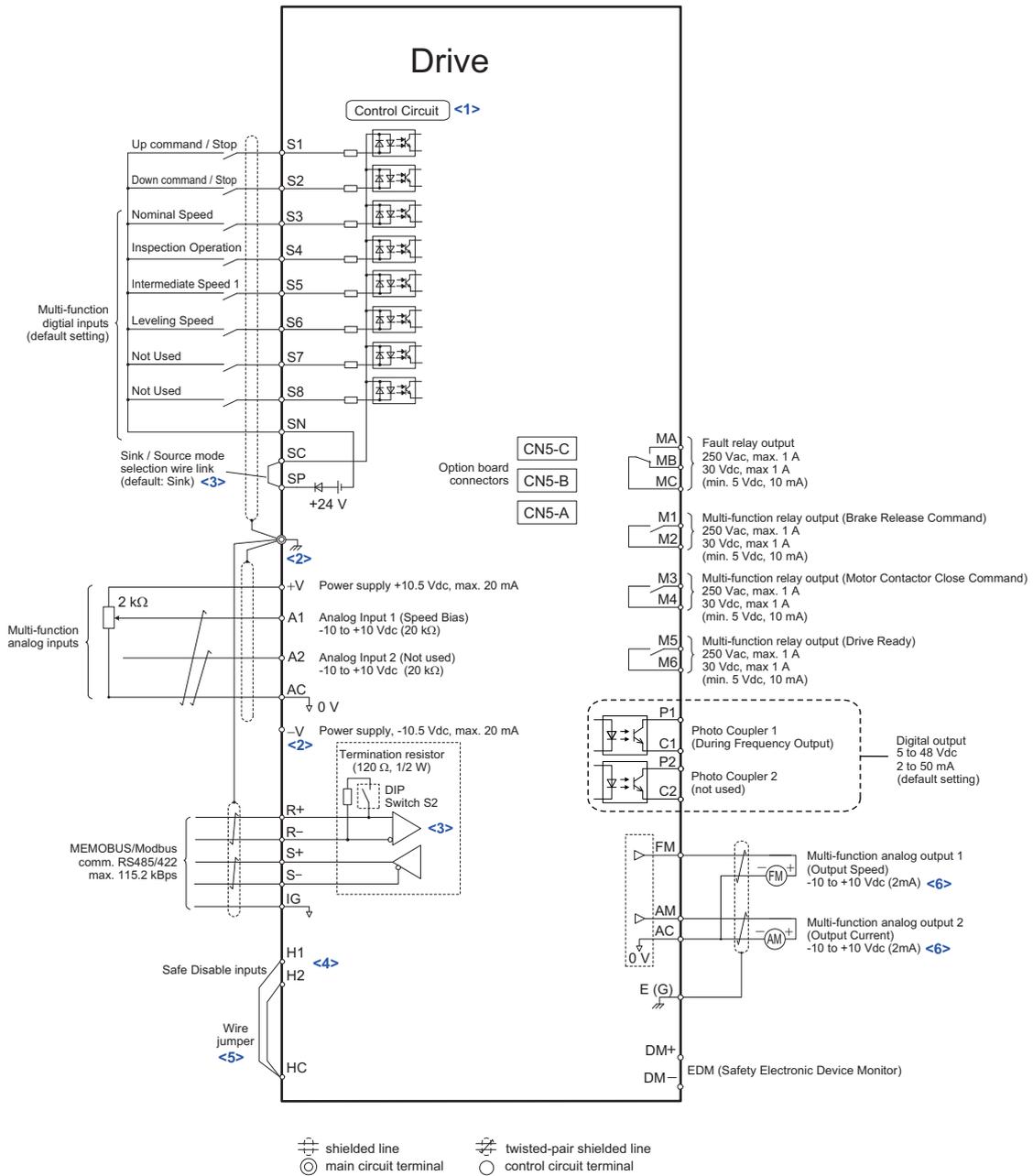


Figure 3.20 Control Circuit Connection Diagram

- <1> Supplying power to the control circuit separately from the main circuit requires 24 V power supply (option).
- <2> 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 this can cause erroneous operation or damage the drive.
- <3> Enable the termination resistor in the last drive in a MEMOBUS network by setting DIP switch S2 to the ON position.
- <4> The sink/source setting for the Safe Disable input is the same as with the sequence input.
- <5> Disconnect the wire jumper between H1 - HC and H2 - HC when utilizing the Safe Disable input.
- <6> 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.

◆ 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 3.20](#).

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

NOTICE: *Do not use a magnetic contactor on the power supply side to frequently start and stop the motor. Failure to comply could result in damage to the drive.*

■ Input Terminals

[Table 3.5](#) lists the input terminals on the drive. Text in parenthesis indicates the default setting for each multi-function input.

Table 3.5 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.	313
	S2	Down Command (Closed: Down, Open: Stop)		
	S3	Multi-function input 1 (Nominal Speed)		
	S4	Multi-function input 2 (Inspection Operation)		
	S5	Multi-function input 3 (Intermediate Speed 1)		
	S6	Multi-function input 4 (Leveling Speed)		
	S7	Multi-function input 5 (Not used)		
	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 link between terminals SC and SN or between SC and SP to select sinking or sourcing, and to select the power supply.	69
	SN	0 V		
	SP	+24 Vdc		
Safe Disable Inputs	H1	Safe Disable input 1	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.	380
	H2	Safe Disable input 2		
	HC	Safe Disable function common		
Analog Inputs	+V	Power supply for analog inputs	10.5 Vdc (max allowable current 20 mA)	136
	-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)	136 177
	A2	Multi-function analog input 2 (Not used)	-10 to 10 Vdc, 0 to 10 Vdc (input impedance: 20 kΩ)	136 178
	AC	Analog input common	0 V	136
	E (G)	Ground for shielded lines and option cards	–	–

<1> Setting jumper S3 for an external power supply makes the wire link between terminals H1, H2, and HC ineffective. Remove the wire link and connect an external power supply that can supply terminals H1, H2, and HC continuously.

■ Output Terminals

[Table 3.6](#) lists the output terminals on the drive. Text in parenthesis indicates the default setting for each multi-function output.

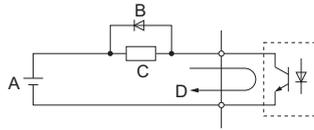
Table 3.6 Control Circuit Output Terminals

Type	No.	Terminal Name (Function)	Function (Signal Level) Default Setting	Page
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	169
	MB	N.C. output		
	MC	Fault output common		
Multi-Function Relay Output	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	169
	M2			
	M3	Multi-function relay output 2 (Output contactor close command)		
	M4			
	M5	Multi-function relay output 3 (Drive ready)		
	M6			

3.8 Control Circuit Wiring

Type	No.	Terminal Name (Function)	Function (Signal Level) Default Setting	Page
Multi-Function Photocoupler Output	P1	Photocoupler output 1 (During Frequency output)	48 Vdc, 2 to 50 mA </>	-
	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	180
	AM	Analog monitor output 2 (Output current)		
	AC	Monitor common		0 V
Safety Monitor Output	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> Connect a flywheel diode as shown in the [Figure 3.21](#) when driving a reactive load such as a relay coil. Make sure the diode rating is greater than the circuit voltage.



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

Figure 3.21 Connecting a Suppression Diode

Serial Communication Terminals

Table 3.7 Control Circuit Terminals: Serial Communications

Type	No.	Signal Name	Function (Signal Level)
MEMOBUS/Modbus Communication </>	R+	Communications input (+)	MEMOBUS/Modbus communication: Use a 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. For more information on the termination resistor, see [Control I/O Configuration on page 69](#).

Terminal Configuration

Control circuit terminals are arranged as shown in [Figure 3.22](#).

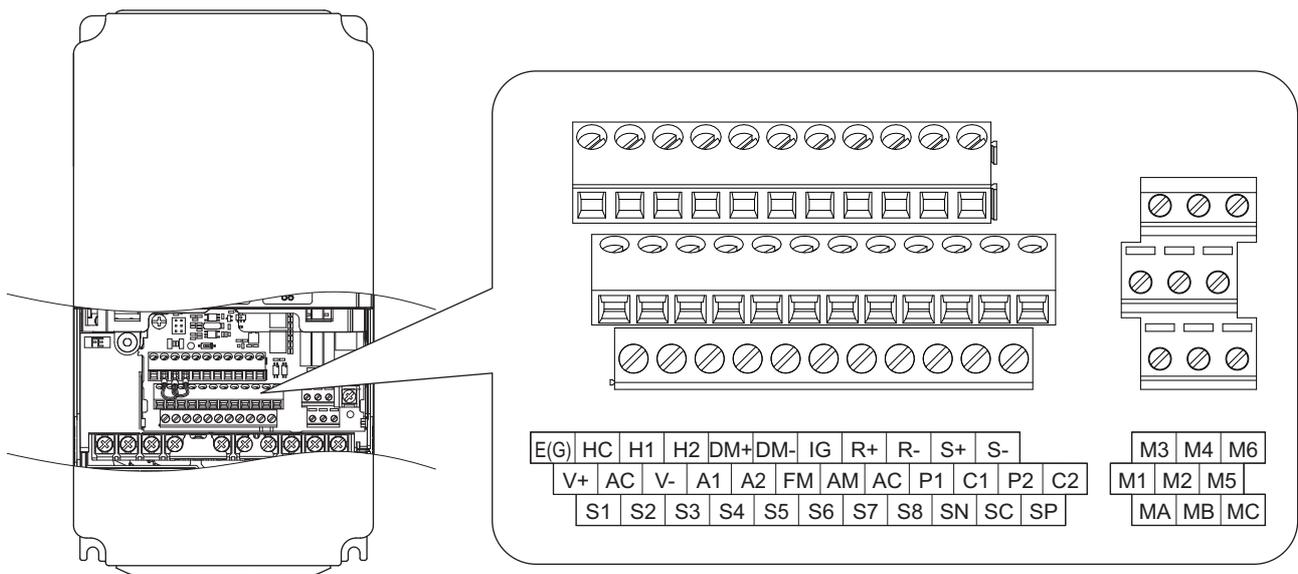


Figure 3.22 Control Circuit Terminal Arrangement

■ Wire Size and Torque Specifications

Select appropriate wire type and gauges from [Table 3.8](#). For simpler and more reliable wiring, use crimp ferrules on the wire ends. Refer to [Table 3.9](#) for ferrule terminal types and sizes.

Table 3.8 Wire Gauges and Torque Specifications

Terminal Block	Terminal	Screw 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	FM, AC, AM, P1, P2, PC, SC, A1, A2, A3, +V, -V, S1-S8, MA, MB, MC, M1, M2	M3.5	0.8 to 1.0 (7.1 to 8.6)	0.5 to 2 (20 to 14)	0.75 (18)	-	-	Shielded line, etc.
	E (G)	M3.5	0.8 to 1.0 (7.1 to 8.6)	0.5 to 2 (20 to 14)	1.25 (12)			
TB4, TB5, TB6	HC, H1, H2, DM+, DM-, IG, R+, R-, S+, S-, RP, MP	M2	0.22 to 0.25 (1.9 to 2.2)	Standard 0.25 to 1.0 (24 to 17) Single 0.25 to 1.5 (24 to 16)	0.75 (18)	0.25 to 0.5 (24 to 20)	0.5 (20)	

■ Ferrule-Type Wire Terminals

Prepare wire ends with insulated sleeves before connecting to the drive. See [Table 3.9](#) for dimensions. Yaskawa recommends CRIMPFOX 6, a crimping tool manufactured by PHOENIX CONTACT.

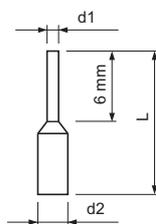


Figure 3.23 Ferrule Dimensions

Table 3.9 Ferrule Terminal Types and Sizes

Size mm ² (AWG)	Type	L (mm)	d1 (mm)	d2 (mm)	Manufacturer
0.25 (24)	AI 0.25-6YE	10.5	0.8	2	PHOENIX CONTACT
0.34 (22)	AI 0.34-6TQ	10.5	0.8	2	
0.5 (20)	AI 0.5-6WH	14	1.1	2.5	

◆ Wiring the Control Circuit Terminal

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

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.*

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: *Separate wiring for digital output terminals MA, MB, MC and M1 to M6 from wiring to other control circuit lines. Improper wiring practices could result in drive or equipment malfunction or nuisance trips.*

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: *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.*

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.*

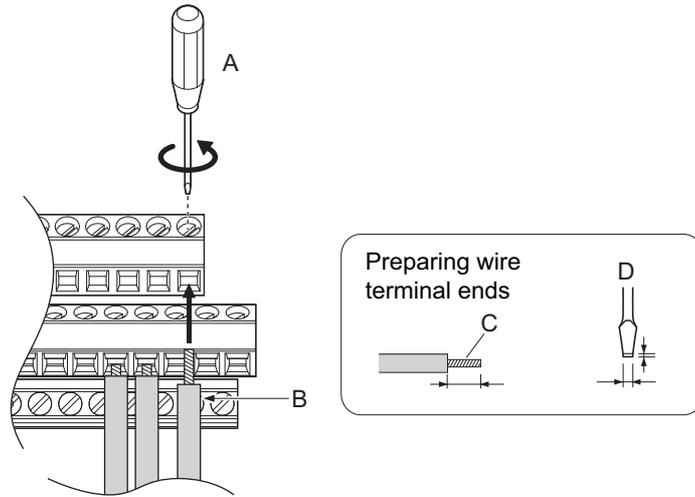
Wire the control circuit only after terminals have been properly grounded and main circuit wiring is complete. Refer to [Figure 3.24](#) for details. Prepare the ends of the control circuit wiring as shown in [Figure 3.25](#). Refer to [Wire Size and Torque Specifications on page 67](#).

NOTICE: *Do not tighten screws beyond the specified tightening torque. Failure to comply may result in erroneous operation, damage the terminal block, or cause a fire.*

3.8 Control Circuit Wiring

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 the following figure:



A – Loosen screw to insert wire.

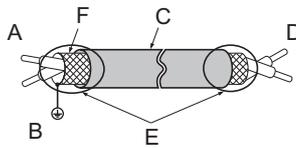
B – Single wire or stranded wire

C – Avoid fraying wire strands when stripping insulation from wire. Strip length 5.5 mm.

D – Blade depth of 0.4 mm or less
Blade width of 2.5 mm or less

Figure 3.24 Terminal Board Wiring Guide

When connecting control wires to the terminals, use shielded twisted-pair wires (treating wire ends as shown in [Figure 3.25](#) and connect the shield to the ground terminal of the drive.



A – Drive side

B – Connect shield to ground terminal of drive.

C – Insulation

D – Control device side

E – Shield sheath (insulate with tape)

F – Shield

Figure 3.25 Preparing the Ends of Shielded Cables

NOTICE: The signal lines between the drive and the operator station or peripheral equipment should not exceed 50 meters when using an analog signal from a remote source to supply the speed reference. Failure to comply could result in poor system performance.

3.9 Control I/O Configuration

◆ Setting Sink/Source with Input Terminals SN and SP

Use the wire link 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 3.10](#) (Default: Sink mode, internal power supply).

Note: Never short terminals SP and SN as doing so will damage the drive.

Table 3.10 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

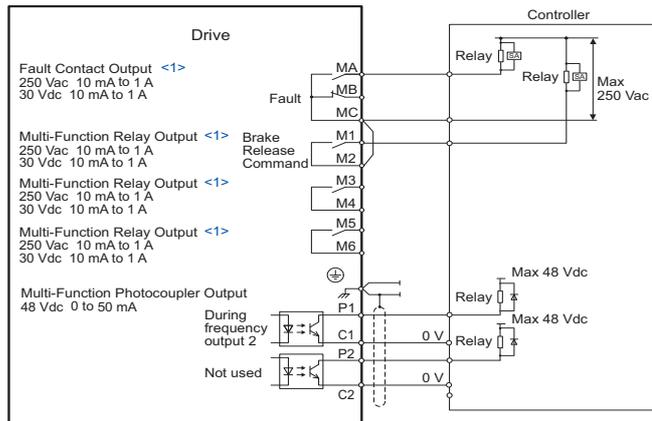
Use jumper S3 on the terminal board to select between Sink mode, Source mode or external power supply for the Safe Disable inputs H1 and H2 as shown in [Table 3.11](#) (Default: Sink mode, internal power supply.)

Table 3.11 Safe Disable Input Sink / Source / External Power Supply Selection

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

◆ Using the Photocoupler and Contact Outputs

The example below illustrates an example of how to use the multi-function digital outputs and the fault relay. Refer to [Figure 3.1](#) for standard connection diagram.



<1> Minimum load: 5 Vdc, 10 mA

Figure 3.26 Photocoupler and Contact Outputs

3.10 Connect to a PC

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

The drive can connect to the USB port of a PC using a USB 2.0, AB type cable (sold separately). DriveWizard Plus can then 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 and PC with the USB cable.

To obtain the driver and software of USB Copy Unit, CopyUnitManager and DriveWizardPlus, access these sites:

China: <http://www.yaskawa.com.cn>

Japan: <http://www.e-mechatronics.com>

Europe: <http://www.yaskawa.eu.com>

Other areas: contact a Yaskawa representative.

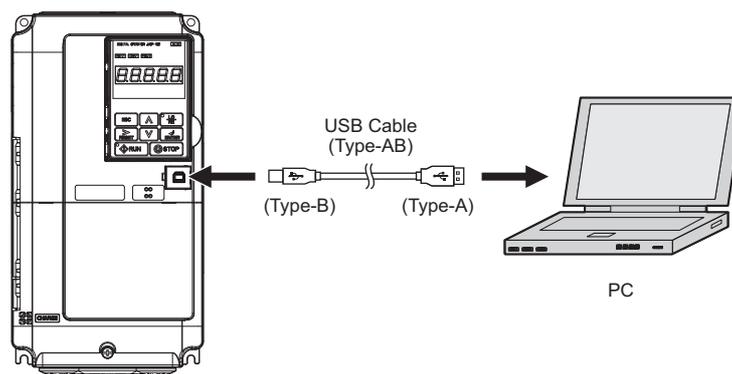


Figure 3.27 Connecting to a PC (USB)

3.11 MEMOBUS/Modbus Termination

This drive is equipped with a built in termination resistor for the RS-422/485 communication port. DIP switch S2 enables or disabled the termination resistor as shown in *Figure 3.28*. The OFF position is the default. The termination resistor should be placed to the ON position when the drive is the last in a series of slave drives.

Table 3.12 MEMOBUS/Modbus Switch Settings

S2 Position	Description
ON	Internal termination resistor ON
OFF	Internal termination resistor OFF (default setting)

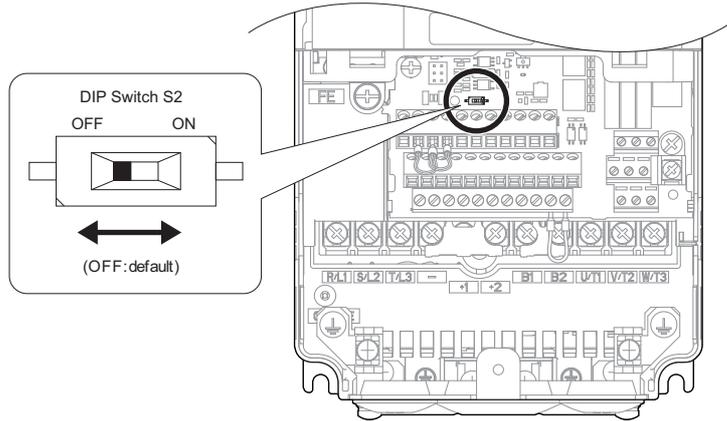


Figure 3.28 DIP Switch S2

Note: Refer to the *MEMOBUS/Modbus Communications on page 341* for details on MEMOBUS/Modbus.

3.12 Wiring Checklist

<input checked="" type="checkbox"/>	No.	Item	Page
Drive, peripherals, option cards			
<input type="checkbox"/>	1	Check drive model number to ensure receipt of correct model.	–
<input type="checkbox"/>	2	Make sure you have the correct braking resistors, DC reactors, noise filters, and other peripheral devices.	278
<input type="checkbox"/>	3	Check the option card model number.	278
Installation area and physical setup			
<input type="checkbox"/>	4	Ensure that the area surrounding the drive complies with specifications.	37
Power supply voltage, output voltage			
<input type="checkbox"/>	5	The voltage from the power supply should be within the input voltage specification range of the drive.	154
<input type="checkbox"/>	6	The voltage rating for the motor should match the drive output specifications.	31 329
<input type="checkbox"/>	7	Verify that the drive is properly sized to run the motor.	31 329
Main circuit wiring			
<input type="checkbox"/>	8	Confirm proper branch circuit protection as specified by national and local codes.	50
<input type="checkbox"/>	9	Properly wire the power supply to drive terminals R/L1, S/L2, and T/L3.	53
<input type="checkbox"/>	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.	62
<input type="checkbox"/>	11	Use 600 Vac vinyl-sheathed wire for the power supply and motor lines.	59
<input type="checkbox"/>	12	Use the correct wire gauges for the main circuit. <i>Refer to Wire Gauges and Tightening Torque on page 59.</i> <ul style="list-style-type: none"> When using comparatively long motor cable, calculate the amount of voltage drop. <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px 0;"> $\text{Motor rated voltage (V)} \times 0.02 \geq 3 \times \text{voltage resistance } (\Omega/\text{km}) \times \text{cable length (m)} \times \text{motor rated current (A)} \times 10^{-3}$ </div> If the cable between the drive and motor exceeds 50 m, adjust the carrier frequency set to C6-03 accordingly. 	59 59 62
<input type="checkbox"/>	13	Properly ground the drive. Review page 63.	63
<input type="checkbox"/>	14	Tightly fasten all terminal screws (control circuit terminals, grounding terminals). <i>Refer to Wire Gauges and Tightening Torque on page 59.</i>	59
<input type="checkbox"/>	15	If using a braking resistor or dynamic braking resistor unit, install a magnetic contactor. Properly install the resistor, and ensure that overload protection shuts off the power supply.	283
<input type="checkbox"/>	16	Verify phase advancing capacitors, input noise filters, or electric leakage circuit breakers are NOT installed on the output side of the drive.	–
Control circuit wiring			
<input type="checkbox"/>	17	Use twisted-pair line for all drive control circuit wiring.	64
<input type="checkbox"/>	18	Connect the shields of shielded wiring to the GND (⊕) terminal.	67
<input type="checkbox"/>	19	Properly wire any option cards.	67
<input type="checkbox"/>	20	Check for any other wiring mistakes. Only use a multimeter to check wiring.	–
<input type="checkbox"/>	21	Properly fasten the control circuit terminal screws in the drive. <i>Refer to Wire Gauges and Tightening Torque on page 59.</i>	59
<input type="checkbox"/>	22	Pick up all wire clippings.	–
<input type="checkbox"/>	23	Ensure that no frayed wires on the terminal block are touching other terminals or connections.	–
<input type="checkbox"/>	24	Properly separate control circuit wiring and main circuit wiring.	–
<input type="checkbox"/>	25	Analog signal line wiring should not exceed 50 m.	–
<input type="checkbox"/>	26	Safe Disable input wiring should not exceed 30 m.	–



Start-Up Programming & Operation

This chapter explains how to use the digital operator, operator functions, modes, and instructions on Auto-Tuning the drive and motor.

4.1 SECTION SAFETY	76
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4.1 Section Safety

DANGER

Ensuring Safety during Auto-Tuning

Before Auto-Tuning, make sure the area around the motor and elevator are clear.

The motor may suddenly rotate during the Auto-Tuning process, which can result in personal injury if proper safety measures are not taken beforehand.

Rotational Auto-Tuning must always be performed with the motor disconnected from the load (ropes removed from traction sheave).

If the ropes are left mounted during Rotational Auto-Tuning, the drive will be unable to set motor parameters correctly. This will result in erroneous operation.

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 any 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.

The internal capacitor remains charged even after the power supply is turned off.

Failure to comply can result in serious electric shock.

WARNING

Ensuring Safety with PM Motors

When using a PM motor with a different speed feedback option than a PG-F3 card together with an external brake sequence, make sure the brake is not released before Initial Magnetic Pole Search has been finished. Use the Initial Pole Search Status signal (H2-□□ = 61) to interlock the brake.

Failing to comply can cause the counterweight to pull on the elevator car, resulting in personal injury.

Whenever performing maintenance, inspection, or wiring on the motors, make sure to open the magnetic contactor on the output side and make sure the motor has come to a complete stop. Next wait for time specified in this manual before beginning to work on the motor.

Failure to comply may result in injury from electrical shock.

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 motor contactor.

Failure to comply may result in injury from electrical shock.

⚠ WARNING**Sudden Movement Hazard**

The drive is capable of running the motor up to 120 Hz. Due to the danger of accidentally operating at high speed, be sure to set the upper limit for the frequency. The default setting for the maximum output frequency is 50 Hz.

Incorrect settings can cause the drive to accelerate to dangerously high speed.

Never set the stopping method to anything other than "Ramp to stop". Parameter b1-03 should therefore always be set to 0.

Any other setting leaves the motor uncontrolled when the Up/Down command is removed and can cause the elevator car to free-fall.

Do not use the fault restart function unnecessarily.

Carelessly using the fault restart function leads to an unintended start of the elevator, resulting in death or serious injury.

A separate holding brake should be used. The holding brake should be wired so that it is closed by an external sequence when a fault occurs, the power is shut off, or an emergency switch is triggered.

Failure to comply could result in death or serious injury.

Precautions should be taken on the machine side to ensure that load can not fall or slip.

Failure to take proper safety precautions can result in serious injury.

Electrical Shock Hazard

Do not operate equipment with covers removed.

Failure to comply could result in death or serious injury.

The diagrams in this section may include drives without covers or safety shields to illustrate 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 remove covers or touch circuit boards while the power is on.

Failure to comply could result in death or serious injury.

⚠ CAUTION**Preventing Injury**

Check the area thoroughly around the motor and elevator before starting to operate the application.

Failure to comply can result in personal injury.

A separate emergency stop switch should be installed separately from drive circuitry (the drive's own emergency stop function is enabled only when it has been assigned to one of the input terminals).

Failure to comply may result in personal injury.

Reset alarms and faults only after making sure that the Up/Down command has also been removed.

Failure to comply can result in personal injury.

Preventing Burns

Never touch the heatsink on the drive, as it can reach high temperatures. When replacing the cooling fan, wait at least 15 minutes after power to the drive has been shut off before touching the fan to ensure that it has cooled off enough.

Failure to comply could result in burns.

NOTICE

Ensuring Safety during Auto-Tuning

Rotational Auto-Tuning will not function properly if a holding brake is applied on the motor. Ensure the motor can freely rotate before beginning Auto-Tuning.

Failure to comply could result in improper operation of the drive.

Equipment Hazard

Do not check signals while the drive is running.

The equipment may be damaged.

The drive's cooling fan may not run during Rescue Operation due to low voltage from the battery or UPS.

Using Rescue Operation for extended periods of time may result in an oH alarm as the heatsink temperature rises.

Set parameter E1-01 to match the input voltage of the drive. The drive input voltage (not motor voltage) must be set in E1-01 for the protective features to function properly.

Failure to set the correct drive input voltage may result in improper drive operation.

Use the torque detection function in the drive to notify the PLC of a potential overcurrent or overload situation before an overcurrent or overload fault is actually triggered. Use undertorque detection to detect any problems that develop on the application side.

If the drive faults out due to overcurrent or overload, the drive output will be interrupted. The motor will start coasting, potentially resulting in damage to the machinery or personal injury.

When replacing the control terminal board or removable terminal board, be sure to also check the value set to parameter o2-04.

If o2-04 is set incorrectly, drive performance may be poor and protection functions may not operate properly, potentially damaging the drive.

4.2 Using the Digital Operator

Use the digital operator to enter run and stop commands, display data, edit parameters, as well as display fault and alarm information.

◆ Keys and Displays

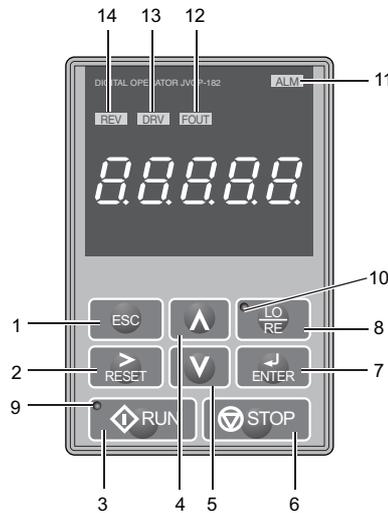


Figure 4.1 Keys and Displays on the Digital Operator

No.	Display	Name	Function
1		ESC Key	<ul style="list-style-type: none"> 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.
2		RESET Key	<ul style="list-style-type: none"> Moves the cursor to the right. Resets the drive to clear a fault situation.
3		RUN Key	Starts the drive in the LOCAL mode. The Run LED <ul style="list-style-type: none"> 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 an emergency stop DI or an up/down command was active during power up.
4		Up Arrow Key	Scrolls up to display the next item, selects parameter numbers and increments setting values.
5		Down Arrow Key	Scrolls down to display the next item, selects parameter numbers and increments setting values.
6		STOP Key <1>	Stops drive operation.
7		ENTER Key	<ul style="list-style-type: none"> Enters parameter values and settings. Selects a menu item to move between displays.
8		LO/RE Selection Key <2>	Switches drive control between the operator (LOCAL) and the control circuit terminals (REMOTE). The LED is on when the drive is in the LOCAL mode (operation from keypad).
9		RUN Light	Lit while the drive is operating the motor. Refer to page 82 for details.
10		LO/RE Light	Lit while the operator is selected to run the drive (LOCAL mode). Refer to page 82 for details.
11		ALM LED Light	<i>Refer to LED Screen Displays on page 80.</i>
12		FOUT LED Light	
13		DRV LED Light	
14		REV LED Light	

- <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.

4.2 Using the Digital Operator

◆ Digital Text Display

Text appears on the digital operator as shown below. This section explains the meaning of text as it appears on the display screen.

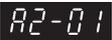
Lit	Flashing
	

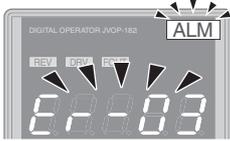
Table 4.1 Digital Text Display

Text	LED	Text	LED	Text	LED	Text	LED
0	0	9	9	I	i	R	r
1	1	A	A	J	j	S	s
2	2	B	b	K	k	T	t
3	3	C	c	L	l	U	u
4	4	D	d	M	m	V	v
5	5	E	E	N	n	W	w
6	6	F	F	O	o	X	none
7	7	G	G	P	p	Y	y
8	8	H	H	Q	q	Z	none

<1> Displayed in two digits.

◆ LED Screen Displays

Table 4.2 LED Screen Displays

Display	Lit	Flashing	Off
ALM	The drive has detected an alarm or error	<ul style="list-style-type: none"> When an alarm occurs oPE detected When a fault or error occurs during Auto-Tuning 	Normal state (no fault or alarm)
REV	During Down command	-	During Up command
DRV	<ul style="list-style-type: none"> The drive is in the Drive Mode During Down command 	-	<ul style="list-style-type: none"> The drive is in the Programming Mode The drive will not accept an Up/down command
FOUT	When the display shows the output speed	-	When a display other than the output speed monitor is shown.
As illustrated in this manual			

◆ Powering Up the Drive and Operation Status Display

■ Powering Up the Drive

Review the following checklist before turning the power on.

Item to Check	Description
Power supply voltage	Ensure the power supply voltage is correct: 200 V class: 3-phase 200 to 240 Vac 50/60 Hz 400 V class: 3-phase 380 to 480 Vac 50/60 Hz
	Properly wire the power supply input terminals (R/L1, S/L2, T/L3).
	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, V, and W.
Control circuit terminals	Check control circuit terminal connections.
Drive control terminal status	Open all control circuit terminals (off).

■ 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 displays the speed reference. DRV is lit.
Fault	 External fault (example)	Data displayed varies by the type of fault. Refer to Fault Displays, Causes, and Possible Solutions on page 229 for more information and possible solution. ALM and DRV are lit.

4.2 Using the Digital Operator

◆ LO/RE LED and RUN LED Indications

Table 4.3 LO/RE LED and RUN LED Indications

LED	Lit	Flashing	Flashing Quickly <1>	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	<ul style="list-style-type: none"> • During deceleration to stop • When an Up/down command is input and speed reference is 0% 	<ul style="list-style-type: none"> • 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 an Emergency 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				

<1> Refer to [Figure 4.2](#) for the difference between “flashing” and “flashing quickly”.

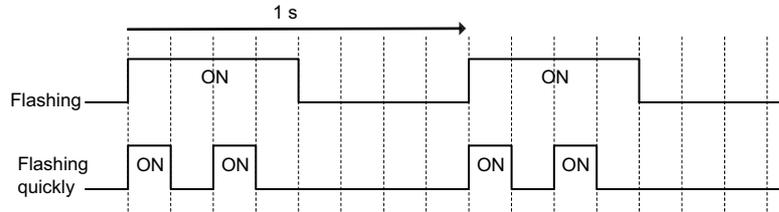


Figure 4.2 RUN LED Status and Meaning

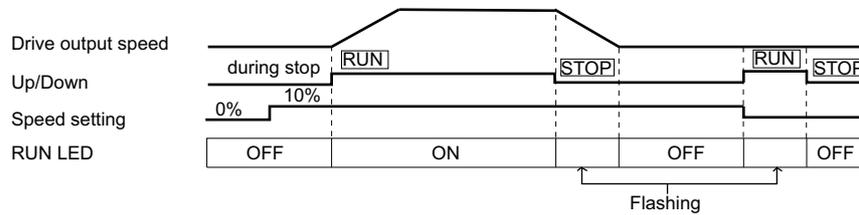


Figure 4.3 RUN LED and Drive Operation

◆ Menu Structure for Digital Operator

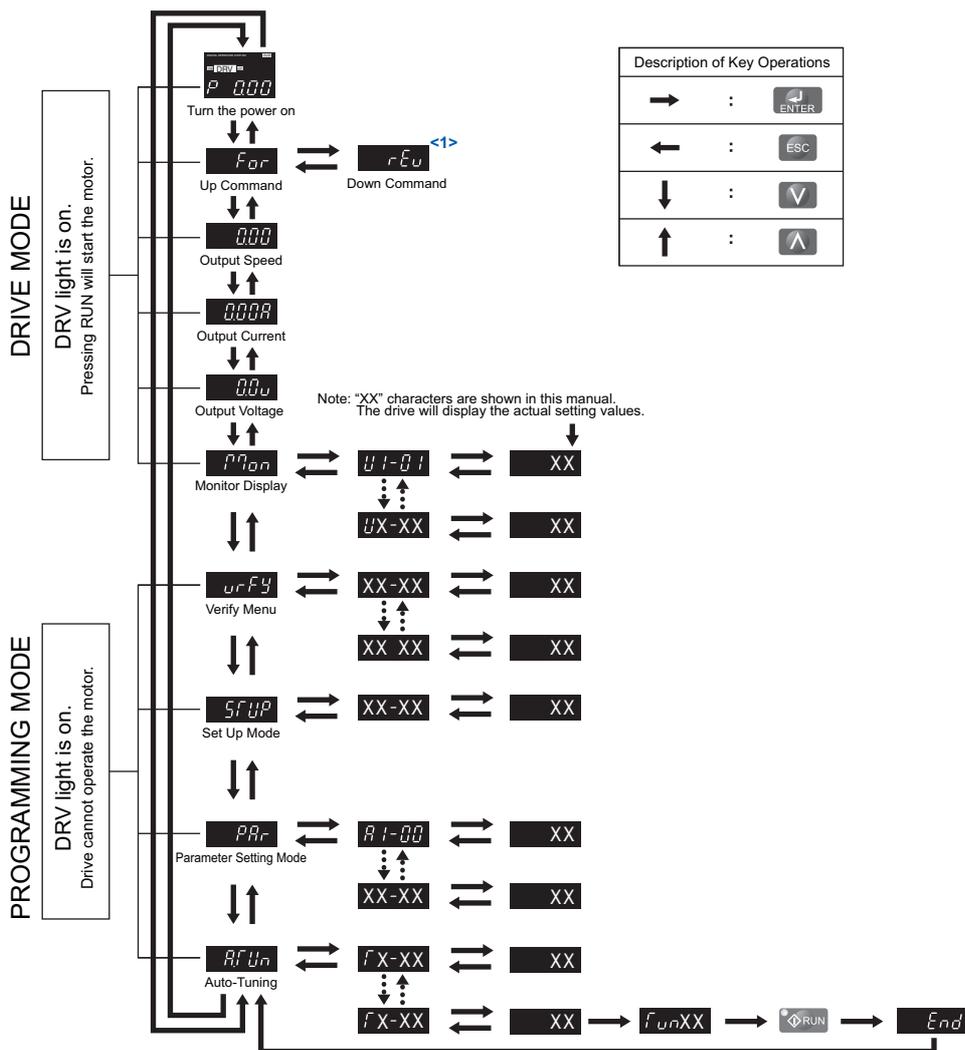


Figure 4.4 Digital Operator Menu and Screen Structure

<1> Reverse can only be selected when the drive is set for LOCAL. Details on switching between Up and Down can be found in [Navigating the Drive and Programming Modes on page 84](#).

4.3 The Drive and Programming Modes

The drive has a Programming Mode to program the drive for operation, and a Drive Mode used to actually run the motor.

Drive Mode: In the Drive Mode, the user can start the motor and observe operation status with the monitors that are available. Parameter settings cannot be edited or changed when in the Drive Mode.

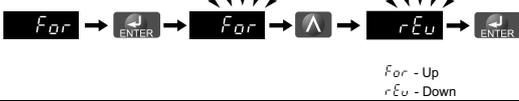
Programming Mode: The Programming Mode allows access to edit, adjust, and verify parameters, as well as perform Auto-Tuning. Unless set to allow an Up/down command, the drive will not accept an Up/down command when the digital operator is in the Programming Mode.

Note: If parameter b1-08 is set to 0 the drive will accept an Up/down command only in the Drive Mode. When editing parameters, the user must first exit the Programming Mode and enter the Drive Mode before starting the motor.

Note: To allow the drive to run the motor while in the Programming Mode, set b1-08 to 1.

◆ Navigating the Drive and Programming Modes

The drive is set to operate in Drive Mode when it is first powered up. Switch between display screens by using the  and  keys.

Mode	Contents	Operator Display	Description
Power Up	Speed Reference (default)		This display screen allows the user to monitor and change the speed reference while the drive is running. <i>Refer to The Drive and Programming Modes on page 84.</i> Note: The user can select the data displayed when the drive is first powered up with parameter o1-02.
	Up/Down		This display shows the direction that has been selected when the drive is controlled by a REMOTE source. When the drive is set for LOCAL, the user can switch between FWD and REV as shown below.  For - Up rEv - Down
Drive Mode	Output Speed Display		Displays the speed that is output from the drive.
	Output Current Display		Monitors the output current of the drive.
	Output Voltage Reference (default)		Shows the data that selected for display by the user in parameter o1-01. The default setting displays drive output voltage (o1-01 = 106). <i>Refer to o1: Digital Operator Display Selection on page 203.</i>
	Monitor Display		Lists the monitor parameters (U□-□□ parameters) available in the drive.
	Drive Mode		

Mode	Contents	Operator Display	Description
Programming Mode			
	Verify Menu		Lists all parameters that have been edited or changed from default settings. → Refer to <i>Verifying Parameter Changes: Verify Menu</i> on page 86.
	Setup Group		A select list of parameters necessary to get the drive operating quickly. → Refer to <i>Using the Setup Group</i> on page 87.
	Parameter Setting Mode		Allows the user to access and edit all parameter settings. → Refer to <i>Parameter Table</i> on page 302.
Programming Mode	Auto-Tuning Mode		Motor parameters are calculated and set automatically. → Refer to <i>Auto-Tuning</i> on page 96.
Drive Mode	Speed Reference		Returns to the speed reference display screen.

■ Drive Mode Details

The following actions are possible in the Drive Mode:

- Run and stop the drive
- Monitor the operation status of the drive (speed reference, output speed, output current, output voltage, etc.)
- View information on an alarm
- View a history of alarms that have occurred

Figure 4.5 illustrates how to change the speed reference from 0.00% to 10.00% while in the Drive Mode. This example assumes the reference source is assigned to the digital operator (b1-02 = 0) and d1-01 is set to 0 or 3.

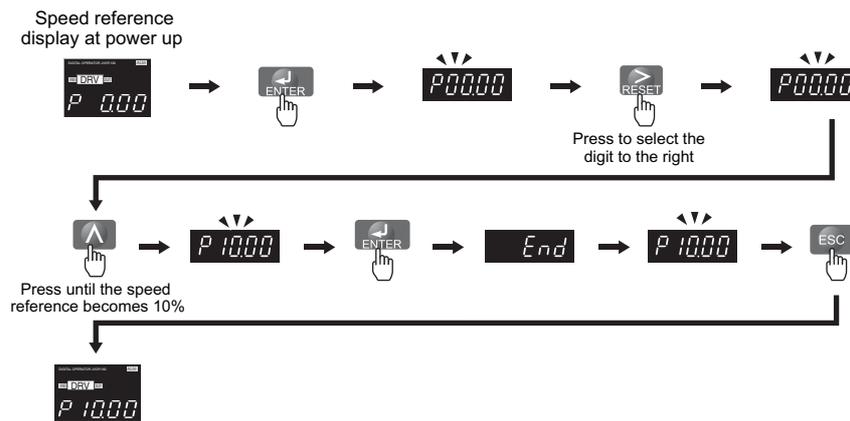


Figure 4.5 Setting the Speed Reference while in the Drive Mode

Note: The drive will not accept a change to the speed reference until the ENTER key is pressed after the speed reference is entered. This feature prevents accidental setting of the speed reference. To have the drive accept changes to the speed reference as soon as changes are made without requiring the ENTER key, set o2-05 to 1.

4.3 The Drive and Programming Modes

■ Programming Mode Details

The following actions are possible in the Programming Mode:

- **Parameter Setting Mode:** Access and edit all parameter settings
- **Verify Menu:** Check a list of parameters that have been changed from their original default values
- **Setup Group:** Access a list of commonly used parameters to simplify setup (see [Simplified Setup Using the Setup Group on page 87](#))
- **Auto-Tuning Mode:** Automatically calculates and sets motor parameters to optimize drive performance

◆ 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.	→	
2.	Press the or key until the Parameter Setting Mode screen appears.	→	
3.	Press the key to enter the parameter menu tree.	→	
4.	Press or key to select the C parameter group.	→	
5.	Press two times.		→ →
6.	Press or key to select the parameter C1-02.	→	
7.	Press to view the current setting value (1.50 s). Left digit flashes.	→	
8.	Press until the desired number is selected. "1" flashes.	→	
9.	Press the key and enter 0020.0.	→	
10.	Press and the drive will confirm the change.	→	
11.	The display automatically returns to the screen shown in Step 4.	→	
12.	Press the key until back at the initial display.	→	

◆ Verifying Parameter Changes: Verify Menu

The Verify Menu lists edited parameters from the Programming Mode or as a result of Auto-Tuning. It helps determine which settings have been changed, and is particularly useful when replacing a drive. If no settings have been changed, the Verify Menu will read *nonE*. The Verify Menu also allows users to quickly access and re-edit any parameters settings that have been changed.

Note: The Verify Menu will not display parameters from the A1 group (except for A1-02) even if those parameters have been changed from their default settings.

The following example is a continuation of the steps above. Here, parameter C1-02 is accessed using the Verify Menu, and is changed again from 1.50 s to 2.50 s.

To check the list of edited parameters:

Step			Display/Result
1.	Turn on the power to the drive. The initial display appears.	→	
2.	Press or until the display shows the top of the Verify Menu.	→	
3.	Press to enter the list of parameters that have been edited from their original default settings. If parameters other than C1-02 have been changed, use the or key to scroll until C1-02 appears.	→	
4.	Press the key to access the setting value. Left digit flashes.	→	

◆ Simplified Setup Using the Setup Group

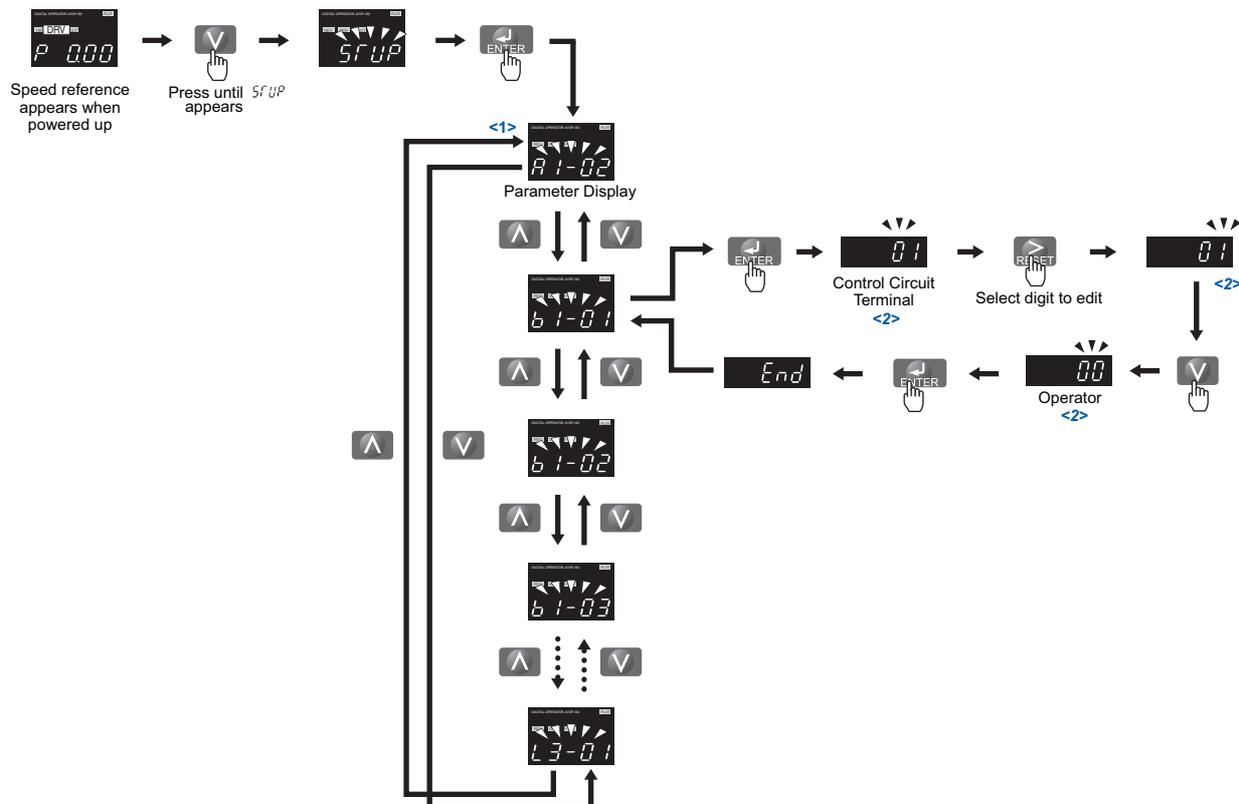
In the Setup Group, the drive lists the basic parameters needed to set up the drive for the elevator. It provides a simplified way to get the elevator running right away by showing only the most important parameters.

■ Using the Setup Group

Figure 4.6 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 4.6 Setup Group Example

4.3 The Drive and Programming Modes

■ Setup Group Parameters

Table 4.4 lists parameters available by default in the Setup Group.

If the desired parameter is not listed in the Setup Group, go to the Programming Mode.

Table 4.4 Setup Group Parameters

Parameter	Name	Parameter	Name
A1-02	Control Method Selection	E1-01	Input Voltage Setting
b1-01	Speed Reference Selection	E1-04	Maximum Output Frequency
C1-01	Acceleration ramp 1	E1-05	Maximum Voltage
C1-02	Deceleration ramp 1	E1-06	Base Frequency
d1-01	Speed Reference 1	E1-09	Minimum Output Frequency
d1-02	Speed Reference 2	E1-13	Base Voltage
d1-03	Speed Reference 3	E2-01	Motor Rated Current
d1-04	Speed Reference 4	E2-11	Motor Rated Output
d1-26	Leveling Speed	L1-01	Motor Overload Protection Selection

Note: Parameter availability depends on the control mode set in A1-02 that is used to run the drive and motor. Consequently, some of the parameters listed above may not be accessible in certain control modes.

◆ Switching Between LOCAL and REMOTE

When set to LOCAL, the Up/Down command is issued from the digital operator keypad. When set to REMOTE, the Up/Down command is issued from another source.

To switch between LOCAL and REMOTE, use the LO/RE key. This key is disabled with default settings, but can be enabled by setting parameter o2-01 to 1.

- Note:**
1. When set for LOCAL, the light on the LO/RE is on.
 2. The drive cannot 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.	
2. Press . The LO/RE light will light up. The drive is now in LOCAL. To set the drive for REMOTE operation, press the key again.	 →

4.4 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.

Flowchart	Purpose	Page
A	Installation, wiring, and basic steps required to setup the motor and elevator for operation.	90
B	Auto-Tuning for induction motors.	93
C	Auto-Tuning for PM motors.	94
D	Encoder Offset Auto-Tuning	95

◆ **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. See the other flowcharts in this chapter for instructions on first powering up the drive, parameter settings, and Auto-Tuning.

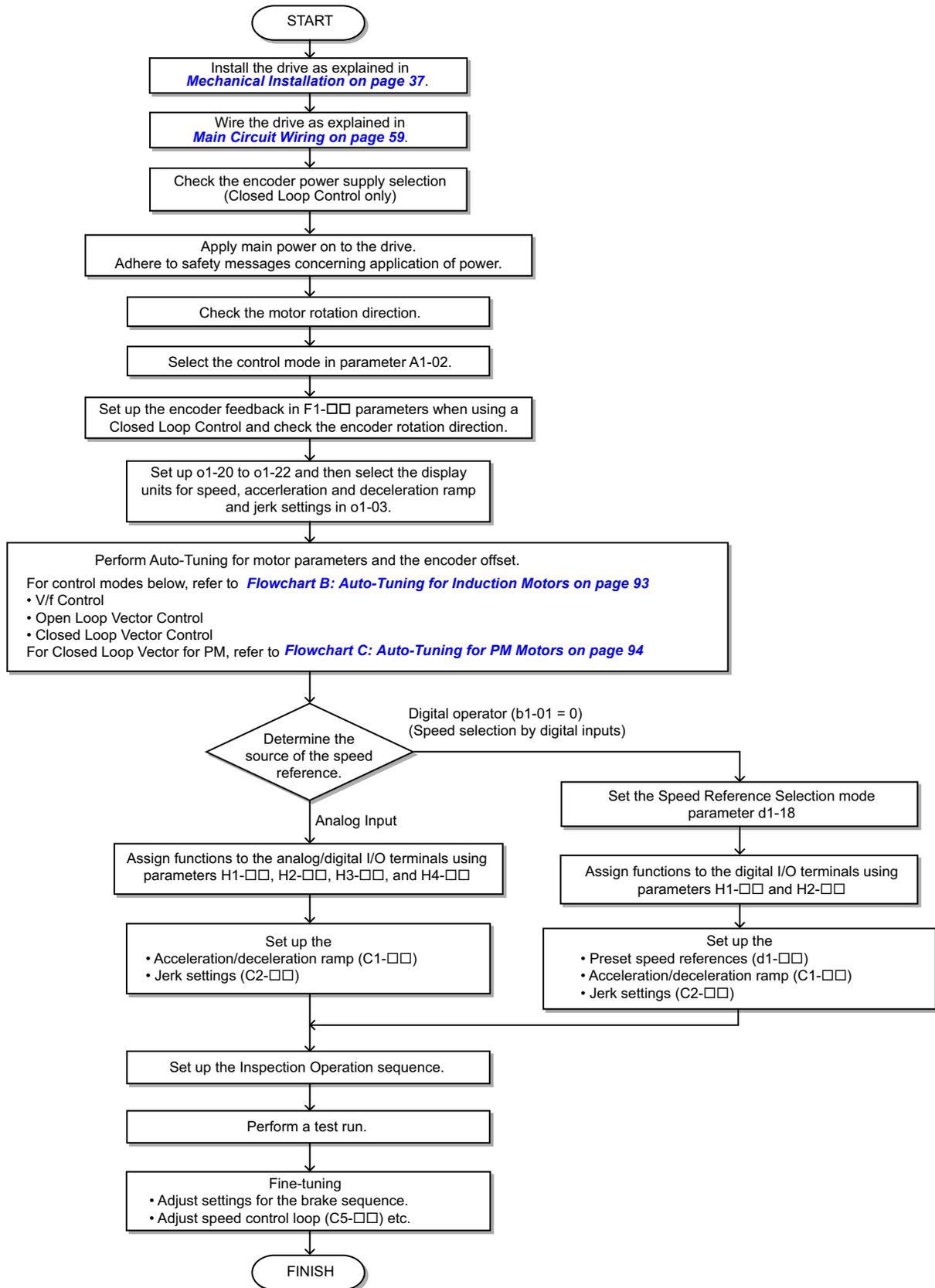


Figure 4.7 Installation, Wiring, Basic Setup for Motor and Elevator

◆ Power On

Before turning on the power supply

- Make sure all wires are connected properly. Also make sure motor phases are connected in the right sequence.
- Make sure that no screws, loose wire ends, or tools are left in the drive.
- If an encoder option card is used make sure the encoder is wired correctly and the power supply on the option card is set according to the encoder specification.

After turning the power on, the drive mode display should appear and no fault or alarm should be displayed. In case of any error refer to [Drive Alarms, Faults, and Errors on page 224](#).

◆ Control Mode Selection

When the drive is first powered up, one of the four control modes must be selected to match the application. Note that Closed Loop Vector modes require 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 or EnDat 2.2/01 encoder	Closed Loop Vector Control for PM motors	7	PG-F3
Permanent magnet motor with ERN1387 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

Depending on the elevator configuration it might be necessary to change the motor direction in order to have the elevator traveling up when the Up command is given to the drive. Do the following to check the motor rotation direction.

- The drive puts out voltage in U-V-W phase sequence when an Up command is input. Check the motor rotation with this phase sequence (for most motors clockwise seen from the shaft side).
- If the motor drives the elevator in up direction with a U-V-W sequence, make sure parameter b1-14 is set to 0.
- If the motor drives the elevator in down direction with a U-V-W sequence, set parameter b1-14 is set to 1.

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

◆ Encoder Setup

■ Encoder Resolution Setup

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

■ Encoder Rotation Direction Setup

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

If information about the signal sequence of the encoder are available

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

If no information about the signal sequence of the encoder are 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 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 91](#).

4.4 Start-Up Flowcharts

◆ Digital Operator Display Unit Selection

The drive allows to choose between different display units for speed related parameters and monitors, acceleration and deceleration ramp and jerk settings. The units can be selected using parameter o1-03 like shown below.

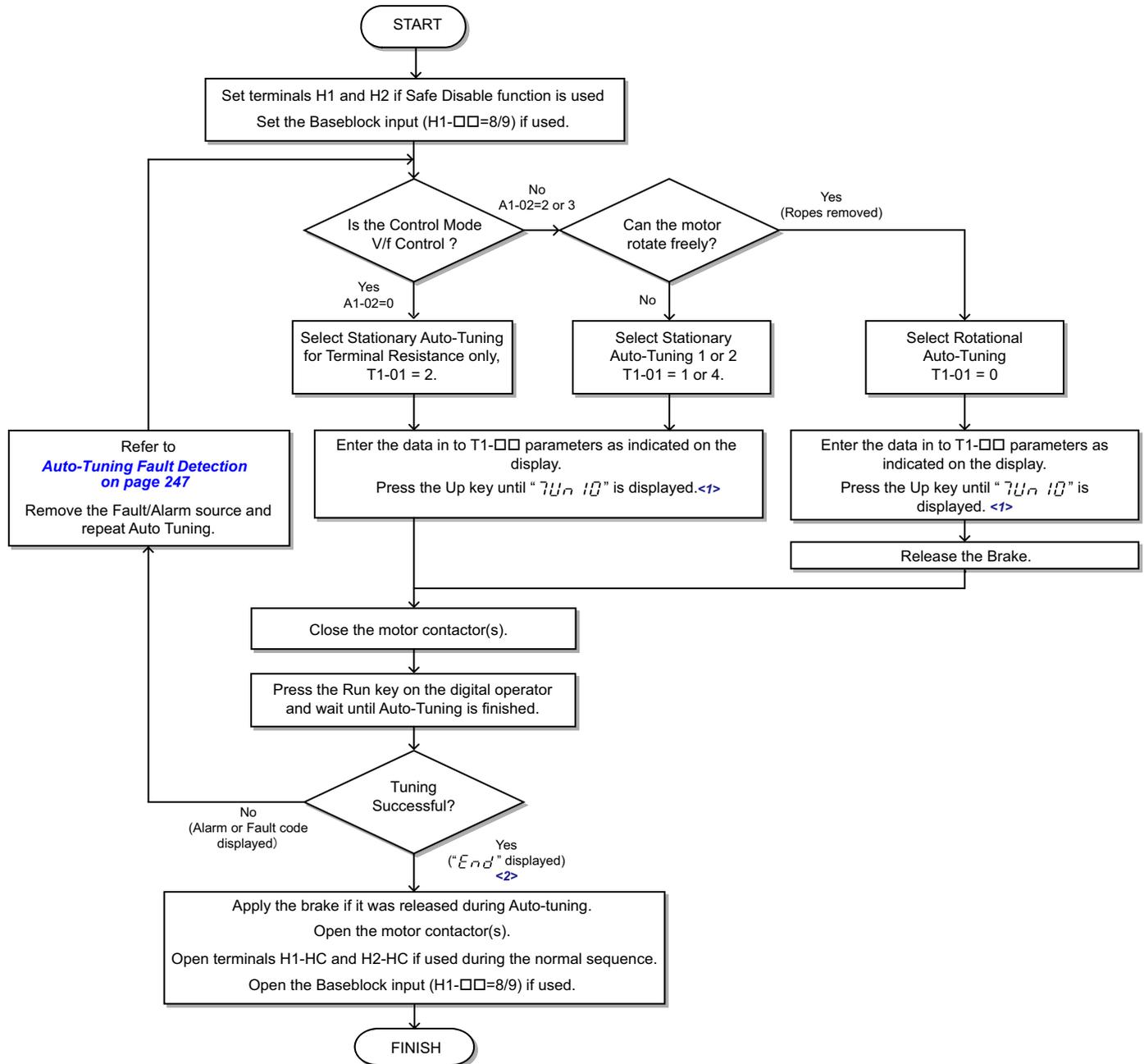
o1-03 Setting	Display Unit		
	Speed Setting/Monitors (d1-□□, U1-02, U1-02,...)	Accel/Decel Ramp (C1-□□)	Jerk Settings (C2-□□)
0	0.01 Hz	0.01 s Set as the time in required to accelerate from zero to the rated speed, and to decelerate from rated speed to zero.	0.01 s Set as the time used to change the accel/decel ramp from zero to the accel/decel ramp setting of C1-□□ and vice versa.
1 (default)	0.01%		
2	1 rpm		
3	User defined		
4	0.01 m/s	0.01 m/s ² (Set as accel/decel ramp)	0.01 m/s ³ (set as jerk value)
5	0.01 m/s	0.01 ft/s ² (Set as accel/decel ramp)	0.01 ft/s ³ (set as jerk value)
6	0.1 ft/min		

When using setting 4 to 6 certain mechanical data have to be programmed to the drive prior to changing o1-03. Perform the following steps.

1. Make sure motor data are set up correctly. Verify the setting of the maximum output frequency in parameter E1-04 and the setting for the number of motor poles in parameter E2-04 or E5-04.
2. Set the traction sheave diameter in units of mm to parameter o1-20.
3. Set the correct roping to parameter o1-21.
4. If a mechanical gear is used, set the gear ratio ($n_{\text{Motor}}/n_{\text{Traction Sheave}}$) to parameter o1-22. If a gearbox is not used, make sure o1-22 is set to 1.0.
5. Change parameter o1-03 to setting 4 or 5. The unit and setting values of related parameters will be changed automatically.

◆ 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.



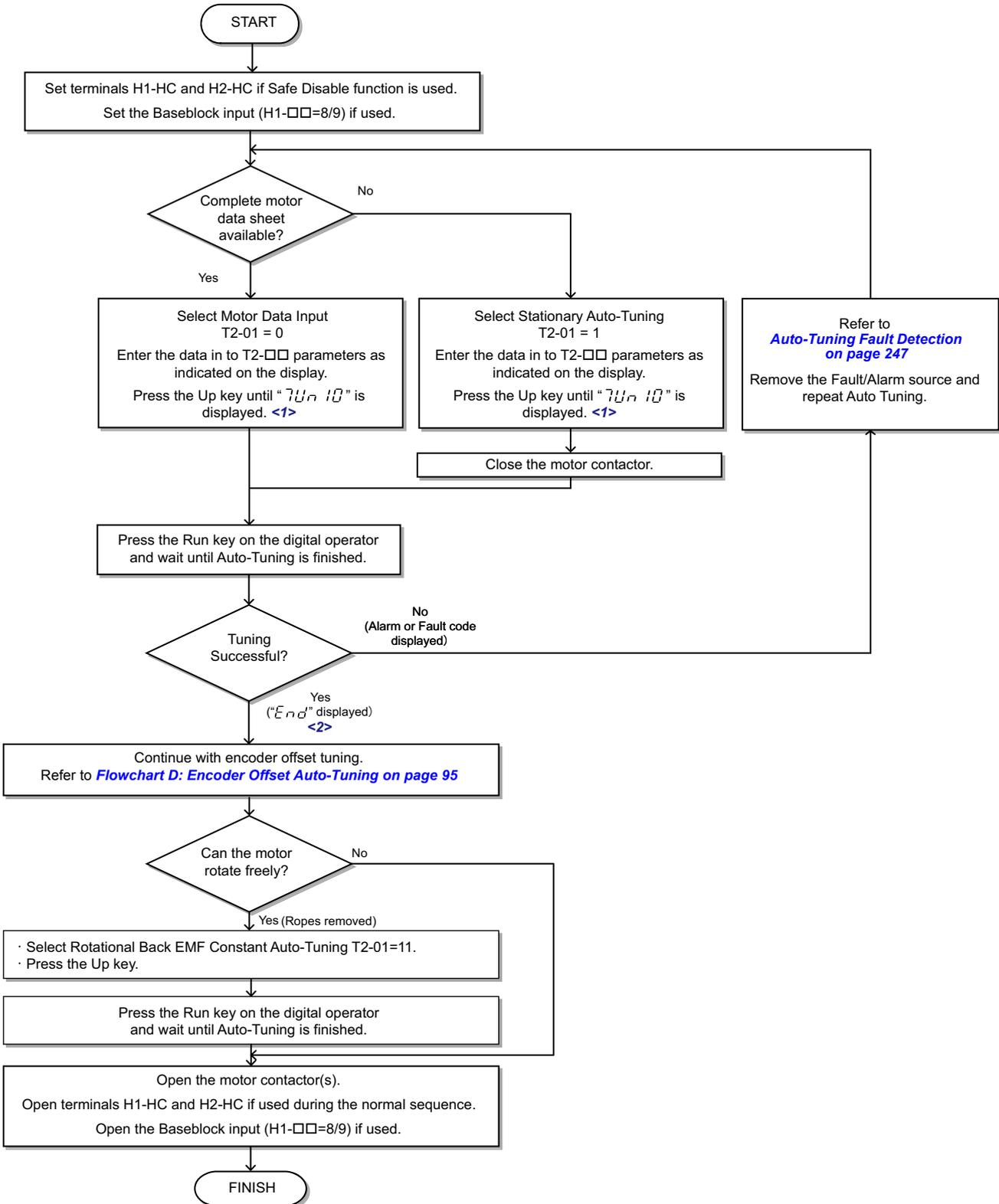
<1> If an LCD operator is used, the display shows "Tuning Ready".
<2> If an LCD operator is used, the display shows "Entry Accepted".

Figure 4.8 Auto-Tuning for Induction Motors

4.4 Start-Up Flowcharts

◆ Flowchart C: Auto-Tuning for PM Motors

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



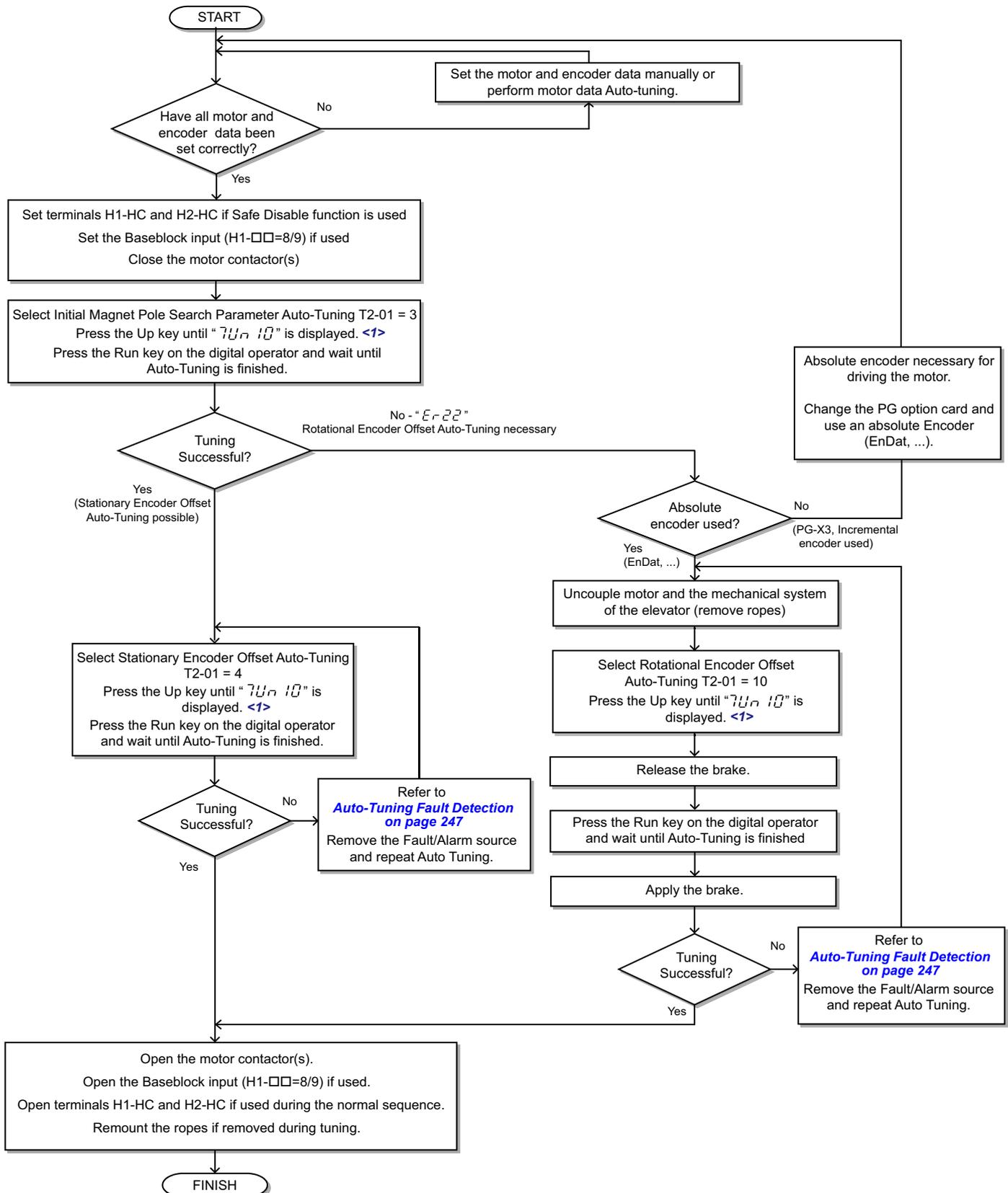
<1> If an LCD operator is used, the display shows "Tuning Ready".

<2> If an LCD operator is used, the display shows "Entry Accepted".

Figure 4.9 Auto-Tuning for PM Motors

◆ Flowchart D: Encoder Offset Auto-Tuning

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



<1> If an LCD operator is used, the display shows "Tuning Ready".

Figure 4.10 Encoder Offset Auto-Tuning

4.5 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 best suits the application. Directions on how to execute Auto-Tuning are listed in [Start-Up Flowcharts on page 89](#).

Note: The drive will only show Auto-Tuning parameters that are valid for the control mode that has been set to 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.

■ Auto-Tuning for Induction Motors

This feature automatically sets the V/f pattern and motor parameters E1-□□ and E2-□□ for an induction motor. In Closed Loop Vector, some F1-□□ parameters for speed feedback detection are also set up.

Table 4.5 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	<ul style="list-style-type: none"> Rotational Auto-Tuning gives the most accurate results, and is therefore highly 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	<ul style="list-style-type: none"> Motor test report or data sheet is not available. Automatically calculates motor parameters needed for vector control. Use if ropes can not be removed. Note that the accuracy is less than with Rotational Auto-tuning. 	No	Yes	Yes
Stationary Auto-Tuning for Line-to-Line Resistance	T1-01 = 2	<ul style="list-style-type: none"> Used for V/f Control or in vector control modes when the drive was set up properly before and 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	<ul style="list-style-type: none"> A motor test report is available. The no-load current and the rated slip must be entered from the test report, all other motor-related parameters are calculated automatically. Use if ropes can not be removed and if slip and no-load current data are available. 	No	Yes	Yes

[Table 4.6](#) lists the data that must be entered for Auto-Tuning. Make sure this data is available before starting Auto-Tuning. The information needed is usually listed on the motor nameplate or in the motor test report provided by the motor manufacturer. Also refer to [page 90](#) and [93](#) for details on Auto-Tuning process and selections.

Table 4.6 Auto-Tuning Input Data

Input Value	Input Parameter	Unit	Tuning Type (T1-01)			
			0 Rotational	1 Stationary 1	2 Stationary for Line-to-Line Resistance	4 Stationary 2
Motor Rated Power	T1-02	kW	Yes	Yes	Yes	Yes
Motor Rated Voltage	T1-03	Vac	Yes	Yes	No	Yes
Motor Rated Current	T1-04	A	Yes	Yes	Yes	Yes
Motor Rated Frequency	T1-05	Hz	Yes	Yes	No	Yes
Number of Motor Poles	T1-06	-	Yes	Yes	No	Yes
Motor Rated Speed	T1-07	r/min	Yes	Yes	No	Yes
Encoder Resolution (Pulses per Revolution)	T1-08	-	Yes	Yes	No	Yes
Motor No-Load Current	T1-09	A	No	Yes	No	Yes
Motor Rated Slip	T1-10	Hz	No	No	No	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 4.7 Types of Auto-Tuning for Permanent Magnet Motors

Type	Setting	Requirements and Benefits
Motor Data Input	T2-01 = 0	<ul style="list-style-type: none"> Use if a motor test report is available Input motor data like on test report. Make sure to convert data into the correct unit before if necessary. Motor does not rotate during Auto-Tuning
Stationary Auto-Tuning	T2-01 = 1	<ul style="list-style-type: none"> Use if a motor test report is not available Input motor data like on name plate. Make sure to convert data into the correct unit before. The drive automatically calculates the motor data.
Stationary Stator Resistance Auto-Tuning	T2-01 = 2	<ul style="list-style-type: none"> Tunes stator resistance only. Should be performed if the motor cable has changed.

Type	Setting	Requirements and Benefits
Rotational Back EMF Constant Auto-Tuning	T2-01 = 11	<ul style="list-style-type: none"> Used the Motor Induction Voltage (E5-24) if no data are available. Should be performed after Motor data have been set and the encoder offset has been adjusted. The motor must be uncoupled from the mechanical system (remove ropes).

Table 4.8 lists the data that must be entered for Auto-Tuning. Make sure the data is available before starting Auto-Tuning. The information needed is usually listed on the motor nameplate or in the motor test report provided by the motor manufacturer. Also refer to page 94 for details on the tuning mode selection and the tuning process.

Table 4.8 Auto-Tuning Input Data

Input Value	Input Parameter	Unit	Tuning Type (T2-01)			
			0 Motor Data input	1 Stationary	2 Stationary Stator Resistance	11 Rotational Back EMF Constant
Control Method	A1-02	-	7	7	7	7
Motor Rated Power	T2-04	kW	Yes	Yes	No	No
Motor Rated Voltage	T2-05	Vac	Yes	Yes	No	No
Motor Rated Current	T2-06	A	Yes	Yes	Yes	No
Number of Motor Poles	T2-08	-	Yes	Yes	No	No
Motor Rated Speed	T2-09	r/min	Yes	Yes	No	No
Stator 1 Phase Resistance	T2-10	Ω	Yes	No	No	No
d-axis Inductance	T2-11	mH	Yes	No	No	No
q-axis Inductance	T2-12	mH	Yes	No	No	No
Voltage Constant </>	T2-13	mVs/rad (el.)	Yes	No	No	No
Voltage Constant </>	T2-14	mVmin (mech.)	Yes	No	No	No
Encoder Resolution (Pulses per Revolution)	T2-16	-	Yes	Yes	No	No
Encoder Offset	T2-17	deg (mech.)	Yes	Yes	No	No

</> Only parameter T2-13 or T2-14 has to be input. Select one and leave the other empty.

■ Encoder Offset Auto Tuning

Encoder Offset Tuning is used for PM motors (A1-02=7). It measures the angle between the encoder zero position and the rotor magnet orientation. It needs to be performed when:

- a drive is setup the first time.
- after initialization.
- when the motor rotation direction has been changed (b1-14).
- when the encoder rotation direction has been changed (F1-05).
- when the encoder has been replaced.

Before performing Encoder Offset Tuning the motor and encoder data must be set properly.

Table 4.9 Types of Auto-Tuning for Encoder Offset

Type	Setting	Requirements and Benefits
Initial Magnet Pole Search Parameters Auto-Tuning	T2-01 = 3	<ul style="list-style-type: none"> Should be performed after motor Auto-tuning in order to decide the encoder tuning method. Attempts to detect the motor rotor position, judges if the 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 encoder. <p>Important: When using a PG-X3 card with an incremental encoder and this tuning fails, the motor can not be driven using and incremental encoder. Change the encoder to an absolute encoder.</p>
Stationary Encoder Offset Auto-Tuning	T2-01 = 4	<ul style="list-style-type: none"> Tunes the encoder offset without rotating the motor. If the encoder offset can not be tuned properly by this method run Rotating Encoder Offset Tuning.
Rotational Encoder Offset Auto-Tuning	T2-01 = 10	<ul style="list-style-type: none"> Tunes the encoder offset while rotating the motor. Motor and mechanical system must be uncoupled (ropes must be removed from traction sheave).

◆ Before Auto-Tuning the Drive

Check the items below before Auto-Tuning the drive.

■ General Auto-Tuning Preparations and Precautions

WARNING! When performing Rotational Auto-Tuning for motor data or 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.

WARNING! Electrical Shock Hazard. When executing Stationary Auto-Tuning for motor data or encoder offset, the motor does not rotate, however, power is applied. Do not touch the motor until Auto-Tuning is completed. Failure to comply may result in dead or serious injury from electrical shock.

WARNING! Sudden Movement Hazard. Do not release the mechanical brake during Stationary Auto-Tuning. Inadvertent brake release may cause damage to equipment or injury to personnel. Ensure that the mechanical brake release circuit is not controlled by the drive multi-function digital outputs exclusively.

- Always try to perform Rotational Auto-Tuning as it gives more accurate results than Non-Rotating Auto-Tuning. Rotation Auto-Tuning should be performed whenever the motor can be uncoupled from the elevator mechanical system (remove ropes from traction sheave). When motor and mechanical system can not be uncoupled, use a Stationary Auto-Tuning method.
- Make sure that the mechanical brake is kept applied for all Stationary Auto-Tuning methods. Make sure to release the brake for all Rotational Auto-Tuning methods.
- Motor contactors must be closed during the Auto-Tuning process.
- H1 and H2 signals must be ON when performing Auto-Tuning.
- A digital input programmed for Baseblock (H1-□□=8/9) must be set so that the drive is not in a baseblock condition.
- Confirm that the motor is mechanically fixed. Do not touch the motor until the Auto-Tuning process is complete. Voltage is applied to the motor during the tuning process, even though the motor may not be rotating.
- Auto-Tuning can be cancelled any time by pressing the STOP key on the digital operator.
- Auto-Tuning requires the user to input data from the motor nameplate or motor test report. Make sure this data is available before Auto-Tuning the drive.
- For best performance, the drive input supply voltage must be greater than the motor rated voltage.
 - Note:** Better performance is possible when using a motor with a base voltage that is 20 V (40 V for 400 V class models) lower than the input supply voltage. This is particularly important when operating the motor above 90% of base speed, where high torque precision is required.
- Make sure the area around the motor is clear of personnel and any equipment before starting the tuning.
- The motor should be fully stopped. Personal injury may result if the motor is already in motion when Auto-Tuning is executed.
- For all Rotating Auto-Tuning modes remove the lock key from the motor shaft when tuning a motor with no gear or traction sheave mounted.
- [Table 4.10](#) describes digital input and output terminal operation while Auto-Tuning is executed.

Table 4.10 Digital Input and Output Operation During Auto-Tuning

Motor Type	Auto-Tuning Type	Digital Input	Digital Output
IM Motor	Rotational Auto-Tuning	Digital input functions are disabled.	Functions the same as during normal operation
	Stationary Auto-Tuning 1	Digital input functions are disabled.	Maintains Stationary the status at the start of Auto-Tuning
	Stationary Auto-Tuning for Line-to-Line Resistance	Digital input functions are disabled.	Maintains Stationary the status at the start of Auto-Tuning
	Stationary Auto-Tuning 2	Digital input functions are disabled.	Maintains Stationary the status at the start of Auto-Tuning
PM Motor	Motor Data Input	Digital input functions are disabled.	Digital output functions are disabled.
	Stationary Auto-Tuning	Digital input functions are disabled.	Maintains Stationary the status at the start of Auto-Tuning
	Stationary Stator Resistance Auto-Tuning	Digital input functions are disabled.	Maintains Stationary the status at the start of Auto-Tuning
	Initial Magnet Pole Search Parameters Auto-Tuning	Digital input functions are disabled.	Maintains Stationary the status at the start of Auto-Tuning
	Stationary Encoder Offset Auto-Tuning	Digital input functions are disabled.	Maintains Stationary the status at the start of Auto-Tuning
	Rotational Encoder Offset Auto-Tuning	Digital input functions are disabled.	Maintains Stationary the status at the start of Auto-Tuning
	Rotational Back EMF Constant Auto-Tuning	Digital input functions are disabled.	Functions the same as during normal operation

◆ 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.

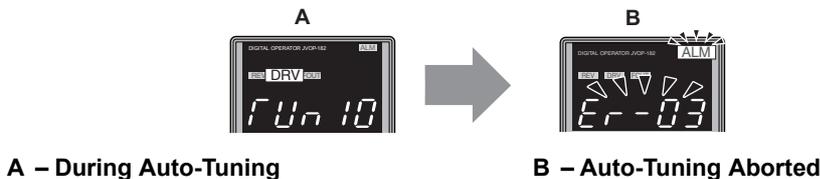


Figure 4.11 Auto-Tuning Aborted Display

◆ Auto-Tuning Operation Example

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

■ Selecting the Type of Auto-Tuning

Step	Step	Display/Result
1. Turn on the power to the drive. The initial display appears.	→	
2. Press the or key until the Auto-Tuning display appears.	→	
3. Press to begin setting parameters.	→	
4. Press to display the value for T1-01.	→	
5. Save the setting by pressing .	→	
6. The display automatically returns to the display shown in Step 3.	→	

■ 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	Step	Display/Result
1. Press to access the motor output power parameter T1-02.	→	
2. Press to view the default setting.	→	
3. Press to select the digit to edit.	→	
4. Press and enter the motor power nameplate data in kW.	→	
5. Press to save the setting.	→	
6. The display automatically returns to the display in Step 1.	→	
7. Repeat Steps 1 through 5 to set the following parameters: <ul style="list-style-type: none"> • 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 	→	

Note: For details on each setting, *Refer to Parameter Settings during Induction Motor Auto-Tuning: T1 on page 100.*

4.5 Auto-Tuning

■ 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 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. Failure to comply could result in improper operation of the drive. Ensure the motor can freely spin before beginning Auto-Tuning.

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

Note: These instructions continue from Step 7 in “Enter Data from the Motor Nameplate”.

Step			Display/Result
1.	After entering the data listed on the motor nameplate, press  to confirm.	→	
2.	Press  to activate Auto-Tuning.  flashes. The drive begins by injecting current into the motor for about 1 min, and then starts to rotate the motor. Note: The second digit indicates the type of Auto-Tuning being performed.	→	
3.	Auto-Tuning finishes in approximately one to two minutes.	→	

◆ 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 that are to be operated in the field weakening range, first perform the Auto-Tuning with the base data. After Auto-Tuning is complete, change the maximum frequency E1-04 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 96](#) for details on the different types of Auto-Tuning.

No.	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.	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. If the motor is to be operated above its base speed, enter the voltage at base speed here.

For better control precision around rated speed when using a vector control mode, it can be helpful to enter the no-load voltage for the motor here. The motor's "no-load voltage" refers to the voltage needed to operate the motor under no-load conditions at rated speed. The no-load voltage can usually be found in the motor test report available from the manufacturer. If no data is available, enter approximately 90% of the rated voltage printed on the motor nameplate. Note that this might increase the output current reducing the overload margin.

When the input power supply voltage is relatively low, set T1-03 to 90%. Because low voltage from the power supply results in higher current levels, be sure to check the capacity of main power supply (fuse) used for the drive.

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

<1> Values shown here are for 200 V class drives. Double values when using a 400 V class unit.

■ T1-04: Motor Rated Current

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

No.	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 the motor is used in the field weakening area, enter the maximum frequency to E1-04 after Auto-Tuning is complete.

No.	Name	Setting Range	Default
T1-05	Motor Base Frequency	0.0 to 120.0 Hz	</>

<1> Regional default settings

Setting 50.0 Hz: China (Model code: CIMR-LB□A) and Asia (Model code: CIMR-LT□A)

■ T1-06: Number of Motor Poles

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

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

■ T1-07: Motor Base Speed

Used to set the motor rated speed according to the motor nameplate value. If a motor with an extended speed range is used or the motor is used in the field weakening area, enter the speed at base frequency here.

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

<1> Regional default settings

Setting 1450 r/min: China (Model code: CIMR-LB□A) and Asia (Model code: CIMR-LT□A)

■ T1-08: Encoder Resolution (Pulses Per Revolution)

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

No.	Name	Setting Range	Default
T1-08	Encoder Resolution (Pulses Per Revolution)	0 to 60000 ppr	</>

<1> Regional default settings

Setting 1024 ppr: China (Model code: CIMR-LB□A) and Asia (Model code: CIMR-LT□A)

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

4.5 Auto-Tuning

■ T1-09: Motor No-Load Current

Sets the no-load current for the motor.

The default setting displayed is no-load current that was 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.	Name	Setting Range	Default
T1-09 <I>	Motor No-Load Current	0 A to [T1-04] (Max: 0 to 2999.9)	–

<I> The value will have two decimal places (0.01 A) in the drive models 2A0018 to 0033 and 4A0009 to 0018 (refer to [Table A.1](#) and [Table A.2](#)), and one decimal place (0.1 A) in the drive models 2A0047 to 0145 and 4A0024 to 0091

■ 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.	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: Auto-Tuning Mode Selection

Selects the type of Auto-Tuning to be performed. [Refer to Auto-Tuning for Permanent Magnet Motors on page 96](#) for details on different types of Auto-Tuning.

No.	Name	Setting Range	Default
T2-01	Auto-Tuning Mode Selection	0 to 4, 10, 11	0

0: Motor Data Input

1: Stationary Auto-Tuning

2: Stationary Stator Resistance Auto-Tuning

3: Initial Magnet Pole Search Parameters Auto-Tuning

4: Stationary Encoder Offset Auto-Tuning

10: Rotational Encoder Offset Auto-Tuning

11: Rotational Back EMF Constant Auto-Tuning

■ T2-04: Rated Power

Specifies the motor rated power in kilowatts.

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

■ T2-05: Rated Voltage

Sets the motor rated voltage.

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

<I> The setting range and default value shown here is for a 200 V class drive. These values double when using a 400 V class unit.

■ T2-06: Motor Rated Current

Enter the motor rated current in amps.

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

■ T2-08: Number of Motor Poles

Enter the number of motor poles.

No.	Name	Setting Range	Default
T2-08	Number of Motor Poles	2 to 48	6

■ T2-09: Motor Base Speed

Enter the motor rated speed in r/min.

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

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

■ T2-10: Motor Stator Resistance

Enter the motor stator resistance per motor phase.

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

■ T2-11: Motor d-Axis Inductance

Enter the d axis inductance per motor phase.

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

■ T2-12: Motor q-Axis Inductance

Enter the q axis inductance per motor phase.

No.	Name	Setting Range	Default
T2-12	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.	Name	Setting Range	Default
T2-13	Induced Voltage Constant Unit Selection	0, 1	1

0: mV/min⁻¹

1: mVs/rad

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: Motor Induced Voltage Constant

Enter the motor induced voltage constant.

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

4.5 Auto-Tuning

■ T2-16: Encoder Resolution (Pulses Per Revolution)

Enter the encoder resolution. Set the actual number of pulses for one full motor rotation.

No.	Name	Setting Range	Default
T2-16	Encoder Resolution (Pulses Per Revolution)	0 to 15000 ppr	1024 ppr

■ T2-17: Encoder Offset

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

No.	Name	Setting Range	Default
T2-17	Encoder Offset	-180.0 to 180.0 deg	0.0 deg

4.6 Setup Procedure for Elevator Applications

◆ Up and Down Commands and Speed Reference Selection

■ Speed Reference Selection

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

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

■ Up / Down Command Source Selection

The input source for the Up and Down signal can be selected in 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 Up direction Terminal S2: Run in 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 up or down direction, the following conditions must be fulfilled:

- A speed reference greater than zero must be selected.
- 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 that the drive is not in 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) must be set, i.e. the output contactor must be closed.

Travel Stop

The drive stops under the following conditions:

- The Up or Down command is cleared.
- d1-18 is set to 1 or 2 and the Up/Down or Leveling Speed signal (H1-□□ = 53) is cleared.
- d1-18 is set to 3 and all speed inputs are cleared.
- A fault occurs. The stopping method depends on the fault occurred and 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 how different travel speeds are selected by digital inputs.

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

4.6 Setup Procedure for Elevator Applications

■ 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

Eight separate speed settings (defined in parameters d1-01 to d1-08) can be selected by three digital input signals.

Setting d1-18 = 3

Seven separate speeds settings (defined in parameters d1-02 to d1-08) can be selected by three digital input signals. The drive stops when no speed is selected (i.e., all speed selection inputs are switched off).

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

With this setting, six different speeds (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)

Depending on the assignment of speed selection functions to the digital input (H1-□□ settings) the different speed settings can be selected like shown in the table below.

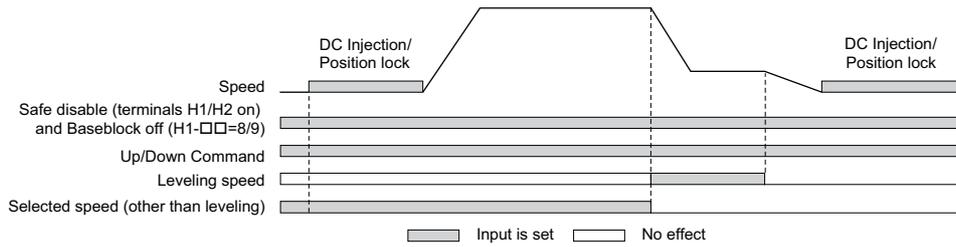
Note: Parameters d1-19 through d1-26 are displayed only if d1-18 is set to 1 or 2.

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)

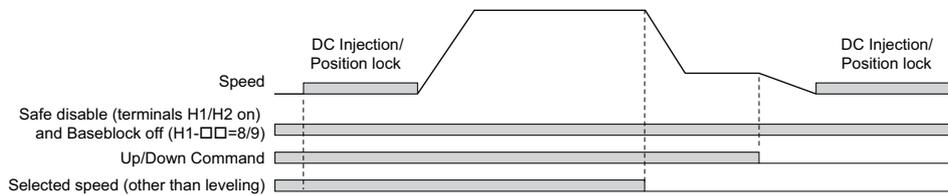
The higher speed has priority over the leveling speed, meaning, the leveling signal is disregarded as long as any other speed selection input is active. The drive decelerates to the leveling speed (d1-26) when the selected speed reference signal is removed.



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

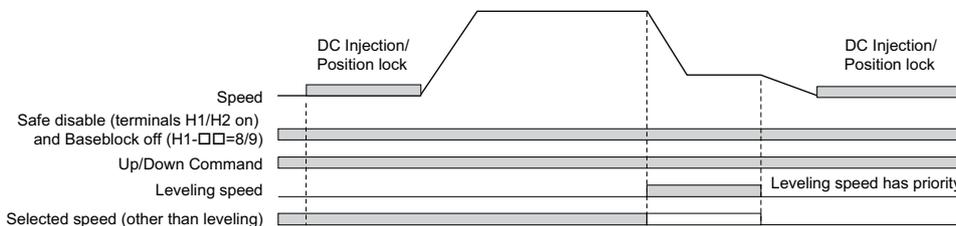
The drive decelerates to the leveling speed (d1-26) when the selected speed reference signal is removed.

If no speed reference is selected at start the drive will trigger an “FrL” fault. To disable Speed Reference Missing (FrL) detection, set parameter S6-15 to “0”. 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)

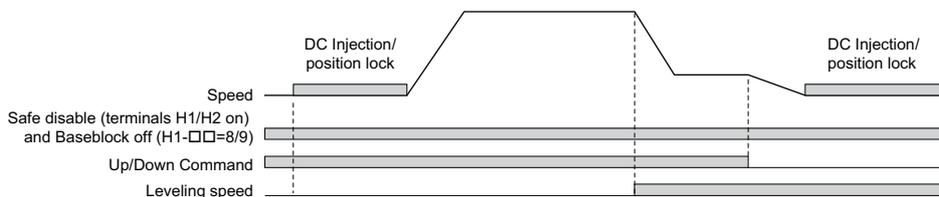
The leveling signal has priority over other speed references. The drive decelerates to the leveling speed (d1-26) when the leveling speed selection input is activated. The drive stops when either the leveling input or the Up/Down command is released.



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.

CAUTION! This sequence can be risky if the speed selection doesn't work for some reason (broken wire, etc.)



4.6 Setup Procedure for Elevator Applications

◆ Multi-Function Terminal Setup

■ Multi-Function Digital Input (Terminals S3 to S8)

The H1 parameters assign functions to digital input terminals S3 to S8. For a list of functions that can be set to these terminals, see [H1-03 to H1-08: Functions for Terminals S3 to S8 on page 166](#).

■ Multi-Function Digital Outputs

The H2 parameters assign functions to digital output terminals M1-M2, M3-M4, M5-M6, P1-C1, and P2-C2. For a list of functions that can be set to these terminals, see [H2-01 to H2-05: Terminals M1-M2, M3-M4, M5-M6, P1-PC, and P1-P2 Function Selection on page 169](#).

■ Multi-Function Analog Inputs

The H3 parameters assign functions to analog input terminals A1 and A2. For a list of functions that can be set to these terminals, see [Multi-Function Analog Input Terminal Settings on page 179](#).

■ 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 drive monitors, see [U: Monitors on page 330](#).

◆ Accel/Decel Ramp and Jerk Settings

Acceleration and deceleration ramp are set using the C1-□□ parameters. Use the C2-□□ for adjusting the jerk at the start and end of acceleration or deceleration.

[Figure 4.12](#) explains how accel/decel ride and jerk settings can be used to adjust the ride profile.

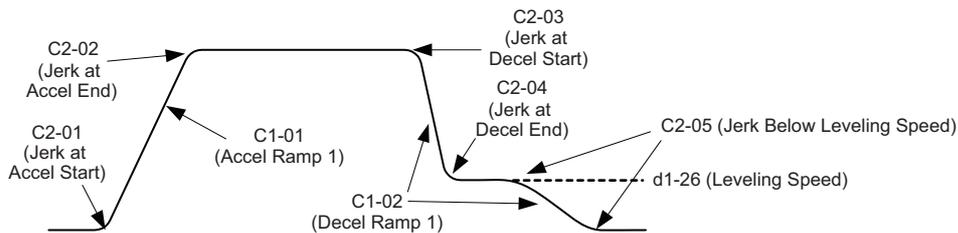


Figure 4.12 Accel/Decel Ramp and the Jerk Function

Units used to set the acceleration and deceleration ramp as well as the Jerk function change with the setting of parameter o1-03. Refer to [Digital Operator Display Unit Selection on page 92](#).

◆ Inspection Operation

■ Start in Inspection Operation

Inspection operation is performed when an Up or Down signal is input while one of the conditions below 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 in Inspection Mode

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 up 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. 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 Time Chart

A time chart for Inspection Operation appears in *Figure 4.13*.

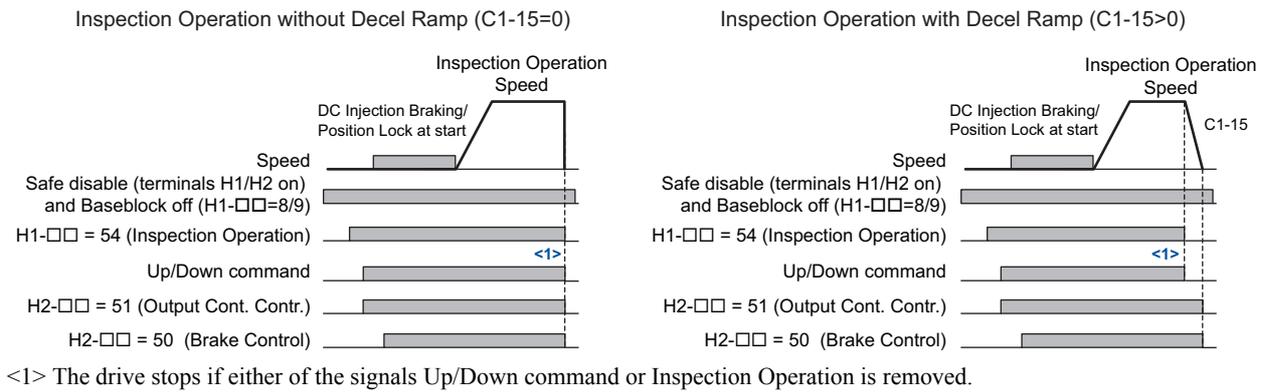


Figure 4.13 Inspection Operation Sequence

◆ Brake Sequence

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

■ Brake Sequence without Torque Compensation

To have the brake sequence operate without torque compensation, do not set any of the analog input terminals for “Torque compensation” (H3-□□ = 14).

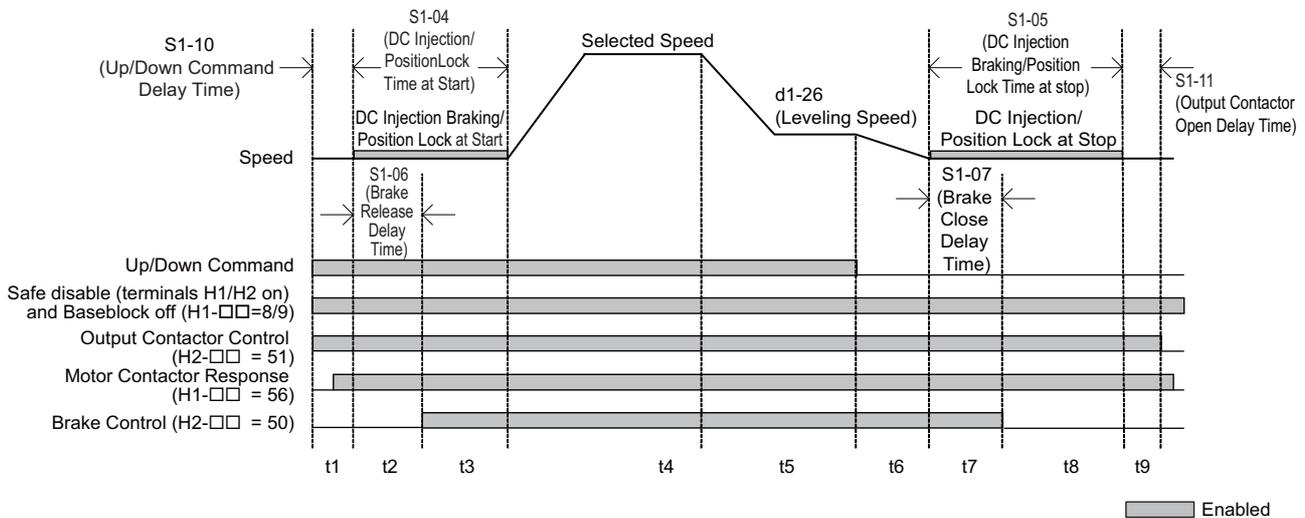


Figure 4.14 Brake Sequence without Torque Compensation at Start

Above, *Figure 4.14* is divided into time zones. Below, *Table 4.11* explains the sequence in each time zone.

4.6 Setup Procedure for Elevator Applications

Table 4.11 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 the next step.
t2	Once the delay time set in S1-10 has passed, the drive outputs current to the motor. DC Injection Braking or Position Lock begins.
	Once 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 apply 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	Once 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 needs to be set up to provide the torque compensation signal (H3-□□ = 14).

Below, [Figure 4.15](#) shows a time chart for a brake sequence using torque compensation.

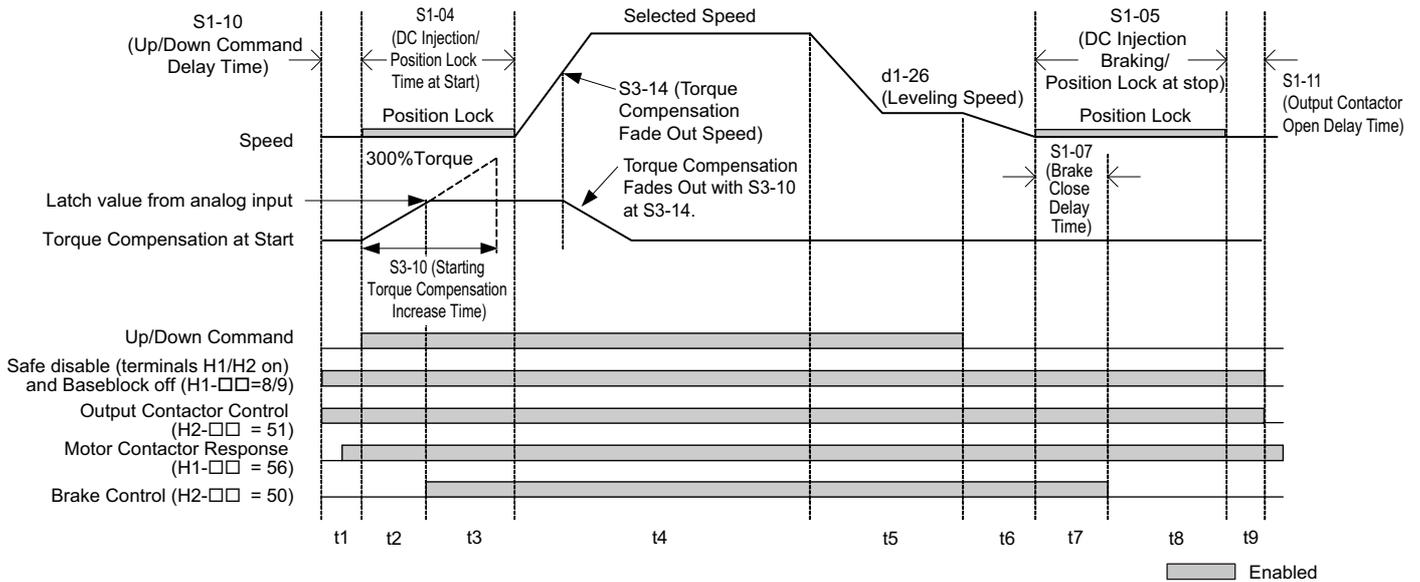


Figure 4.15 Brake Sequence Using Torque Compensation at Start

Above, [Figure 4.15](#) is divided into time zones. Below, [Table 4.12](#) explains the sequence in each time zone.

Table 4.12 Time Zones for Brake Sequence with 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 the next step. The drive reads the torque value from the analog input (load cell).

Time Zone	Description
t2	Once 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.
	Once 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. Once the torque compensation fade-out 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 apply 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	Once 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.

Before the torque compensation function can be used, the analog input scaling must be adjusted to the load cell output. This can be done by bringing the elevator into two different load conditions and teaching 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, see [Standard Connection Diagram on page 50](#).
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 input the load is connected to (U1-13 for terminal A1, U1-14 for terminal A2)
5. Give the elevator an Up or Down command, using Inspection Operation or normal operation mode. The car should be hold 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 input the load is connected to (U1-13 for terminal A1, U1-14 for terminal A2)
4. Give the elevator an Up or Down command, using Inspection Operation or normal operation mode. The car should be hold 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.

4.6 Setup Procedure for Elevator Applications

After setting load conditions 1 and 2 perform trial runs. If required, parameter S3-12 can be set up to add a bias to the load cell input when riding in Down direction (default: 0.0%, same torque compensation characteristics in up and down direction). Below, [Figure 4.16](#) illustrates how torque compensation is affected by the settings of S3-12 and S3-27 through S3-30.

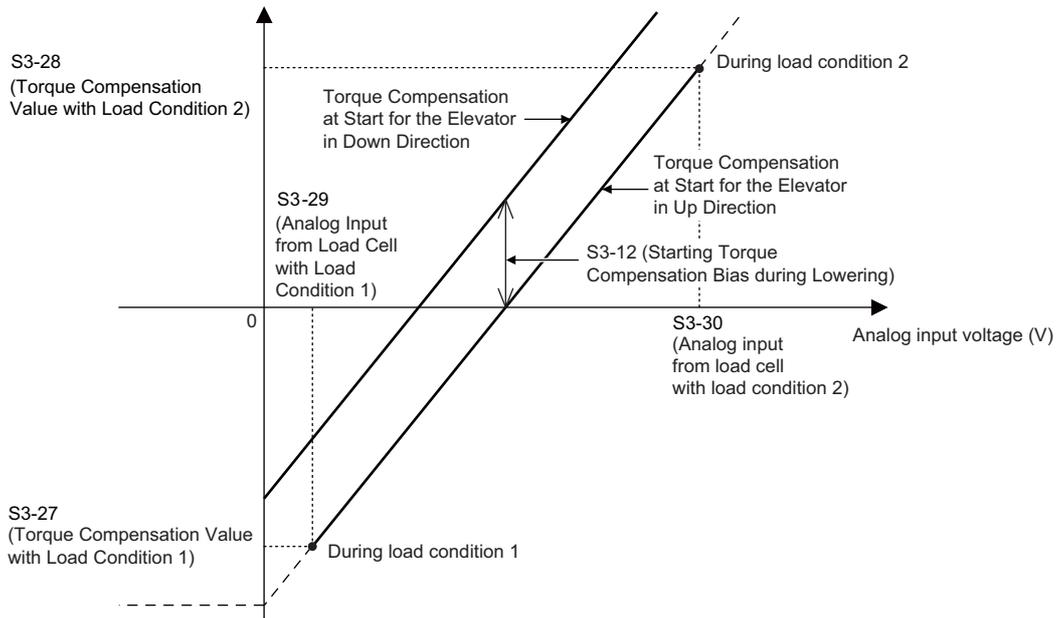


Figure 4.16 Torque Compensation at start for the Elevator in Up and Down Direction

◆ Adjustments for Riding Comfort

This section explains how to adjust settings to eliminate problems with hunting, vibration, and rollback.

Take the steps presented in this section after the basic application setup is complete. Also refer to [Riding Comfort Related Problems on page 127](#) for further descriptions on how to resolve riding comfort problems.

■ Speed Loop Adjustments (CLV and PM/CLV)

The speed control loop uses four different gain and integral time settings that can be adjusted using C5-□□ parameters. The settings are switched over when the motor speed reaches the level set in parameter C5-07.

- Proportional gain and integral time C5-03/04 are used at start when the speed is lower than the setting of C5-07.
- Proportional gain and integral time C5-01/02 are used at speeds above the setting of C5-07.
- Proportional gain and integral time C5-13/14 are used at stop when leveling speed is selected as speed reference and the speed is lower than the setting of C5-07.
- Proportional gain and integral time C5-19/20 are used during Position Lock at start in CLV/PM.

Increase the gain and shorten the integral time to increase speed control responsiveness in each of the sections. Reduce the gain and increase the integral time if vibration or oscillation occurs.

■ Inertia Compensation (CLV and PM/CLV)

Inertia compensation can be used to eliminate motor speed overshoot at the acceleration end or undershoot at the end of deceleration caused by the system inertia. Adjust the function following the steps below.

1. Make sure the speed control loop parameters are adjusted properly (C5-□□).
2. Set parameter n5-01 = 1 to enable inertia compensation.
3. Calculate and set n5-02 and n5-03 as follows:

Motor Acceleration Time n5-02	$n5-02 = J_{Mot} \cdot \frac{\pi \cdot n_{r_Mot}}{30 \cdot T_{r_Mot}}$	<ul style="list-style-type: none"> • J_{Mot} - Motor inertia in kgm² • n_{r_Mot} - Rated motor speed in min⁻¹ • T_{r_Mot} - Rated motor torque in Nm
Inertia Compensation Gain n5-03	$\Sigma J = J_{TS} \cdot i^2 + \Sigma m \cdot \left(\frac{30 \cdot v_{r_Elev}}{\pi \cdot n_{r_Mot}} \right)^2$ $n5-03 = \Sigma J / J_{Mot}$	<ul style="list-style-type: none"> • J_{TS} - Traction sheave inertia in kgm² • i - Gear ratio (n_{Load}/n_{Mot}) • v_{r_Elev} - Rated elevator speed in m/s • Σm - Mass of all moved parts (car, counterweight, ropes, load <I>) in kg

<I> Insert 0 kg for the load to calculate the lowest setting, insert the elevator rated load to calculate the maximum setting for n5-03. Use the lower setting for initial trials.

4. Change the setting of n5-03 within the limits calculated in step 3 until the desired performance is achieved.
If possible trace the output speed after soft starter (U1-16) and the motor speed (U1-05) values. Increase n5-03 if the motor speed does not follow the speed after soft start. Decrease n5-03 if the motor overshoots the designated speed at the end of acceleration or undershoots the speed at the end of deceleration.

■ Adjusting Position Lock at Start (CLV/PM)

Set the S3-□□ and C5-□□ parameters as described below in order to reduce rollback effects at start.

- With the unloaded elevator car, adjust the speed loop gain (C5-19) and integral time for Position Lock (C5-20). Increase the gain and reduce the integral time in order to reduce the rollback of the car. Set them in the opposite way if vibration occurs.
- Adjust the Position Lock at start gain 2 (S3-02). Increase S3-02 if rollback occurs, decrease it if vibration occurs.
- If the elevator is balanced and oscillation at start occurs, try gradually increasing the setting in S3-40 in steps of one pulse.

◆ 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 d1-25 to travel to the nearest floor.

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.

■ Drive Power Supply for Rescue Operation

There are various ways of supplying power to the drive for rescue operation. Independent of what way is chosen, the voltage in the DC bus of the drive and the voltage supplied to the drive control circuit must meet the specifications given in [Table 4.13](#).

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 3 phase or battery supply. Make sure that even with this higher ripple the DC bus voltage never falls below the minimum value listed in [Table 4.13](#).

4.6 Setup Procedure for Elevator Applications

When using a PM motor with an incremental 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 “ $E_{nd} \bar{0}$ ” to “ $E_{nd} \bar{1} \bar{0}$ ” then rescue operation will require a battery or UPS that supplies the drive DC bus with at least 280 Vdc for 200V class drives and 560Vdc for 400 V class drives. Alternatively switch to an absolute encoder and a PG-E3 or PG-F3 option card.

Table 4.13 Power Supply Ratings for Rescue Operation

Motor Type	Speed Feedback	DC Bus Voltage	Control Circuit Voltage
Induction Motor	Incremental Encoder with PG-X3 option card	200 V class drives: 48 to 340 Vdc 400 V class drives: 96 to 680 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)
Permanent Magnet Motor	Incremental Encoder with PG-X3 option card “ $E_{nd} \bar{0}$ ” to “ $E_{nd} \bar{1} \bar{0}$ ” 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	
	Incremental 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	When supplied via a 24 Vdc control power backup unit: 200 V and 400 V class drives: 24 Vdc
	Absolute Encoder with PG-F3 or PG-E3 option card	200 V class drives: 48 to 340 Vdc 400 V class drives: 96 to 680 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 power supply to a battery or UPS requires some 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 settings:

- A single-phase, 230 V UPS is used as backup power supply for a 200 V or 400 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 or 500 Vdc for 400 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 or 500 Vdc for 400 V class drives is used for the main and control power supply.

Select the setup that matches your application, and follow the corresponding instructions for wiring and drive settings. For applications 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 any 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.

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

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

Wiring

See [Figure 4.17](#) for a wiring diagram.

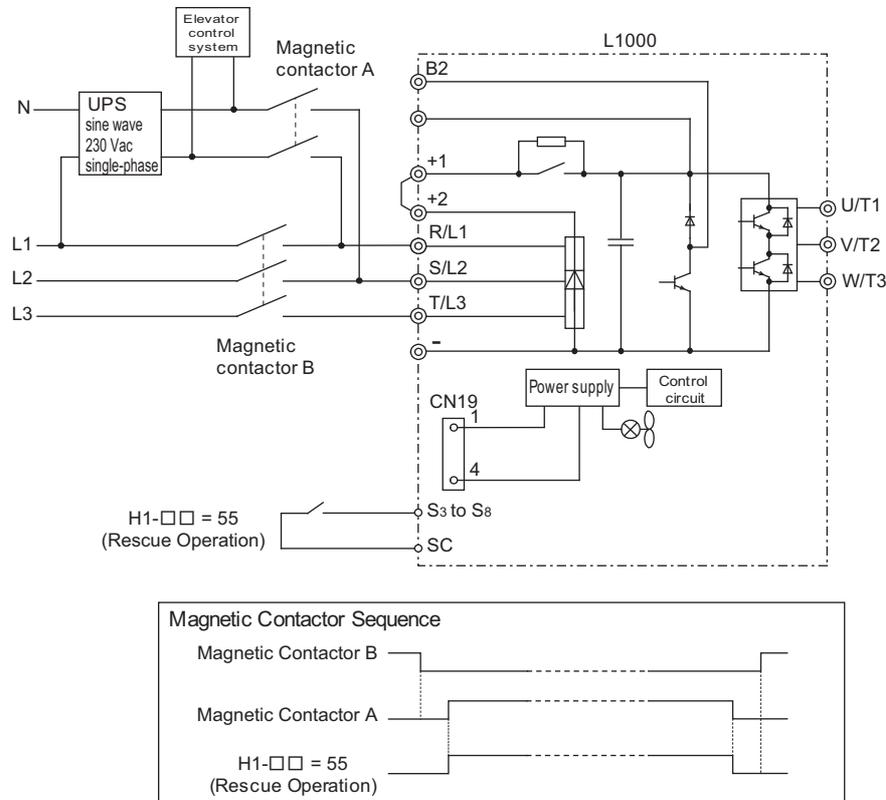


Figure 4.17 Using a Single-Phase 230 V UPS

Operation Sequence

Starting Rescue Operation

- First open contactor B.
- Set the input terminal programmed for Rescue Operation (H1-□□ = 55).
- Close contactor A.
- Set the Up/Down command.

Ending Rescue Operation

- After the car has stopped open contactor A.
- Clear the input terminal set for Rescue Operation (H1-□□ = 55).
- Close contactor B to return to operation with normal power supply.

Possible Problems

There may be problems with 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:

- Use a separate battery for the controller power supply
Use a battery with a voltage higher than 250 Vdc for 200 V class drives or 500 Vdc for 400 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).

4.6 Setup Procedure for Elevator Applications

■ Using Separate Batteries for DC Bus and Control Power Supply, DC Bus Battery under 250 Vdc (500 Vdc)

Follow the instructions below 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 and 500 Vdc for 400V class drives.

Wiring

Follow the wiring diagram shown in [Figure 4.18](#). 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. For instructions on removing the cover, see [Connecting the Drive and Battery on page 119](#).

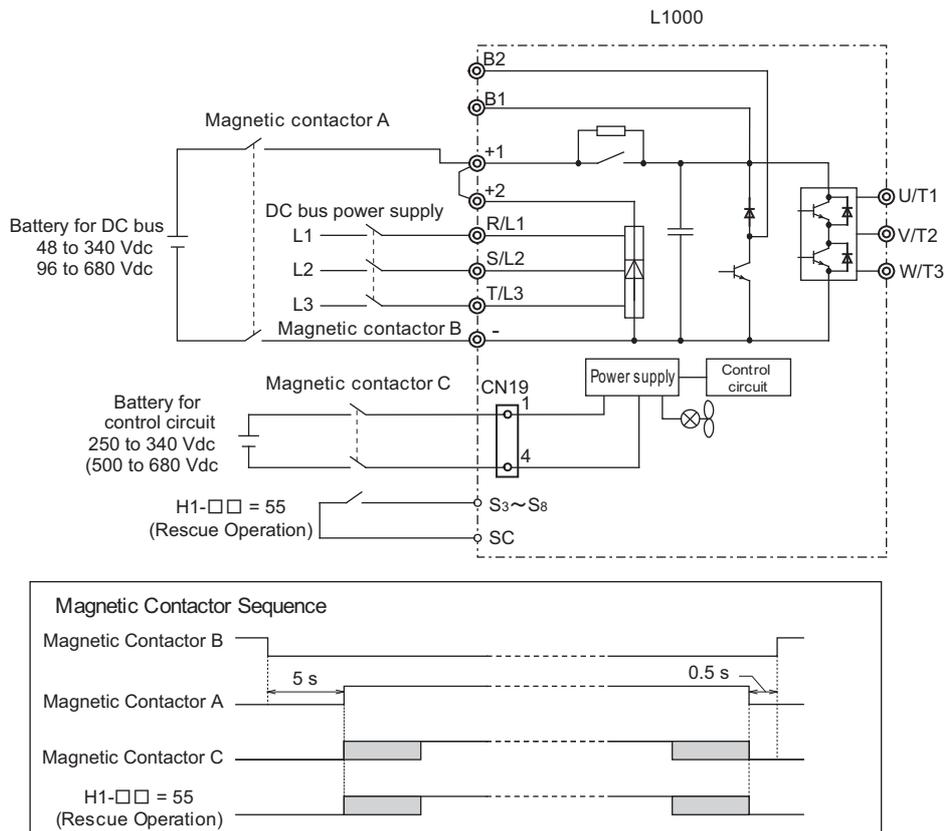


Figure 4.18 Wiring Two Batteries for DC Bus and Control Power Supply (DC Bus Battery is less than 250 V)

Operation Sequence

Starting Rescue Operation

- Open contactor B and wait at least 5 seconds.
- Set the input terminal programmed for Rescue Operation (H1-□□ = 55).
- Close contactors A and C.
- Set the Up/Down command.

Ending Rescue Operation

- After the car has stopped open contactors A and C.
- Clear the input terminal set for Rescue Operation (H1-□□ = 55).
- Wait at least 0.5 s and then close contactor B to return to operation with normal power supply.

■ Using a Battery for the DC Bus and 24 V Power Supply Unit Option for the Control Circuit

Follow the instructions below 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 class drives and 96 Vdc for 400 V class drives.

Wiring

Yaskawa offers a 24 V Power Supply Unit for the control circuit that useful in applications unable to connect to a backup battery greater than 250 V. Wiring instructions can be found in [Figure 4.19](#). For a more detailed explanation of the 24 V Power Supply Unit, see the manual that accompanied the product.

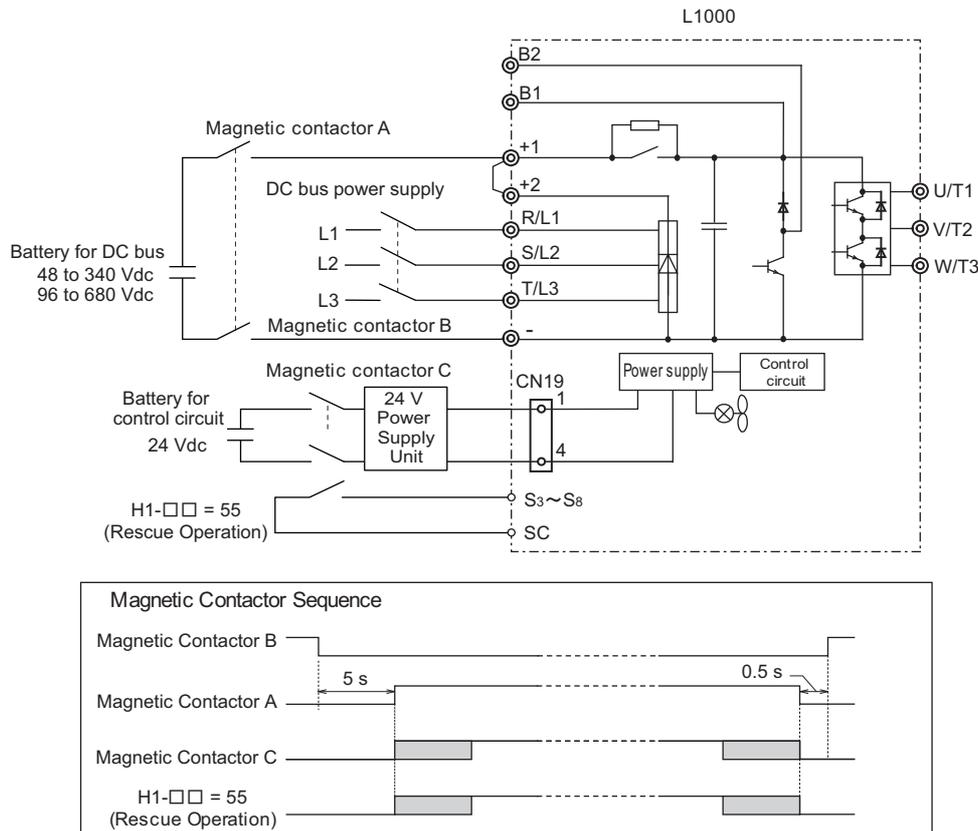


Figure 4.19 Using a Battery for the DC Bus and 24 V Power Supply Unit Option for the Control Circuit

Operation Sequence

Starting Rescued Operation

- Open contactor B and wait at least 5 seconds.
- Set the input terminal programmed for Rescue Operation (H1-□□ = 55).
- Close contactors A and C.
- Set the Up/Down command.

Ending Rescue Operation

- After the car has stopped open contactors A and C.
- Clear the input terminal set for Rescue Operation (H1-□□ = 55).
- Wait at least 0.5 s and then close contactor B to return to operation with normal power supply.

4.6 Setup Procedure for Elevator Applications

■ Using a Single Battery with Minimum 250 Vdc (500 Vdc)

Follow the instructions below 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 or 500 Vdc for 400 V class drives.

Wiring

Following the wiring diagram show in [Figure 4.20](#).

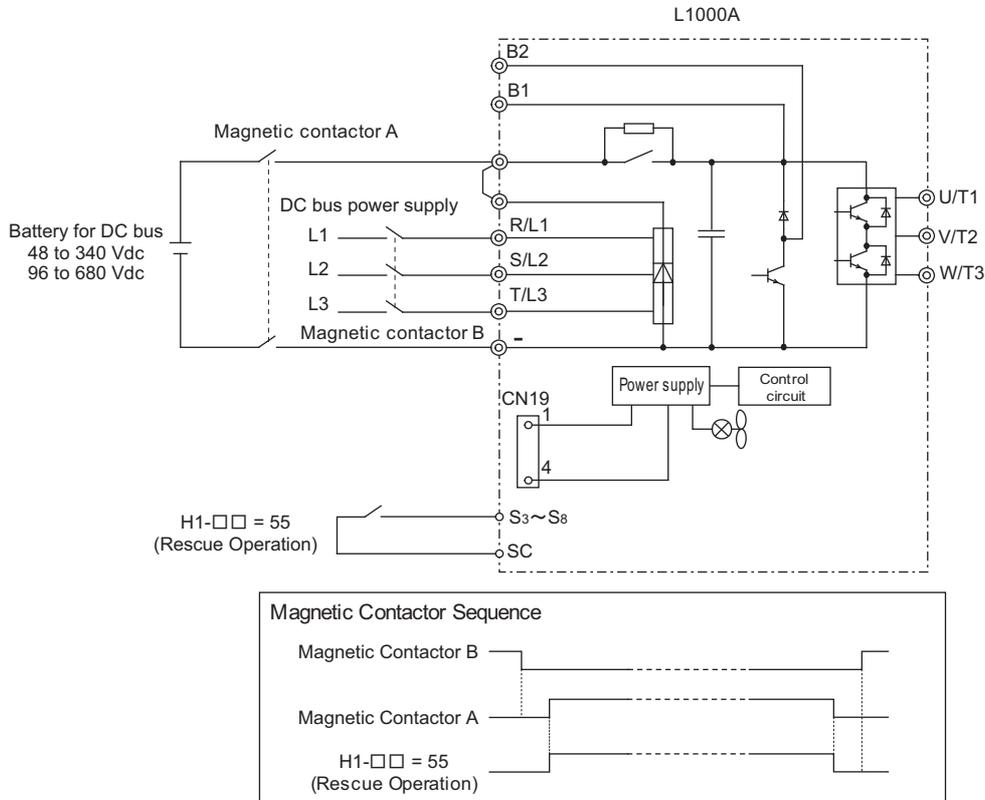


Figure 4.20 Using a Backup Battery With Minimum 250 Vdc (500 Vdc)

Operation Sequence

Starting Rescue Operation

- First open contactor B.
- Set the input terminal programmed for Rescue Operation (H1-□□ = 55).
- Close contactor A.
- Set the Up/Down command.

Ending Rescue Operation

- After the car has stopped open contactor A.
- Clear the input terminal set for Rescue Operation (H1-□□ = 55).
- 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. Before connecting the cable to port CN19 first the connector cover must be removed. Follow the instructions below.

Information on battery power ratings can be found in [Table 4.13](#).

Note: The connector port location and angle vary by drive capacity.

DANGER! Make sure to switch off the power supply when before wiring and connecting the battery cable. Failure to comply may lead to dead or serious injury.

Battery Connections for CIMR-L□2A0018 to 2A0075, CIMR-L□4A0009 to 4A0039

1. Insert the tip of a screwdriver into the opening on the edge of the connector cover. Slide the cover off the drive as indicated in the diagram below.

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 internal equipment.

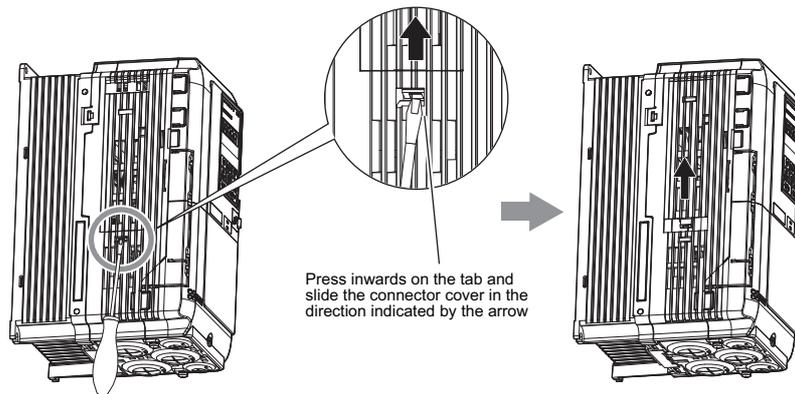


Figure 4.21 Removing the Connector Cover

2. Connect the cable provided to the CN19 port.

Note: The connector port location and angle vary by drive capacity.

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.

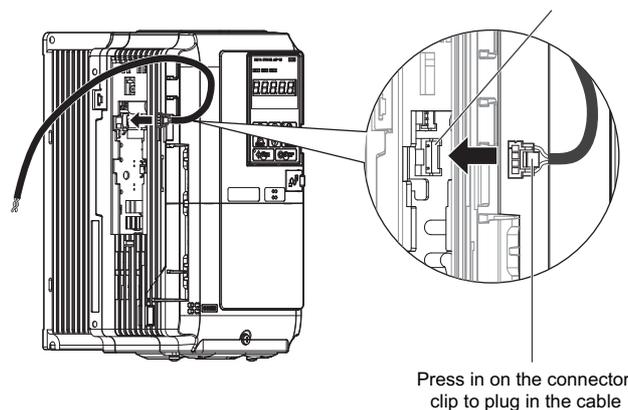


Figure 4.22 Connecting the Cable

4.6 Setup Procedure for Elevator Applications

3. Use a pair of shears 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.

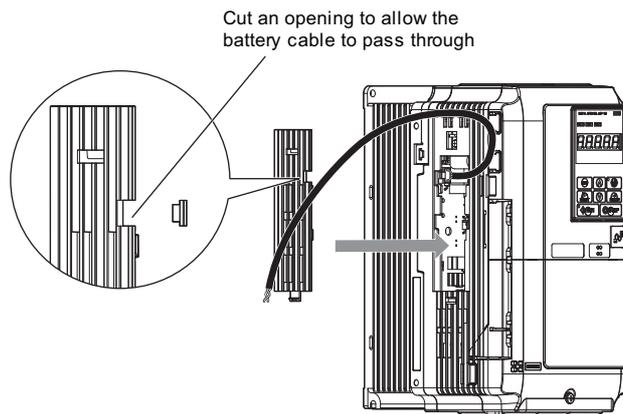


Figure 4.23 Reattaching the Connector Cover (1)

4. Slide the connector cover back into place as shown in [Figure 4.24](#).

NOTICE: Make sure the cable does not get caught between the drive and the connector cover, as this could damage the cable.

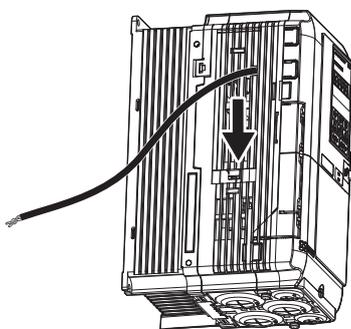


Figure 4.24 Reattaching the Connector Cover (2)

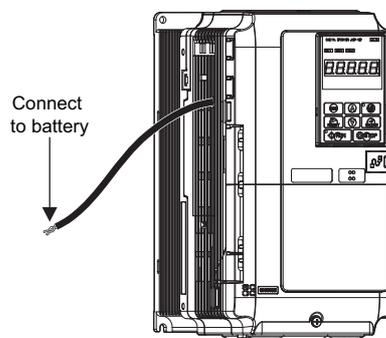


Figure 4.25 Drive and Battery Connection Complete

CIMR-L□2A0085 to 2A0180, CIMR-L□4A0045 to 4A0150

1. Use a Phillips screwdriver (M4) to loosen the screw holding the connector cover in place.

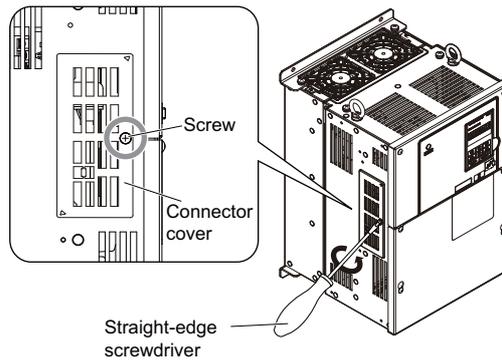


Figure 4.26 Removing the Connector Cover

2. Slide the connector cover from the drive as shown in [Figure 4.27](#).

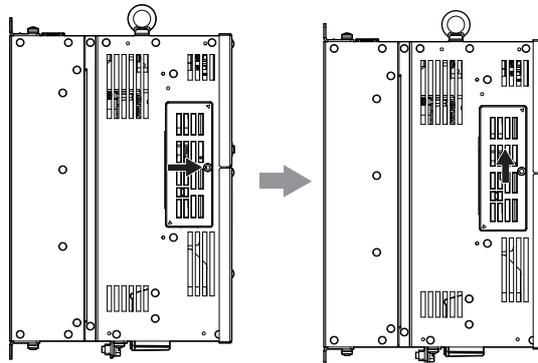


Figure 4.27 Sliding the Connector Cover

3. Insert a straight-edge screwdriver into the opening as shown in [Figure 4.28](#), then remove the connector cover by sliding it along as shown in [Figure 4.28](#).

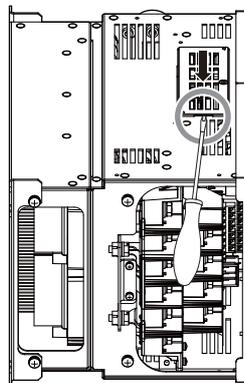


Figure 4.28 Removing the Connector Cover

4.6 Setup Procedure for Elevator Applications

4. Connect the cable to the CN19 connector port on the drive.

Note: The connector port location and angle vary by drive capacity.

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.

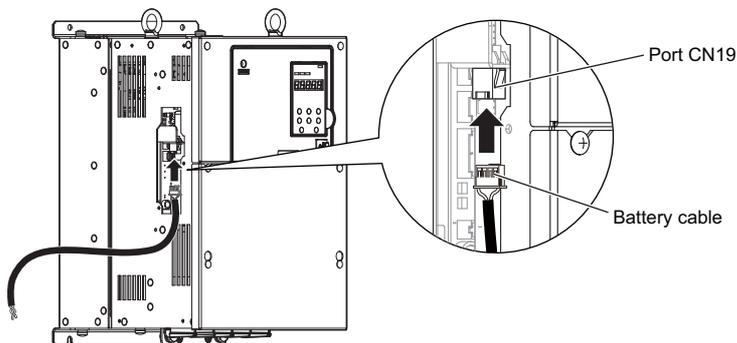


Figure 4.29 Connecting the Cable

5. Use a pair of shears 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.

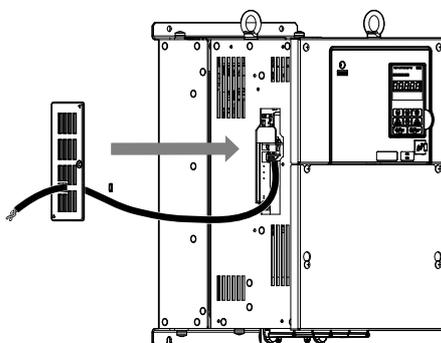


Figure 4.30 Reattaching the Connector Cover

6. Slide the connector cover back into place as shown in [Figure 4.31](#).

NOTICE: Make sure the cable does not get caught between the drive and the connector cover, as this could damage the cable.

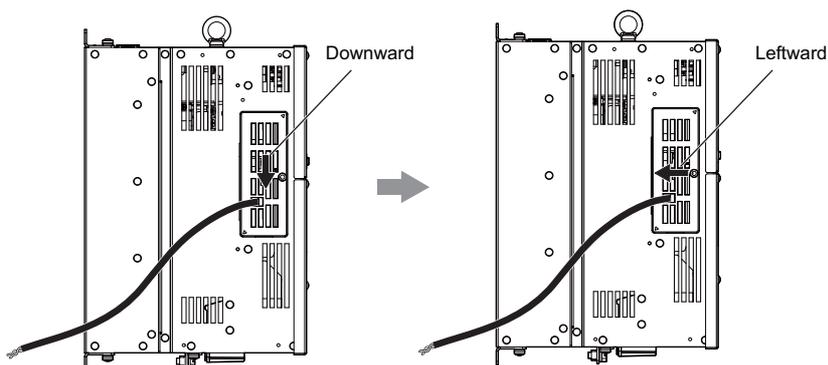


Figure 4.31 Sliding the Connector Cover into Place

7. Use a Phillips screwdriver (M4) to fasten the screw that holds the connector cover in place.

NOTICE: Never use any other screw than the one provided to fasten the connector cover into place. Another type of screw has a chance of coming into contact with drive components, and could damage the drive.

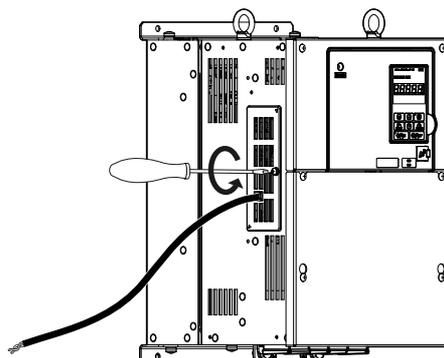


Figure 4.32 Reattaching the Connector Cover

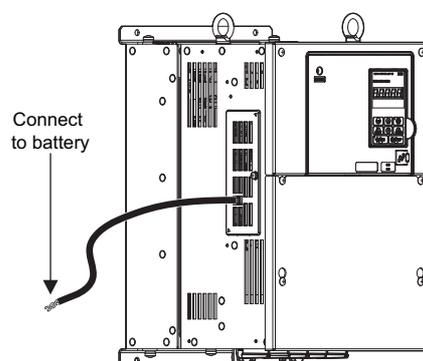


Figure 4.33 Drive and Battery Connection Complete

4.6 Setup Procedure for Elevator Applications

■ Rescue Operation Torque Limit

The torque limit during Rescue Operation is set in parameter S4-05. Once Rescue Operation is complete, the drive refers 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 up and then in 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 d1-25. The output terminals set for “Light load direction” (H2-□□ = 54) and “Light Load Direction detection status”(H2-□□ = 55) will close.

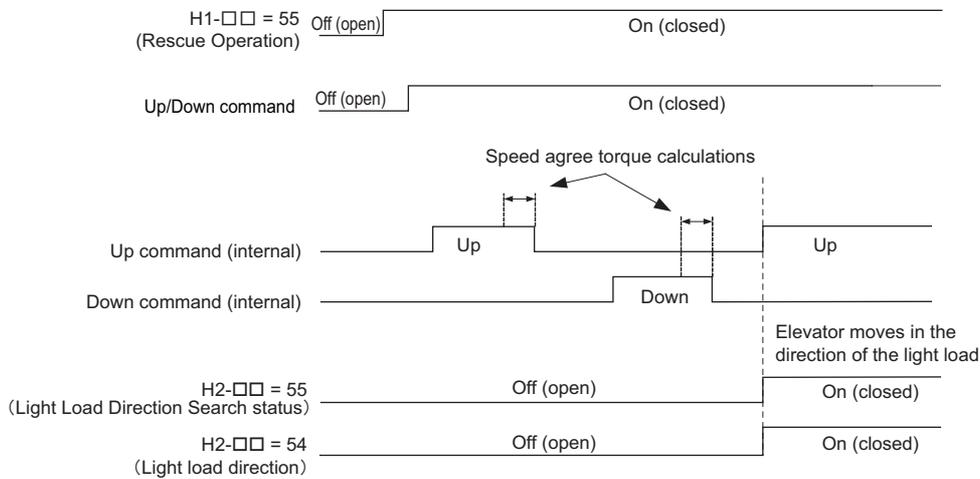


Figure 4.34 Light Load Direction Detection (Up)

- 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 d1-25 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.

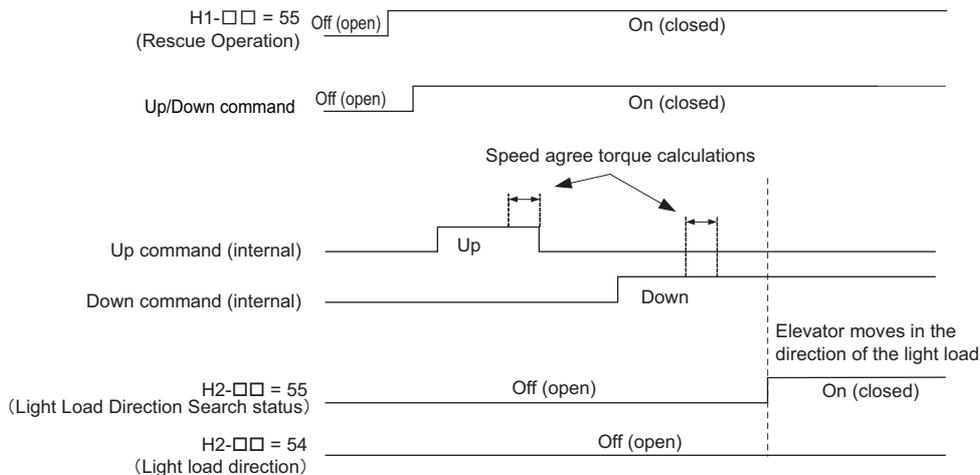


Figure 4.35 Light Load Direction Detection (Down)

4.7 Common Problem during Setup and Possible Solutions

This section describes troubleshooting problems that do not trip an alarm or fault.

Common Problems		Page
Cannot Change Parameter Settings		125
Motor Does Not Rotate Properly after Pressing RUN Button or after Entering External Up/down Command	Motor Does Not Rotate	125
	Motor Rotates in the Opposite Direction from the Up/down Command	126
Motor Gets Too Hot		126
Drive Does Not Allow Selection of Rotational Auto-Tuning		126
Noise From Drive or Output Lines When the Drive is Powered On		126
Earth Leakage Circuit Breaker (ELCB)		126
Riding comfort related problems		127

◆ Cannot Change Parameter Settings

Cause	Possible Solutions
The drive is running the motor (i.e., the Up/down command is present).	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> Set the Access Level to allow parameters to be edited (A1-01 = 2).
The operator is not in the Parameter Setup Mode	<ul style="list-style-type: none"> See what mode the operator is currently set for. Switch to the Parameter Setting Mode. Refer to <i>The Drive and Programming Modes on page 84</i>.
The wrong password was entered.	<ul style="list-style-type: none"> 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. <p>If you cannot remember the password:</p> <ul style="list-style-type: none"> Scroll to A1-04. Press the  button and press  at the same time. Parameter A1-05 will appear. Set a new password to parameter A1-05.
Undervoltage was detected.	<ul style="list-style-type: none"> Check the drive input power 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.	<ul style="list-style-type: none"> Enter the Drive Mode. <i>Refer to The Drive and Programming Modes on page 84</i>.
The  button is enabled (o2-01=1) and was pushed.	<p>Check if the correct Up/Down command source is selected. If the operator keypad shall be the source, the LO/RE button LED must be on. If the source is REMOTE, it must be off.</p> <p>Take the following steps to solve the problem:</p> <ul style="list-style-type: none"> Push the  button. o2-01 is set to 0 by default, i.e. the LO/RE button is disabled.
Auto-Tuning has just completed.	<ul style="list-style-type: none"> 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. <i>Refer to The Drive and Programming Modes on page 84</i>.
An Emergency Stop was executed and has not yet been reset.	Reset the Emergency Stop command.
Settings are incorrect for the source that provides the Up/down command.	<p>Check parameter b1-02 (Up/down Command Selection). Set b1-02 so that it corresponds with the correct Up/down command source.</p> <p>0: Digital operator 1: Control circuit terminal (default setting) 2: MEMOBUS/Modbus communications 3: Option card</p>
There is faulty wiring in the control circuit terminals.	<ul style="list-style-type: none"> 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.	<p>Check parameter b1-01 (Speed Reference Selection). Set b1-01 to the correct source of the speed reference.</p> <p>0: Digital operator 1: Control circuit terminal (default setting) 2: MEMOBUS/Modbus communications 3: Option card</p>
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. <i>Refer to Control I/O Configuration on page 69</i>

4.7 Common Problem during Setup and Possible Solutions

Cause	Possible Solutions
Speed reference is too low.	<ul style="list-style-type: none"> • 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  button is enabled (o2-02=1) and was pressed when the drive was started from a REMOTE source.	<ul style="list-style-type: none"> • When the  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 91 and Encoder Setup on page 91 .
Drive control circuit terminals for the Up and Down commands are switched.	<ul style="list-style-type: none"> • Check the control circuit wiring. • Correct any fault wiring.

◆ Motor Gets Too Hot

Cause	Possible Solutions
The load is too heavy.	<p>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:</p> <ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • Perform Auto-Tuning. • Calculate the motor value and reset the motor parameters. Refer to E2: Motor Parameters on page 155. • Change the motor control method to V/f Control (A1-02 = 0).
Insufficient voltage insulation between motor phases.	<p>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.</p> <ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • Check if the desired tuning mode is available for the selected control mode. Refer to Auto-Tuning on page 96. • Change the motor control method by setting A1-02.

◆ Noise From Drive or Output Lines When the Drive is Putting Out Voltage

Cause	Possible Solutions
PWM switching in the drive generates excessive noise.	<ul style="list-style-type: none"> • Lower the carrier frequency (C6-03). • Install a noise filter on the input side of drive input power. Refer to Input-Side Noise Filter on page 287. • Install a noise filter on the output side of the drive. Refer to Output-Side Noise Filter on page 287. • 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.

◆ Electric Leakage Circuit Breaker (ELCB) Trips During Run

Cause	Possible Solutions
Excessive leakage current trips ELCB.	<ul style="list-style-type: none"> • Increase the ELCB sensitivity or use ELCB with a higher threshold. • Lower the carrier frequency (C6-03). • Reduce the length of the cable used between the drive and the motor. • Install a noise filter or reactor on the output side of the drive.

◆ Riding Comfort Related Problems

The table below describes the most typical problems related to ride comfort and also proposes countermeasures. Before taking any action listed below make sure the startup procedure has been performed as previously describes, i.e. Auto-Tuning has been performed, etc.

Problem	Control Mode and Possible Cause		Corrective Action
Rollback at start	V/f and OLV	Not enough torque when the brake is released	<ul style="list-style-type: none"> • Increase the DC Injection Braking current at start using parameter S1-02. • Increase the minimum (E1-10) and medium (E1-08) V/f pattern voltages. Make sure, that the starting and leveling current does not rise too high.
		DC Injection and brake timing not optimal.	Set the time for DC Injection Braking at start (S1-04) as short as possible, but make sure that brake releases completely before the motor starts to turn.
	OLV	The slip or torque compensation function acts too slowly	<ul style="list-style-type: none"> • Decrease the torque compensation time C4-02. • Decrease the slip compensation time C3-02.
	CLV CLV/PM	The speed control is not responding fast enough when the brake is released	Adjust the speed control loop parameters used during position lock. Increase C5-19 and reduce C5-20.
		The Position Lock control loop does not respond fast enough	<ul style="list-style-type: none"> • Adjust the speed control loop parameters used during position lock. Increase C5-19 and reduce C5-20. • Increase the position lock gain at start 1 in S3-01 gradually. If vibration occurs reduce it. • Increase the position lock gain at start 2 in S3-02 gradually until rollback disappears.
All	Motor torque is not fully established when the brake is released	Lengthen the brake release delay time (S1-06) and the time for DC Injection Braking / Position Lock at start (S1-04).	
	Motor contactors close too late	Make sure, that the contactors are closed before the Up/Down command is set or latest together with the Up/Down command.	
Shock at start	All	Motor starts turning when the brake is not completely released or runs against the brake	Increase the DC Injection Braking time at start using parameter S1-04.
		Acceleration rate is changing too quickly	Decrease the Jerk at start. Decrease C2-01 if set in m/s ² , increase C2-01 if set in s.
		Rollback occurs during brake releasing	See above under “Rollback at start”.
Shock at stop	All	Brake is applied too early, causing the motor to run against the brake	Increase the delay time to apply the brake (S1-07). If necessary, also increase the DC Injection Braking time at stop S1-05.
		Motor contactor is released before the brake has fully applied	Check the motor contactor sequence.
Jerk occurs due to overshoot when the motor reaches top speed	CLV CLV/PM	Rollback occurs before the brake applies at stop	<ul style="list-style-type: none"> • Make sure the speed control loop parameters for position lock are adjusted properly (C5-13 and C5-14). • Increase the position lock gain at stop S3-03 gradually until no rollback occurs anymore. If vibration occurs reduce the gain S3-03.
		OLV	Too fast torque compensation or slip compensation
	All	Speed control Loop setting are too soft or too hard	<ul style="list-style-type: none"> • Adjust the speed control loop gain C5-01 and integral time C5-02. • Adjust inertia compensation parameters (n5-□□) if only speed control loop settings can not solve the problem
		Wrong motor data	<ul style="list-style-type: none"> • For induction motors readjust the motor data (E2-□□), especially the slip (E2-02) and no-load current values (E2-03), or perform Auto-Tuning again. • For PM motors readjust the motor data in E5-□□ or perform Auto-Tuning.
Motor stops shortly (under-shoot) when the leveling speed is reached	CLV CLV/PM	Inertia compensation function is not set up correctly.	If the inertia compensation function is used (n5-01=1) make sure the values in n5-02 and n5-03 are correct.
		The acceleration rate changes too quickly when reaching the selected speed.	Decrease the jerk at the end of acceleration. Decrease C2-02 if set in m/s ² , increase C2-02 if set in s.
	V/f and OLV	Not enough torque at low speed	Increase the minimum and middle voltage levels for the V/f pattern voltage (E1-10 and E1-08 respectively). Make sure that the starting and leveling current does not rise too high.
		OLV and CLV	Motor data incorrect
	CLV CLV/PM	Too much slip compensation	
All		Speed control loop responds too slow	Increase the speed control gain and reduce the speed control integral time used for low speed at stop. The parameters to be changed depend on the setting of C5-05 and if a third set of speed loop settings is used or not. Refer to Speed Loop Adjustments (CLV and PM/CLV) on page 112 .
	The inertia compensation function is not set up correctly	If the inertia compensation function is used (n5-01=1) make sure the values in n5-02 and n5-03 are correct.	
Motor speed overshoot at acceleration end and under-shoot when reaching leveling speed occurs. Problem can not be resolved by adjusting the speed loop.	CLV CLV/PM	The deceleration rate changes too quickly when reaching the leveling speed	Decrease the Jerk at the end of deceleration. Decrease C2-04 if set in m/s ² , increase C2-04 if set in s.
		Inertia is high.	Use the inertia compensation function. Set n5-01 to 1 and then adjust parameters n5-02 and n5-03 as described in Inertia Compensation (CLV and PM/CLV) on page 113 .
Motor or machine vibrates at high speed or top speed	OLV	Torque compensation is responding too quickly	Increase the torque compensation delay time (C4-02).
	CLV CLV/PM	Speed control loop adjusted too hard	Decrease C5-01, then increase C5-02.

4.7 Common Problem during Setup and Possible Solutions

Problem	Control Mode and Possible Cause		Corrective Action
Motor or machine vibrates in the low or medium speed range	V/f	Output voltage is too high	Reduce the V/f pattern settings (E1-08, E1-10).
	OLV	Torque compensation is responding too quickly	Increase the torque compensation delay time (C4-02).
		Output voltage is too high	Reduce the V/f pattern settings (E1-08, E1-10).
	OLV CLV	The value for the motor slip is set incorrectly	Check the motor slip value in parameter E2-02. Increase or decrease it in steps of 0.2 Hz.
Motor or machine vibrates in During Position Lock	CLV CLV/PM	The Position Lock control loop does not respond fast enough	<ul style="list-style-type: none"> • If vibration occurs at during position lock at start, first decrease S3-02. If decreasing S3-02 does not resolve the problem, decrease S3-01. • Decrease S3-03 if vibration occurs during position lock at stop.
		The speed control is not responding quickly enough when the brake is released	Decrease C5-19 and then increase C5-20.
Vibrations with the frequency equal to the motor speed occur	CLV CLV/PM	Encoder vibrates	Check the encoder mounting and the alignment of encoder and motor shaft.
	All	Mechanical problems Rotational parts (motor armature, handwheel, brake disk/drum) are not properly balanced	Check bearings and gearbox. Properly balance rotating parts.
Oscillations when using an analog speed reference	All	The analog reference value is not stable or the signal is noisy	<ul style="list-style-type: none"> • Check the analog signal line connection. Use shielded twisted pair cables. • Apply a filter to the analog input signal by setting parameter H3-13.
Top speed is different in motoring and regenerative mode.	OLV	Slip Compensation during Regenerative operation is switched off	Make sure C3-04 is set properly and set parameter C3-05 to 0.
Speed reference and motor speed do not match when using an analog reference signal.	All	The drives analog input is not set according to the signal level of the controller speed reference output signal	Check the gain and bias settings for the analog input that is used to set the speed reference. Check parameters H3-03 and H3-04 for input A1, check parameters H3-11 and H3-12 for input A2.
Acceleration is longer than set to C1-□□ parameters.	All	The load is too high.	<ul style="list-style-type: none"> • Check if the acceleration rate set is not too high (acceleration time is too short). • Make sure the drive rated current is enough to fulfill the application requirements. • Make sure the load does not stuck, car guide lubrication is ok, etc.
	V/f and OLV	The load is too high and the current/torque exceeds the stall prevention level.	Check if the stall prevention level at acceleration in L3-03 is not set too small.
	OLV, CLV CLV/PM	The load is too high and the torque exceeds the drives torque limits.	Check if the torque limit parameters L7-□□ are not set too small.
Motor speed does not match the speed reference at constant speed	All	The load is too high.	Make sure the drive rated current is enough to fulfill the application requirements.
	V/f	The load is too high and the current/torque exceeds the stall prevention level.	Check if the stall prevention level during run in L3-06 is not set too small.
	OLV, CLV CLV/PM	The load is too high and the torque exceeds the torque limits.	Check if the torque limit parameters L7-□□ are not set too small.
High frequency acoustic noise from the motor	All	The carrier frequency is too low	Increase the carrier frequency in parameter C6-03. If the carrier frequency is set higher than the default setting, a current derating must be considered.

4.8 Verifying Parameter Settings and Backing Up Changes

Use the Verify Menu to check all changes to parameter settings as a result of Auto-Tuning. *Refer to Verifying Parameter Changes: Verify Menu on page 86.*

Save the verified parameter settings. Change the access level or set a password to the drive to prevent accidental modification of parameter settings.

◆ Backing Up Parameter Values: o2-03

The following procedure saves all parameters settings to drive memory where they can later be recalled. Set o2-03 to “1” to save parameter changes. This saves all parameter settings, and then returns o2-03 to 0. The drive can now “recall” the saved parameters by performing a User Initialization (A1-03 = 1110).

No.	Parameter Name	Description	Setting Range	Default Setting
o2-03	User Parameter Default Value	Lets the user create a set of default settings for a User Initialization. 0: Saved/Not set 1: Set Defaults - Saves current parameter settings as the default values for a User Initialization. 2: Clear All - Clears the currently saved user settings. After saving the user parameter set value, the items of 1110 (User Parameter Initialize) are displayed in A1-03 (User Parameter Default Value).	0 to 2	0
A1-03	Initialize Parameters	Selects a method to initialize the parameters. 0: No Initialize 1110: User Initialization (The user must first program and store desired settings using parameter o2-03) 2220: 2-Wire Initialization (parameter initialized prior to shipment) 5550: oPE4 Fault reset	0 to 2220, 5550	0

◆ Parameter Access Level: A1-01

Setting the Access Level for “Operation only” (A1-01 = 0) allows the user to access parameters A1-□□ and U□-□□ only. Other parameters are not displayed.

Setting the Access Level for “User Parameters” (A1-01 = 1) allows the user to access only the parameters that have been previously saved as User Parameters. This is helpful when displaying only the relevant parameters for a specific application.

No.	Parameter Name	Description	Setting Range	Default
A1-01	Access Level Selection	Selects which parameters are accessible via the digital operator. 0: Operation only. A1-01 and A1-04 can be set and monitored, U□-□□ parameters can also be viewed. 1: User Parameters. Only those recently changed among application parameters A2-01 to A2-16 and A2-17 to A2-32 can be set and monitored. 2: Advanced Access Level. All parameters can be set and monitored.	0 to 2	2
A2-01 to A2-32	User Parameters 1 to 32	Parameters selected by the user are saved as User Parameters. This includes recently viewed parameters or parameters specifically selected for quick access. If parameter A2-33 is set to 1, recently viewed parameters will be listed between A2-17 and A2-32. Parameters A2-01 through A2-16 must be manually selected by the user. If A2-33 is set to 0, then recently viewed parameters will not be saved to the group of User Parameters. A2-□□ parameters are now available for manual programming.	A1-00 to o4-13	—
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. The most recently changed parameter is saved to A2-17. The second most recently changed parameter is saved to A2-18.	0, 1	1

◆ Password Settings: A1-04, A1-05

The user can set a password to the drive to restrict access. The password is selected via parameter A1-05. The password must be entered to A1-04 to unlock parameter access (i.e., parameter setting A1-04 must match the value programmed into A1-05). The following parameters cannot be edited until the value entered to A1-04 correctly matches the value set to A1-05: A1-01, A1-02, A1-03 and A2-01 through A2-33.

Note: Parameter A1-05 is hidden from view. To display A1-05, access parameter A1-04 and simultaneously press the  key and the  key.

◆ Copy Function

Parameter settings can be copied to another drive to simplify parameter restoration or multiple drive setup. The drive supports the following copy options:

- **LED Operator (standard in all models)**

The LED operator used to operate the drive also supports copying, importing, and verifying parameter settings. *Refer to o3: Copy Function on page 206* for details.

- **LCD Operator**

The optional LCD operator also supports copying, importing, and verifying parameter settings. Refer to the manual supplied with the LCD operator for instructions.

- **USB Copy Unit and CopyUnitManager**

The copy unit is an external option connected to the drive to copy parameter settings from one drive and save those settings to another drive. Refer to the manual supplied with the USB Copy Unit for instructions.

The CopyUnitManager is a PC software tool. It allows the user to load parameter settings from the Copy Unit onto a PC, or from the PC onto a Copy Unit. This is useful when managing parameters for various drives or applications. Refer to the manual supplied with the CopyUnitManager for instructions.

- **DriveWizard Plus**

DriveWizard is a PC software tool for parameter management, monitoring, and diagnosis. DriveWizard can load, store, and copy drive parameter settings. For details, refer to Help in the DriveWizard software.

Note: To obtain the driver and software of USB Copy Unit, CopyUnitManager and DriveWizardPlus, access these sites:

China: <http://www.yaskawa.com.cn>

Europe: <http://www.yaskawa.eu.com>

Japan: <http://www.e-mechatronics.com>

Other areas: contact a Yaskawa representative.



Parameter Details

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5.1 A: Initialization

The initialization group contains parameters associated with initial setup of the drive. Parameters involving the display language, access levels, initialization, and password are located in this group.

◆ A1: Initialization

■ A1-00: Language Selection

Selects the display language for the digital operator.

Note: This parameter is not reset when the drive is initialized using parameter A1-03.

No.	Parameter Name	Setting Range	Default
A1-00	Language Selection	0 to 7	</>

<1> Regional default settings

Setting 0: Asia except for China (Model code: CIMR-LT□A)

Setting 7: China (Model code: CIMR-LB□A)

Setting 0: English

Setting 1: Japanese

Setting 2: German

Setting 3: French

Setting 4: Italian

Setting 5: Spanish

Setting 6: Portuguese

Setting 7: Chinese

■ A1-01: Access Level Selection

Allows or restricts access to drive parameters.

No.	Parameter Name	Setting Range	Default
A1-01	Access Level Selection	0 to 2	2

Setting 0: Operation only

Access is restricted to parameters A1-01, A1-04, and all U monitor parameters.

Setting 1: User Parameters

Access to only a specific list of parameters set to A2-01 through A2-32. These User Parameters can be accessed using the Setup Mode of the digital operator.

Setting 2: Advanced Access Level (A) and Setup Access Level (S)

All parameters can be viewed and edited.

Notes on Parameter Access

- If the drive parameters are password protected by A1-04 and A1-05, parameters A1-01, A1-03, and all A2 parameters cannot be modified.
- If parameters are changed via serial communication, then it will not be possible to edit or change parameters settings with the drive's digital operator until an Enter command is issued to the drive from the serial communication.

■ A1-02: Control Method Selection

Selects the Control Method (also referred to as the “control mode”) the drive uses to operate the motor. If the drive is set up to run two motors, then A1-02 determines the control mode for motor 1.

No.	Parameter Name	Setting Range	Default
A1-02	Control Method Selection	0, 2, 3, 7	0

Note: This parameter is not reset when the drive is initialized using parameter A1-03.

Setting 0: V/f Control for Induction Motors

Used to control an induction motor without encoder feedback. Provides basic performance with minimum tuning effort.

Setting 2: Open Loop Vector Control

Used to control an induction motor without encoder feedback. Provides higher performance than V/f control but tuning might require more effort.

Setting 3: Closed Loop Vector Control

Used to drive an induction motor with encoder feedback. This mode offers high performance control down to 0 rpm motor speed.

Setting 7: Closed Loop Vector Control for PM Motors

This control mode offers high performance control of a permanent magnet motors with incremental or absolute encoder feedback.

■ A1-03: Initialize Parameters

Resets parameters back to the original default values. After initialization, the setting for A1-03 automatically returns to 0.

No.	Parameter Name	Setting Range	Default
A1-03	Initialize Parameters	0, 1110, 2220, 5550	0

Setting 0: No initialization**Setting 1110: User Initialize**

Drive parameters are reset to values selected by the user as User Settings. User Settings are stored when parameter o2-03 is set to “1: Set defaults”.

Note: A “user-initialization” resets all parameters to a user-defined set of default values that were previously saved to the drive. To clear the user-defined default values, set parameter o2-03 to 2.

Setting 2220: 2-Wire Initialization

Resets all parameters back to their original default settings with digital inputs S1 and S2 configured as Forward run and Reverse run, respectively.

Setting 5550: oPE04 Reset

If parameters on a certain drive have been edited and then a different terminal block is installed with different settings saved in its built-in memory, an oPE04 error will appear on the display. To use the parameter settings saved to the terminal block memory, set A1-02 to 5550.

Notes on Parameter Initialization

The parameters shown in [Table 5.1](#) will not be reset when the drive is initialized by setting A1-03 = 2220.

Table 5.1 Parameters not Changed by Drive Initialization

No.	Parameter Name
A1-00	Language Selection
A1-02	Control Method Selection
E1-03	V/f Pattern Selection
E5-02	Motor Rated Capacity (for PM)
E5-03	Motor Rated Current (for PM)
E5-04	Motor Poles (for PM)
E5-05	Motor Stator Resistance (for PM)
E5-06	Motor d-Axis Inductance (for PM)
E5-07	Motor q-Axis Inductance (for PM)
E5-09	Motor Induction Voltage Constant 1 (for PM)
F6-08	Communications Parameter Initialization
L8-35	Installation Selection
o2-04	Drive Model Selection

5.1 A: Initialization

■ A1-04, A1-05: Password and Password Setting

A1-04 is for entering the password when the drive is locked. A1-05 is a hidden parameter used to set the password.

No.	Parameter Name	Setting Range	Default
A1-04	Password	0000 to 9999	0000
A1-05	Password Setting		

How to use the Password

The user can set a password for the drive to restrict access. The password is set to A1-05 and must be entered to A1-04 to unlock parameter access. Until the correct password is entered, the following parameters cannot be viewed or edited: A1-01, A1-03, and A2-01 through A2-33.

The instructions below demonstrate how to set a new password. Here, the password set is “1234”. An explanation follows on how to enter the password to unlock the parameters.

Table 5.2 Setting the Password for Parameter Lock

Step			Display/Result
1.	Turn on the power to the drive. The initial display appears.	→	
2.	Scroll to the Parameter Setup display and press	→	
3.	Scroll to the right by pressing	→	
4.	Select the flashing digits by pressing	→	
5.	Select A1-04 by pressing	→	
6.	Press the key while holding down at the same time. A1-05 will appear. Note: Because A1-05 is hidden, it will not be displayed by simply pressing the key.	→	 “05” flashes
7.	Press the key.	→	
8.	Use , , and to enter the password.	→	
9.	Press to save what was entered.	→	
10.	The display automatically returns to the display shown in step 5.	→	

Table 5.3 Check to see if A1-02 is locked (continuing from step 10 above)

Step			Display/Result
1.	Press to display A1-02.	→	 “02” flashes
2.	Press to display the value set to A1-02.	→	
3.	Press and , making sure that the setting values cannot be changed.		
4.	Press to return to the first display.	→	

Table 5.4 Enter the Password to Unlock Parameters (continuing from step 4 above)

Step			Display/Result
1.	Press to enter the parameter setup display.	→	
2.	Press to select the flashing digits as shown.	→	 “01” flashes

Step			Display/Result
3.	Press  to scroll to A1-04.	→	
4.	Enter the password "1234".	→	
5.	Press  to save the new password.	→	
6.	Drive returns to the parameter display.	→	
7.	Press  and scroll to A1-02.	→	
8.	Press  to display the value set to A1-02. If the first "0" blinks, parameter settings are unlocked.	→	
9.	Use  and  to change the value if desired (though changing the control mode at this point is not typically done).		 OLV
10.	Press  to save the setting, or press  to return to the previous display without saving changes.	→	
11.	The display automatically returns to the parameter display.	→	

Note: Parameter settings can be edited after entering the correct password. Performing a 2-wire initialization resets the password to "0000". Reenter the password to parameter A1-05 after drive initialization.

◆ A2: User Parameters

■ A2-01 to A2-32: User Parameters 1 to 32

The user can select 32 parameters and assign them to A2-01 through A2-32. This saves time later scrolling through the parameter menu. The list of User Parameters can also track the most recently edited settings and save those parameters to this list.

No.	Parameter Name	Setting Range	Default
A2-01 to A2-32	User Parameters 1 to 32	A1-00 to 04-13	Determined by A1-02

Saving User Parameters

To save specific parameters to A2-01 to A2-32, first set the access level to allow access to all parameters (A1-01 = 2). Next assign the parameter number to the User Parameters list by entering it into one of the A2-□□ parameters. If A1-01 is then set to 1, the access level can be restricted so that users can only set and refer to the specific parameters saved as User Parameters.

■ A2-33: User Parameter Automatic Selection

A2-33 determines whether or not parameters that have been edited are saved to the User Parameters (A2-17 to A2-32) for quick, easy access.

No.	Parameter Name	Setting Range	Default
A2-33	User Parameter Automatic Selection	0 or 1	1

Setting 0: Do not save list of recently viewed parameters.

To manually select the parameters listed in the User Parameter group, set A2-33 to 0.

Setting 1: Save history of recently viewed parameters.

By setting A2-33 to 1, all parameters that were recently edited will be automatically saved to A2-17 through A2-32. A total of 16 parameters are saved with the most recently edited parameter set to A2-17, the second most recently to A2-18, and so on. User Parameters can be accessed using the Setup Mode of the digital operator.

5.2 b: Application

◆ b1: Operation Mode Selection

■ b1-01: Speed Reference Selection

Use parameter b1-01 to select the speed reference source for the REMOTE mode.

Note: If a Up/Down command is input to the drive but the speed reference entered is 0 or below the minimum frequency, the RUN indicator LED on the digital operator will light and the STOP indicator will flash.

No.	Parameter Name	Setting Range	Default
b1-01	Speed Reference Selection	0 to 3	0

Setting 0: Operator keypad

When b1-01 = 0, the user can enter the speed reference in the following ways:

- Switch between the speed references set to the d1-□□ parameters according to the speed reference priority (d1-18) and multi-function digital input terminal settings. For more detailed instructions, refer to [d1: Speed Reference on page 151](#).
- Enter the speed reference directly using the digital operator keypad.

Instructions on changing speed reference settings can be found in [The Drive and Programming Modes on page 84](#).

Setting 1: Terminals (analog input terminals)

When b1-01 = 1, the speed reference is supplied via the drive's analog input terminals. The drive will look to analog input terminals A1 or A2 for the speed reference (here, either parameter H3-02 or H3-10 must be set to "0", assigning terminal A1 or A2 respectively to the speed reference). Parameter d1-18 has to be set to 0. For more detailed instructions, refer to [d1: Speed Reference on page 151](#).

Terminals A1 and A2 can accept a voltage signal to supply the speed reference to the drive. Below, [Table 5.5](#) shows the parameter settings and voltage levels required for each terminal.

Table 5.5 Analog Input Settings for Speed Reference Using Voltage Signals

Terminal	Signal Level	Parameter Settings				Notes
		Signal Level Selection	Function Selection	Gain	Bias	
A1	0 to 10 Vdc	H3-01 = 0	H3-02 = 0 (speed reference bias)	H3-03	H3-04	-
	-10 to +10 Vdc	H3-01 = 1				
A2	0 to 10 Vdc	H3-09 = 0	H3-10 = 0 (speed reference bias)	H3-11	H3-12	-
	-10 to +10 Vdc	H3-09 = 1				

Setting 2: MEMOBUS/Modbus Communications

When b1-01 = 2, the speed reference is given to the drive using MEMOBUS/Modbus register 0002h. Setting the speed reference from MEMOBUS/Modbus requires parameter d1-18 to be set to 0.

Note: If preset speeds set in the d1-□□ parameters shall be switched over via MEMOBUS/Modbus, parameter b1-01 must be set to 0. Additionally digital inputs must be programmed for speed selection. The desired speed can be selected by switching these digital inputs using the MEMOBUS/Modbus operation command (0001h).

Setting 3: Option card

When b1-01 = 3, the drive looks to a serial network option card for the speed reference. Setting the speed reference from a communication option card requires parameter d1-18 to be set to 0.

- Note:**
1. If preset speeds set in the d1-□□ parameters shall be switched over via a communication option card, parameter b1-01 must be set to 0. Additionally digital inputs must be programmed for speed selection. The desired speed can be selected by switching these digital inputs using the drive operation command (refer to the option card manual for details).
 2. If the speed reference source is set for an option card (b1-01 = 3), but an option card is not installed, an OPE05 Operator Programming Error will be displayed on the digital operator and the drive will not run.

■ b1-02: Up/Down Command Selection

Parameter b1-02 determines the Up/Down command source in the REMOTE mode. The motor should be wired so that when an Up command is issued, the elevator car goes up.

No.	Parameter Name	Setting Range	Default
b1-02	Up/Down command Selection	0 to 3	1

Setting 0: Operator

Allows the user to enter the Up or Down command from the digital operator. Use this setting when performing a test run only.

Setting 1: Control Circuit Terminal

Up and Down commands are issued from the control circuit terminals. This is the standard setting used in most elevator applications.

Setting 2: MEMOBUS/Modbus Communications

Up and Down commands are issued via MEMOBUS/Modbus communications.

Setting 3: Option Card

Up and Down commands are issued over a network to the drive via a serial communications option card..

Note: If b1-02 is set to 3, but an option card is not installed in CN5-A, an oPE05 operator programming error will be displayed on the digital operator and the drive will not run.

■ b1-03: Stopping Method Selection

Select how the drive stops the motor when the Up/Down command is removed or when a Stop command is entered.

No.	Parameter Name	Setting Range	Default
b1-03	Stopping Method Selection	0 or 1	0

Setting 0: Ramp to stop

Ramps the motor to stop at the deceleration ramp set in C1-02. The actual time required for deceleration may vary by load conditions (mechanical loss, inertia).

Setting 1: Coast to stop

If b1-03 = 1, then the drive will shut off output to the motor and simply allow it to coast freely to stop as soon as the Up/Down command is removed.

■ b1-06: Digital Input Reading

This parameter defines how the digital inputs are read.

No.	Name	Setting Range	Default
b1-06	Digital Input Reading	0 or 1	1

Setting 0: Read once

The state of a digital input is read once. If the state has changed, the input command is immediately processed. With this setting the drive responds more quickly to digital inputs, but a noisy signal could cause erroneous operation.

Setting 1: Read twice

The state of a digital input is read twice. Only if the state does not change during the double reading, the input command is processed. This reading process is slower but more resistant against noisy signals.

5.2 b: Application

■ b1-08: Up/Down command selection while in Programming Mode

As a safety precaution, the drive will not normally respond to a Up/Down command input when the digital operator is being used to adjust parameters in the Programming Mode (Verify Menu, Setup Mode, Parameter Settings Mode, and Auto-Tuning Mode). If required by the application, set b1-08 to allow the drive to run while in the Programming Mode.

No.	Parameter Name	Setting Range	Default
b1-08	Up/Down command Selection while in Programming Mode	0 to 2	0

Setting 0: Disabled

A Up/Down command is not accepted while the digital operator is in the Programming Mode.

Setting 1: Enabled

A Up/Down command is accepted in any digital operator mode.

Setting 2: Prohibit programming during run

It is not possible to enter the Programming Mode as long as the drive output is active. The Programming Mode cannot be displayed during Run.

■ b1-14: Phase Order Selection

Sets the phase order for drive output terminals U/T1, V/T2, and W/T3. Switching motor phases will reverse the direction of the motor. This parameter can be used to switch the direction of the Up and Down commands.

No.	Parameter Name	Setting Range	Default
b1-14	Phase Order Selection	0 or 1	0

Setting 0: Standard phase order (U-V-W)

Setting 1: Switched phase order (U-W-V)

- Note:**
1. If using a closed loop control mode such as CLV (A1-02 = 3) or CLV/PM (A1-02 = 7) and parameter b1-14 is changed, be sure to also change the direction of the motor encoder (F1-05) to match the direction of the Up and Down commands.
 2. If CLV/PM is used, also perform encoder offset Auto-Tuning.

◆ b2: Magnetic Flux Compensation

■ b2-08: Magnetic Flux Compensation Value

Sets the magnetic flux compensation at start as a percentage of the no-load current value (E2-03). This function allows better flux establishment, making it easier to start machines that require high starting torque or motors with a large rotor time constant.

No.	Name	Setting Range	Default
b2-08	Magnetic Flux Compensation Value	0 to 1000%	0%

When an Up/Down command is issued, the DC current level injected into the motor changes linearly from the level set to b2-08 to E2-03 within the time set to S1-04.

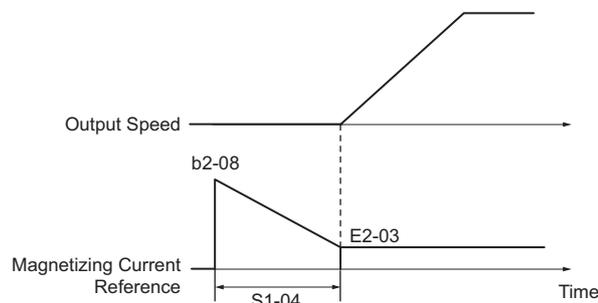


Figure 5.1 Magnetic Flux Compensation

Note that the level of the DC current injected to the motor is limited to 80% of the drive rated current or to the motor rated current, whichever value is smaller.

- Note:**
1. If b2-08 is set below 100%, it can take a relatively long time for flux to develop.
 2. If b2-08 is set to 0%, the DC current level will be the DC Injection current set to S1-02.
 3. As DC Injection can generate a fair amount of noise, b2-08 may need to be adjusted to keep noise levels acceptable.

◆ b4: Delay Timers

The timer function is independent of drive operation and can be used to delay the switching of a digital output triggered by a digital input signal. An on-delay and off-delay can be separately set. The delay timer can help to get rid of chattering switch noise from sensors.

To enable the timer function, a multi-function input must be set to “Timer input” (H1-□□=18) and a multi-function output must be set to “Timer output” (H2-□□=12). One timer can be used only.

■ b4-01, b4-02: Timer Function On-Delay, Off-Delay Time

b4-01 sets the on-delay time for switching the timer output. b4-02 sets the off-delay time for switching the timer output.

No.	Name	Setting Range	Default
b4-01	Timer Function On-Delay Time	0.0 to 3000.0 s	0.0 s
b4-02	Timer Function Off-Delay Time	0.0 to 3000.0 s	0.0 s

■ Timer Function Operation

When the timer function input closes for longer than the value set in b4-01, the timer output switches on. When the timer function input is open for longer than the value set in b4-02, the timer output function switches off. The following diagram demonstrates the timer function operation.

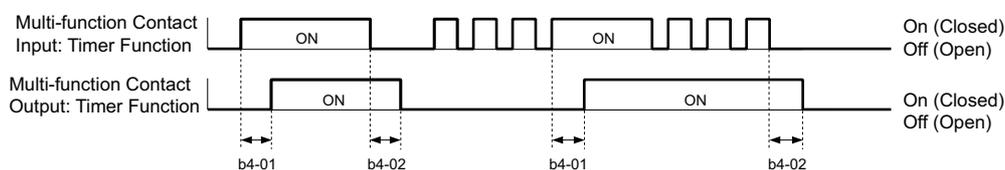


Figure 5.2 Timer Operation

◆ b6: Dwell Function

The Dwell function is used to temporarily hold the output speed at a predefined value for a set time, then continue accelerating or decelerating.

The figure below shows how the Dwell function works.

Note: Using the Dwell function requires that the stopping method for the drive be set to “Ramp to stop” (b1-03 = 0).

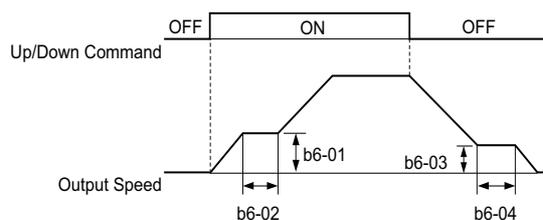


Figure 5.3 Dwell Function at Start and Stop

■ b6-01, b6-02: Dwell Speed, Dwell Time at Start

b6-01 determines the speed that is held or the time set in b6-02 during acceleration.

No.	Name	Setting Range	Default
b6-01	Dwell Speed at Start	0.0 to 100.0% <I>	0.0%
b6-02	Dwell Time at Start	0.0 to 10.0 s	0.0 s

<I> A setting of 100% is equal to the maximum speed.

5.2 b: Application

■ b6-03, b6-04: Dwell Speed, Dwell Time at Stop

Parameter b6-03 determines the speed that is held for the time set in b6-04 during deceleration.

No.	Name	Setting Range	Default
b6-03	Dwell Speed at Stop	0.0 to 100.0% <1>	0.0%
b6-04	Dwell Time at Stop	0.0 to 10.0 s	0.0 s

<1> A setting of 100% is equal to the maximum speed.

◆ b7: Droop Control (CLV/PM)

Droop control can automatically balance the load level between two motors that drive the same load. It must be activated in one of the two drives that control these two motors. The drive in which Droop control is activated will automatically reduce the speed if the torque reference rises, and increase the speed if the torque reference falls again.

Note: Disable Feed Forward (n5-01 = 0) whenever using Droop control.

■ b7-01: Droop Control Gain

Sets the amount of speed reduction when the torque reference is 100%. The gain is set as a percentage of the maximum output speed. A setting of 0.0% disables the Droop control function.

No.	Parameter Name	Setting Range	Default
b7-01	Droop Control Gain	0.0 to 100.0%	0.0%

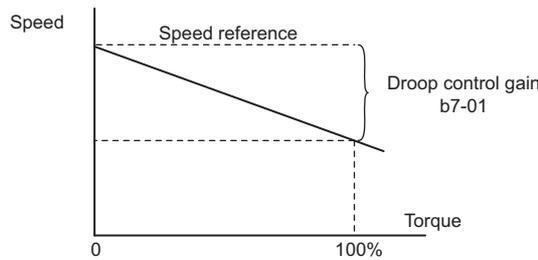


Figure 5.4 Droop Control Gain

■ b7-02: Droop Control Delay Time

The setting in b7-02 adjusts the responsiveness of Droop control. Reduce the setting if the reaction time is too long, and increase it if hunting occurs.

No.	Parameter Name	Setting Range	Default
b7-02	Droop Control Delay Time	0.03 to 2.00 s	0.05 s

◆ b8: Energy Saving

The Energy Saving function can significantly increase the efficiency of an IPM motor.

Note: The Energy Saving function should be used only with a Yaskawa IPM motor.

■ b8-01: Energy Saving Control Selection

Enables or disables the Energy Saving function.

No.	Parameter Name	Setting Range	Default
b8-01	Energy Saving Control Selection	0 or 1	0

Setting 0: Disabled

Setting 1: Enabled

■ b8-16: Energy Saving Control Constant (Ki)

Enter the Energy Saving value (Ki) as specified on the motor nameplate (for IPM motors only).

No.	Name	Setting Range	Default
b8-16	Energy Saving Control Constant (Ki)	0.00 to 2.00	0.10

■ b8-17: Energy Saving Control Constant (Kt)

Enter the Energy Saving value (Kt) as specified on the motor nameplate (for IPM motors only).

No.	Name	Setting Range	Default
b8-17	Energy Saving Control Constant (Kt)	0.00 to 2.00	1.00

5.3 C: Tuning

C parameters are used to set the acceleration and deceleration characteristics, as well as Jerk. Other parameters in this group cover settings for slip compensation, torque compensation, and carrier frequency.

◆ C1: Acceleration and Deceleration Ramps

■ C1-01 to C1-08: Accel, Decel Ramps 1 to 4

Four different sets of acceleration and deceleration ramps can be set in the drive. They can be selected by digital inputs or can be switched automatically. Acceleration ramp parameters always set the ramp or time to accelerate from 0 to the maximum speed. Deceleration ramp parameters always set the ramp or time to decelerate from the maximum speed to 0. C1-01 and C1-02 are the default active accel/decel settings.

No.	Parameter Name	Setting Range	Default
C1-01	Acceleration Ramp 1	0.00 to 600.00 s <I>	1.50 s <I>
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		

<I> The setting range and default value depend on the display units set in parameter o1-03. If o1-03 is set between 0 and 4, the time required to go from 0% speed to 100% maximum speed is expressed in seconds. If o1-03 is set to 5 or 6, then setting units will appear in m/s² or ft/s². If the drive is in V/f control mode the accel/decel ramps can be set in seconds only.

Switching Acceleration Ramps by Digital Input

Accel/decel ramps 1 are active by default if no input is set. The accel/decel ramps 2, 3, and 4 can be activated by digital inputs (H1-□□ = 7 and 1A) as explained in [Table 5.6](#).

Table 5.6 Accel/Decel Ramp Selection by Digital Input

Accel/Decel Ramp Sel. 1 H1-□□ = 7	Accel/Decel Ramp Sel. 2 H1-□□ = 1A	Active Ramps	
		Acceleration	Deceleration
0	0	C1-01	C1-02
1	0	C1-03	C1-04
0	1	C1-05	C1-06
1	1	C1-07	C1-08

[Figure 5.5](#) shows an operation example for changing accel/decel ramps. The example below requires that the stopping method be set for “Ramp to stop” (b1-03 = 0).

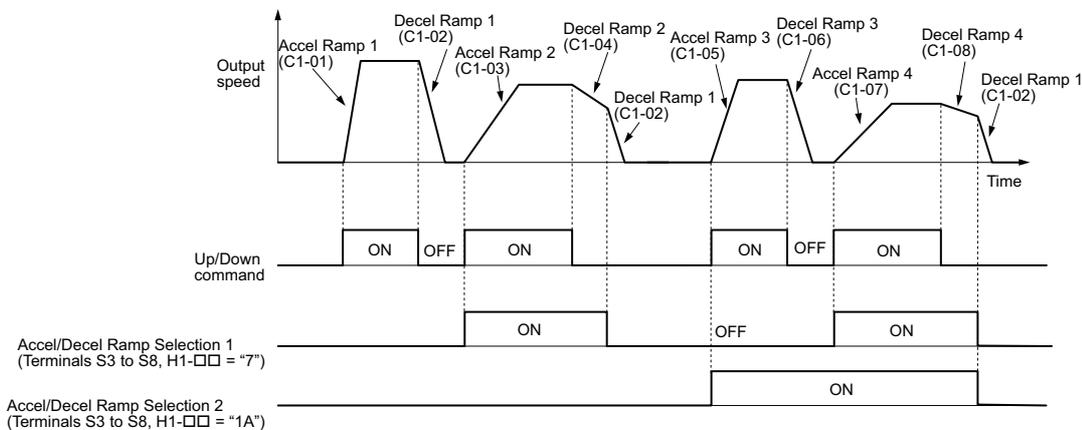


Figure 5.5 Timing Diagram of Accel/Decel Ramp Change

Switching Accel/Decel Ramps by a Speed Level

The drive can switch between different acceleration and deceleration ramps automatically. The drive will switch from accel/decel ramp 4 in C1-07 and C1-08 to the default accel/decel ramp in C1-01 and C1-02 when the output speed exceeds the speed level set in parameter C1-11. When it falls below this level, the accel/decel ramps are switched back. [Figure 5.6](#) shows an operation example.

Note: Acceleration and deceleration ramps selected by digital inputs have priority over the automatic switching by the speed level set to C1-11. For example, if accel/decel ramp 2 is selected, the drive will use this time only and not switch from accel/decel ramp 4 to the selected one.

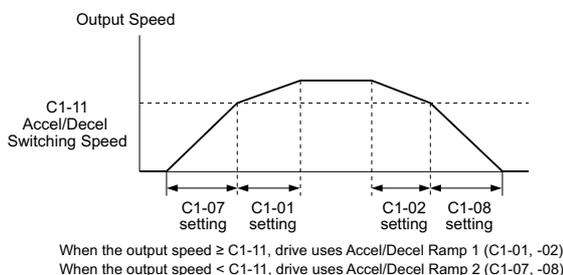


Figure 5.6 Accel/Decel Switching Speed

■ C1-11: Accel/Decel Switching Speed

Sets the speed at which the drive switches between accel/decel ramp settings. [Refer to Switching Accel/Decel Ramps by a Speed Level on page 143.](#)

No.	Parameter Name	Setting Range	Default
C1-11	Accel/Decel Switching Speed	0.0 to 100.0%	0.0%

Note: Setting C1-11 to 0.0% disables this function.

■ C1-09: Emergency Stop Ramp

Parameter C1-09 will set a special deceleration that is used when certain faults occur or that can be operated by closing a digital input configured as H1-□□ = 15 (N.O. input) or 17 (N.C. input). The input does not have to be closed continuously, even a momentary closure will trigger the Emergency Stop operation. Unlike standard deceleration, once the Emergency Stop operation is initiated, the drive cannot be restarted until the deceleration is complete, the Emergency Stop input is cleared, and the Up/Down command is cycled.

A Emergency Stop can be selected as the action the drive should take when certain faults occur, such as L8-03 (Overheat Pre-Alarm Operation Selection).

No.	Parameter Name	Setting Range	Default
C1-09	Emergency Stop Ramp	0.0 to 600.0 s <I>	1.50 s <I>

<I> The setting range and default value depend on the display units set in parameter o1-03. If o1-03 is set between 0 and 4, the time required to go from 0% speed to 100% maximum speed is expressed in seconds. If o1-03 is set to 5 or 6, then setting units will appear in m/s² or ft/s². If the drive is in V/f control mode, the emergency stop ramp can be set in seconds only.

■ C1-10: Accel/Decel Setting Resolution

Determines the units for the acceleration and deceleration ramps set to C1-01 through C1-09 using parameter C1-10.

No.	Parameter Name	Setting Range	Default
C1-10	Accel/Decel Setting Resolution	0 or 1	0

Setting 0: Two decimal places

Setting 1: One decimal place

■ C1-15: Inspection Deceleration Ramp

Sets the deceleration ramp during Inspection Run. For more information, see [Inspection Operation on page 108.](#)

No.	Parameter Name	Setting Range	Default
C1-15	Inspection Deceleration Ramp	0.00 to 2.00 s <I>	0.00 s <I>

<I> The setting range and default value depend on the display units set in parameter o1-03. If o1-03 is set between 0 and 4, the time required to go from 0% speed to 100% maximum speed is expressed in seconds. If o1-03 is set to 5 or 6, then setting units will appear in m/s² or ft/s². If the drive is in V/f control mode, the inspection deceleration ramp can be set in seconds only.

◆ C2: Jerk Settings

Jerk settings set the transition between acceleration rates. Adjust them to smooth out jerks or shocks that occur when the speed is changed.

■ C2-01 to C2-05: Jerk Settings

C2-01 through C2-05 set separate jerks for each section of the acceleration or deceleration.

No.	Parameter Name	Setting Range	Default
C2-01	Jerk at Accel Start	0.00 to 10.00 s </>	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		

<1> The setting range and default value depend on the display units set in parameter o1-03. If o1-03 is set between 0 and 4, the time required to go from 0% speed to 100% maximum speed is expressed in seconds. If o1-03 is set to 5 or 6, then setting units will appear in m/s² or ft/s².

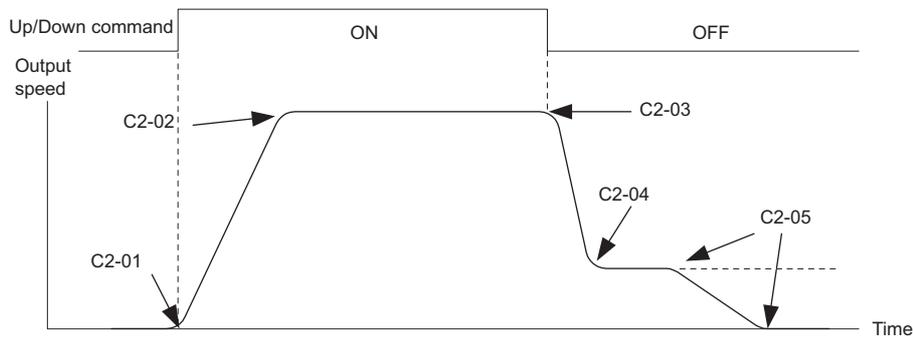


Figure 5.7 Jerk Settings

When o1-03 is set to between 0 and 4, the jerk settings are expressed in seconds. Then the actual accel/decel time including jerk settings can be calculated as follows:

$$\text{Actual accel ramp} = \text{accel ramp setting} + (C2-01 + C2-02) / 2$$

$$\text{Actual decel ramp} = \text{decel ramp setting} + (C2-03 + C2-04) / 2$$

◆ C3: Slip Compensation

The Slip Compensation function improves the speed accuracy of an induction motor. By adjusting the output speed in accordance with the motor load, it compensates the slip and makes the motor speed equal to the speed reference.

Note: Perform Auto-Tuning and make sure that the motor rated current (E2-01), the motor rated slip (E2-02), and the no-load current (E2-03) have all been set properly before making any adjustments to slip compensation parameters.

■ C3-01: Slip Compensation Gain

This parameter sets the gain for the motor slip compensation function. Although this parameter rarely needs to be changed, adjustments might be needed under the following circumstances:

- If the motor at constant speed is slower than the speed reference, increase C3-01.
- If the motor at constant speed is faster than the speed reference, decrease C3-01.

No.	Parameter Name	Setting Range	Default
C3-01	Slip Compensation Gain	0.0 to 2.5	1.0

■ C3-02: Slip Compensation Primary Delay Time

Adjusts the filter on the output side of the slip compensation function. Although this parameter rarely needs to be changed, adjustment may help in the following situations:

- Decrease the setting when the slip compensation response is too slow.
- Increase this setting when speed is unstable.

No.	Parameter Name	Setting Range	Default
C3-02	Slip Compensation Primary Delay Time	0 to 10000 ms	2000 ms

■ C3-03: Slip Compensation Limit

Sets the upper limit for the slip compensation function as a percentage of the motor rated slip (E2-02).

No.	Parameter Name	Setting Range	Default
C3-03	Slip Compensation Limit	0 to 250%	200%

The slip compensation limit is constant throughout the constant torque range (speed reference \leq E1-06). In the constant power range (speed reference \geq E1-06), it is increased based on C3-03 and the output speed as shown in the following diagram.

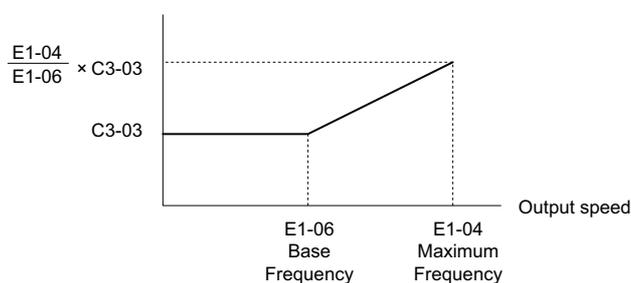


Figure 5.8 Slip Compensation Limit

■ C3-04: Slip Compensation Selection during Regeneration

Enables or disables slip compensation during regenerative operation.

Even if enabled, this function does not operate when the output speed is too low.

No.	Parameter Name	Setting Range	Default
C3-04	Slip Compensation Selection during Regeneration	0 to 2	0

Setting 0: Disabled

Slip compensation is not provided. The actual motor speed might be higher than the speed reference.

Setting 1: Enabled (6 Hz and above)

Slip compensation is enabled during regenerative operation. It will not be active at output frequencies below 6 Hz.

Setting 2: Enabled (compensation provided wherever possible)

Slip compensation is enabled during regenerative operation. It will not be active at output frequencies below 2 Hz. The drive uses the motor rated slip set in E2-02 to automatically calculate the frequency range where compensation will be disabled.

■ C3-05: Output Voltage Limit Operation Selection

Determines if the motor flux reference is automatically reduced when output voltage reaches the saturation range.

If the input power supply voltage is low or the motor has a high voltage rating, this function can help improve the speed precision when moving heavy loads at high speeds. When this function is enabled, the reduction in flux causes a slightly higher current at high speed. Keep this in mind when selecting the drive.

No.	Parameter Name	Setting Range	Default
C3-05	Output Voltage Limit Operation Selection	0 or 1	Determined by A1-02

Setting 0: Disabled

Setting 1: Enabled

◆ C4: Torque Compensation

The torque compensation function compensates for insufficient torque production at start-up or when a load is applied.

Note: Make sure the motor parameters and V/f pattern are set properly before setting torque compensation parameters.

■ C4-01: Torque Compensation Gain

Sets the gain for the torque compensation function.

No.	Parameter Name	Setting Range	Default
C4-01	Torque Compensation Gain	0.00 to 2.50	1.00

Torque Compensation in V/f:

The drive calculates the motor primary voltage loss using the output current and the line to line resistance (E2-05) and then adjusts the output voltage to compensate insufficient torque at start or when load is applied. The effects of this voltage compensation can be increased or decreased using parameter C4-01.

Torque Compensation in OLV:

The drive controls the motor excitation current (d-axis current) and torque producing current (q-axis current) separately. Torque compensation affects the torque producing current only. C4-01 works as a factor of the torque reference value that builds the torque producing current reference.

Adjustment

Although this parameter rarely needs to be adjusted, changing the torque compensation gain in small steps of 0.05 may help in the following situations:

- Increase this setting when using a long motor cable.
- Decrease this setting when motor oscillation occurs.

Adjust C4-01 so that the output current does not exceed the drive rated current.

Note: Refrain from adjusting torque compensation in Open Loop Vector Control, as it can have a negative effect on torque accuracy.

■ C4-02: Torque Compensation Primary Delay Time

Sets the delay time used for applying torque compensation.

No.	Parameter Name	Setting Range	Default
C4-02	Torque Compensation Primary Delay Time	0 to 60000 ms	Determined by A1-02

Adjustment

Although C4-02 rarely needs to be changed, adjustments may help in the following situations:

- If the motor vibrates, increase C4-02.
- If the motor responds too slowly to changes in the load, decrease C4-02.

■ C4-03: Torque Compensation at Forward Start

Sets the amount of torque at start in the forward direction in order to improve motor performance during start with a heavy load. Compensation is applied using the time constant set in parameter C4-05. Enable this function when the load pulls the motor in reverse when starting with a Forward Up/Down command. Setting of 0.0% disables this feature.

No.	Parameter Name	Setting Range	Default
C4-03	Torque Compensation at Forward Start	0.0 to 200.0%	0.0%

■ C4-04: Torque Compensation at Reverse Start

Sets the amount of torque reference at start in the reverse direction in order to improve motor performance during start with heavy load. Compensation is applied using the time constant set in parameter C4-05. Enable this function if the load pulls the motor in the forward direction when starting with a Reverse Up/Down command. Setting 0.0% disables this feature.

No.	Parameter Name	Setting Range	Default
C4-04	Torque Compensation at Reverse Start	-200.0 to 0.0%	0.0%

■ C4-05: Torque Compensation Time Constant

This parameter is the time constant for applying the torque compensation at start that is set to C4-03 and C4-04.

No.	Parameter Name	Setting Range	Default
C4-05	Torque Compensation Time Constant	0 to 200 ms	10 ms

◆ C5: Speed Control Loop

The Speed Control Loop controls the motor speed in CLV and CLV/PM control modes. It adjusts torque reference in order to minimize the difference between speed reference and actual motor speed.

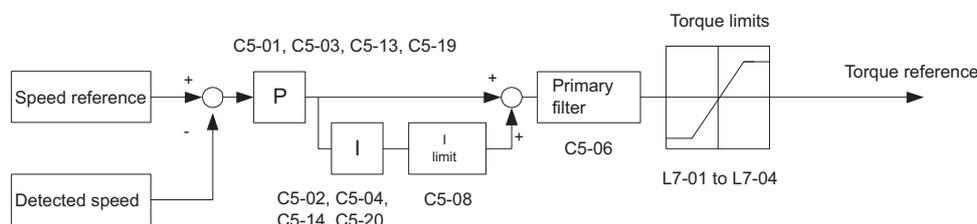


Figure 5.9 Speed Control Block Diagram

■ Adjusting the Speed Control Loop Parameters

Before adjusting Speed Control Loop parameters make sure all motor data have been set up correctly or Auto-Tuning has been performed.

Analog output signals should be used to monitor the speed reference after softstarter (U1-16) and the motor speed (U1-05) when adjusting the Speed Control Loop. Refer to [H4: Multi-Function Analog Outputs on page 180](#) for details on setting up analog output functions.

Generally when tuning the Speed Control Loop, first optimize the Speed Control Loop gain, then adjust the integral time settings. Always make adjustments with the load connected to the motor.

The drive provides three different gain and integral time settings for the speed loop. They are automatically switched over if the switching speed in parameter C5-07 is set larger than 0% (default: 0% for CLV, 2% for CLV/PM). If no switching speed is defined (C5-07 = 0) the drive will use one set of speed loop parameters only (C5-01/02).

However, in order to achieve adequate performance in all sections of a trip, for the most installations it will be necessary to use two or all three sets of speed loop settings.

Additional Speed loop settings are provided for Position Lock. Those can be used to prevent rollback especially in gearless applications.

Also refer to [C5-01, C5-03, C5-13 / C5-02, C5-04, C5-14: Speed Control Loop Proportional Gain 1, 2, 3 / Speed Control Loop Integral Time 1, 2, 3 on page 148](#).

Perform the following steps for adjusting Speed Control Loop parameters:

1. Check parameter C5-07 and set a speed loop setting switching point. For CLV/PM the drive is preset to 2%. For CLV set C5-07 between 8~10%.
2. Start a trip and check for any problems like rollback, vibration, overshoot, etc.
3. Adjust C5-19/20 in order to solve rollback problems during Position Lock right before the motor starts accelerating. Increase C5-19, then shorten C5-20 if the motor rolls back right after the brake releases. Set them in the opposite way if vibration occurs. If the rollback can not be eliminated by setting C5-19/10, refer to parameters S3-01/02 (Position Lock Gains at Start).

5.3 C: Tuning

4. Adjust C5-03/04 in order to improve the performance at start after Position Lock has been finished. Increase C5-03, then shorten C5-04 if the speed response is slow. Set them in the opposite way if vibration occurs.
5. Adjust C5-01/02 in order to solve problems that occur at speeds higher than C5-07. Increase C5-01, then shorten C5-02 if overshoot when reaching the top speed occurs. Set them in the opposite way if vibration occurs.
6. Adjust C5-13/14 in order to improve the stopping behavior. Increase C5-13, then shorten C5-14 if the landing accuracy is poor. Adjust them in the opposite way if vibrations occur. If problems can not be resolved by setting C5-13/14, refer to parameter S3-03 Position Lock Gain at Stop). Note that C5-13/14 settings will not be effective if the speed reference is set from an analog input.
7. Repeat steps 2 to 6 until the desired riding comfort has been reached. Also refer to [Riding Comfort Related Problems on page 127](#).

■ C5-01, C5-03, C5-13 / C5-02, C5-04, C5-14: Speed Control Loop Proportional Gain 1, 2, 3 / Speed Control Loop Integral Time 1, 2, 3

These parameters can be used to adjust the responsiveness of the Speed Control Loop.

No.	Parameter Name	Setting Range	Default
C5-01	Speed Control Loop Proportional Gain 1	0.00 to 300.00	Determined by A1-02
C5-02	Speed Control Loop Integral Time 1	0.000 to 10.000 s	Determined by A1-02
C5-03	Speed Control Loop Proportional Gain 2	0.00 to 300.00	Determined by A1-02
C5-04	Speed Control Loop Integral Time 2	0.000 to 10.000 s	Determined by A1-02
C5-13	Speed Control Loop Proportional Gain 3	0.00 to 300.00	Determined by A1-02
C5-14	Speed Control Loop Integral Time 3	0.000 to 10.000 s	Determined by A1-02

Speed Control Loop Gain Tuning (C5-01, C5-03, C5-13)

The higher this setting, the faster is the speed response. Too high of a setting can lead to oscillation.

Speed Control Loop Integral Time Tuning (C5-02, C5-04, C5-14)

Determines how fast a continuous speed deviation problem is eliminated. Too long of an integral time makes the speed control less responsive, while a too short of an integral time can cause oscillation.

■ C5-06: Speed Control Loop Primary Delay Time Constant

This parameter sets the filter time constant for the time from the speed loop to the torque command output.

Increase this setting gradually in increments of 0.01 for loads with low rigidity, or when oscillation is a problem.

Note: This parameter rarely requires adjustment.

No.	Parameter Name	Setting Range	Default
C5-06	Speed Control Loop Primary Delay Time Constant	0.000 to 0.500 s	0.004 s

■ C5-07: Speed Control Settings Switching Speed

Sets the speed where the drive should switch between Speed Control Loop proportional gain 1, 2, and 3 (C5-01, C5-03, and C5-13) as well as between integral time 1, 2, and 3 (C5-02, C5-04, and C5-14).

No.	Parameter Name	Setting Range	Default
C5-07	Speed Control Settings Switching Speed	0.0 to 100.0%	Determined by A1-02

Switching Between Speed Loop Settings Accel/Decel

Switching between speed loop settings helps to achieve optimal performance and riding comfort in all sections of a trip. If C5-07 is set higher than 0% then the speed loop settings automatically change with the output speed as shown in [Figure 5.10](#) and [Figure 5.11](#).

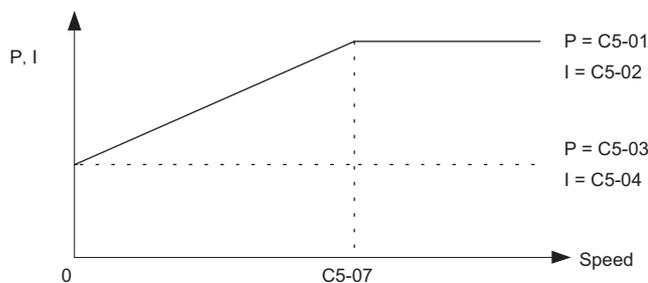


Figure 5.10 Settings at Low and High Speed during Acceleration

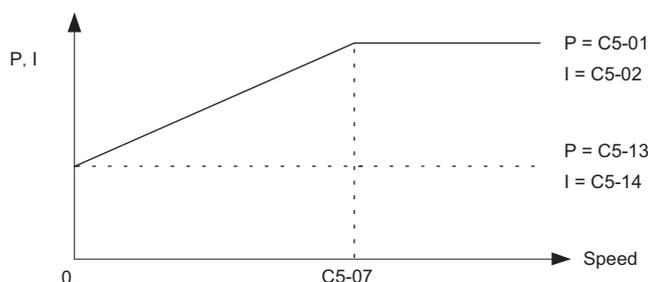


Figure 5.11 Settings at Low and High Speed during Deceleration

■ **C5-08: Speed Control Loop Integral Limit**

Sets the upper limit for Speed Control Loop output as a percentage of the rated torque.

No.	Parameter Name	Setting Range	Default
C5-08	Speed Control Loop Integral Limit	0 to 400%	400%

■ **C5-16: Speed Control Loop Delay Time during Position Lock**

Adjusts the delay applied to the torque reference output from Speed Control Loop during Position Lock.

Gradually increasing C5-16 in increments of 0.01 can help solving vibration problems.

Note: This setting rarely needs to be changed.

No.	Parameter Name	Setting Range	Default
C5-16	Speed Control Loop Delay Time during Position Lock	0.000 to 0.500 s	0.000 s

■ **C5-19, C5-20: Speed Control Loop P Gain Time, I Time during Position Lock**

These two parameter are used to adjust the responsiveness of Speed Control Loop during Position Lock. Increase C5-19 and shorten C5-20 if the motor rolls back right after the brake releases. Set them in the opposite way if vibrations occur.

No.	Parameter Name	Setting Range	Default
C5-19	Speed Control Loop Proportional Gain Time during Position Lock	0.00 to 300.00	Determined by A1-02
C5-20	Speed Control Loop Integral Time during Position Lock	0.000 to 10.000 s	0.100 s

◆ **C6: Carrier Frequency**

■ **C6-03: Carrier Frequency**

Parameter C6-03 sets the carrier frequency.

No.	Parameter Name	Setting Range	Default
C6-03	Carrier Frequency	1.0 to 15.0 kHz	Determined by o2-04

5.3 C: Tuning

■ C6-06: PWM Method

Determines how the drive should perform pulse width modulation.

No.	Parameter Name	Setting Range	Default
C6-06	PWM Method	0 to 2	0

0: 2-phase/3-phase conversion

1: 2-phase modulation

2: 3-phase modulation

Note: With the setting 2, the drives rated output current is reduced. Consult Yaskawa or your sales agency for details.

■ C6-09: Carrier Frequency during Rotational Auto-Tuning

C6-09 determines what the carrier frequency should be while Rotational Auto-Tuning is performed.

This parameter rarely requires adjustment, but can be helpful solving problems with overcurrent when Auto-Tuning a low impedance motor. In such cases, first set C6-03 to a high value, then set C6-09 = 1.

No.	Parameter Name	Setting Range	Default
C6-09	Carrier Frequency during Rotational Auto-Tuning	0 or 1	0

Setting 0: 5 kHz

Setting 1: Same value set to C6-03

■ C6-21: Inspection Operation Carrier Frequency

Sets the carrier frequency during Inspection Run.

No.	Parameter Name	Setting Range	Default
C6-21	Inspection Operation Carrier Frequency	0 or 1	1

Setting 0: Use the value set to C6-03

Setting 1: 2 kHz

■ C6-23: Carrier Frequency during Initial Motor Pole Search

Sets the carrier frequency when estimating the initial polarity.

No.	Parameter Name	Setting Range	Default
C6-23	Carrier Frequency during Initial Motor Pole Search	0 or 1	0

Setting 0: 2 kHz

Setting 1: Use the value set to C6-03

5.4 d: Reference Settings

The d parameters determine the speed of the elevator. This includes the speed reference and Field Forcing settings for motor response.

◆ d1: Speed Reference

The d1 parameter group is used to set the speed reference. Switch the multi-function input contact terminals to create a multi-step speed sequence using the various references set to the d1 parameters.

■ d1-18: Speed Reference Selection Mode

Sets the priority of the speed reference inputs.

No.	Parameter Name	Setting Range	Default
d1-18	Speed Reference Selection Mode	0 to 3	0

Setting 0: Use multi-speed references d1-01 to d1-08

Up to eight separate preset speed references can be programmed to the drive using parameters d1-01 through d1-08 and can be selected using binary coded digital inputs. When d1-18 is set to “0”, parameters d1-19 through d1-23 and d1-26 are not displayed. For further explanation, refer to [Multi-Speed Inputs 1, 2 \(d1-18 = 0 or 3\) on page 106](#).

Setting 1: High speed reference has priority

Six different speeds (d1-19 to d1-23, d1-26) can be programmed to the drive and can be selected using dedicated digital inputs. Each of the speed references set to d1-19 through d1-23 takes priority over the leveling speed set to d1-26. When d1-18 is set to “1”, parameter d1-01 to d1-08 are not displayed. For further explanation, refer to [Separate Speed Inputs \(d1-18 = 1 or 2\) on page 106](#).

Setting 2: Leveling speed reference has priority

Six different speeds (d1-19 to d1-23, d1-26) can be programmed to the drive and can be selected using dedicated digital inputs. The leveling speed reference in d1-26, however, takes priority over all other speed references when enabled via one of the multi-function input terminals (H1-□□ = 53). When d1-18 is set to “2”, parameters d1-01 to d1-08 are not displayed. For further explanation, refer to [Separate Speed Inputs \(d1-18 = 1 or 2\) on page 106](#).

Setting 3: Use multi-speed references d1-02 to d1-08, no speed selection stops the drive

Up to seven separate preset speed references can be programmed to the drive using parameters d1-02 through d1-08 and can be selected using binary coded digital inputs. When d1-18 is set to “3”, parameters d1-19 through d1-23 and d1-26 are not displayed. For further explanation, refer to [Multi-Speed Inputs 1, 2 \(d1-18 = 0 or 3\) on page 106](#).

■ d1-01 to d1-08: Speed References 1 to 8

These parameters set speed references 1 through 8. Each of these speed reference values can be selected using digital inputs programmed for multi-speed selection (H1-□□ = 3, 4, 5).

No.	Parameter Name	Setting Range	Default
d1-01 to d1-08	Speed Reference 1 to 8	0.00 to 100.00% <I>	0.00% <I>

<I> Setting units and the default setting are determined by parameter o1-03. For more information, refer to [Defaults and Setting Ranges by Display Unit Selection \(o1-03\) on page 339](#).

For details on multi-step speed selection, refer to [Multi-Speed Inputs 1, 2 \(d1-18 = 0 or 3\) on page 106](#).

■ d1-19: Nominal Speed

Sets the nominal speed when a multi-function input terminal is programmed for “Nominal speed” (H1-□□ = 50).

No.	Name	Setting Range	Default
d1-19	Nominal Speed	0.00 to 100.00% <I>	100.00% <I>

<I> Setting ranges and defaults vary by the setting units determined by parameter o1-03. For more information, refer to [Defaults and Setting Ranges by Display Unit Selection \(o1-03\) on page 339](#).

5.4 d: Reference Settings

■ d1-20, d1-21, d1-22: Intermediate Speeds 1 to 3

Set intermediate speeds 1 through 3.

No.	Name	Setting Range	Default
d1-20	Intermediate Speed 1	0.00 to 100.00% <I>	0.00% <I>
d1-21	Intermediate Speed 2	0.00 to 100.00% <I>	0.00% <I>
d1-22	Intermediate Speed 3	0.00 to 100.00% <I>	0.00% <I>

<I> Setting ranges and defaults vary by the setting units determined by parameter o1-03. For more information, refer to [Defaults and Setting Ranges by Display Unit Selection \(o1-03\) on page 339](#).

■ d1-23: Releveling Speed

Sets the releveling speed when a multi-function input terminal is programmed for “Releveling speed” (H1-□□ = 52).

No.	Name	Setting Range	Default
d1-23	Releveling Speed	0.00 to 100.00% <I>	0.00% <I>

<I> Setting ranges and defaults vary by the setting units determined by parameter o1-03. For more information, refer to [Defaults and Setting Ranges by Display Unit Selection \(o1-03\) on page 339](#).

■ d1-24: Inspection Operation Speed

Sets the inspection speed when a multi-function input terminal is programmed for “Inspection speed” (H1-□□ = 54). A description of the inspection speed can be found in [Inspection Operation on page 108](#).

No.	Name	Setting Range	Default
d1-24	Inspection Operation Speed	0.00 to 100.00% <I>	50.00% <I>

<I> Setting ranges and defaults vary by the setting units determined by parameter o1-03. For more information, refer to [Defaults and Setting Ranges by Display Unit Selection \(o1-03\) on page 339](#).

■ d1-25: Rescue Operation Speed

Determines the speed during Rescue Operation. For details refer to [Rescue Operation on page 113](#).

No.	Name	Setting Range	Default
d1-25	Rescue Operation Speed	0.00 to 100.00% <I>	10.00% <I>

<I> Setting ranges and defaults vary by the setting units determined by parameter o1-03. For more information, refer to [Defaults and Setting Ranges by Display Unit Selection \(o1-03\) on page 339](#).

■ d1-26: Leveling Speed

Sets the inspection speed when a multi-function input terminal is programmed for “Leveling speed” (H1-□□ = 53).

No.	Name	Setting Range	Default
d1-26	Leveling Speed	0.00 to 100.00% <I>	8.00% <I>

<I> Setting ranges and defaults vary by the setting units determined by parameter o1-03. For more information, refer to [Defaults and Setting Ranges by Display Unit Selection \(o1-03\) on page 339](#).

■ d1-28: Leveling Speed Detection Level

When the speed priority selection in d1-18 is set to “0” or “3” and the speed reference value falls below the level set in d1-28, the drive interprets the selected speed as levelling speed. This parameter must be set in order to be able to use the Speed Control Loop settings 3 when d1-18 = 0/3. Also refer to [C5: Speed Control Loop on page 147](#).

No.	Name	Setting Range	Default
d1-28	Leveling Speed Detection Level	0.00 to 100.00%	0.00%

■ d1-29: Inspection Speed Detection Level

When the speed priority selection in d1-18 is set to “0” or “3” and the speed reference value is below the level set in d1-29 but higher than the level set in d1-28, the drive interprets the selected speed as inspection speed. This parameter must be set in order to be able to the Inspection Operation function when d1-18 = 0/3. Also refer to *Inspection Operation on page 108*.

No.	Name	Setting Range	Default
d1-29	Inspection Speed Detection Level	[d1-28] to 100.00%	0.00%

◆ d6: Field Forcing

Field Forcing

The Field Forcing function compensates the delaying influence of the motor time constant when changing the excitation current reference. Field Forcing can improve the motor responsiveness. It is ineffective during DC Injection Braking.

■ d6-03: Field Forcing Selection

Enables or disables the Field Forcing function.

No.	Parameter Name	Setting Range	Default
d6-03	Field Forcing Selection	0 or 1	0

Setting 0: Disabled

Setting 1: Enabled

■ d6-06: Field Forcing Limit

Sets the maximum level to what the Field Forcing function can boost the excitation current reference. The value is set as a percentage of the motor no load current.

No.	Parameter Name	Setting Range	Default
d6-06	Field Forcing Limit	100 to 400%	400%

Note: Adjustment is not normally required.

5.5 E: Motor Parameters

E parameters cover V/f pattern and motor data settings.

◆ E1: V/f Pattern

■ E1-01: Input Voltage Setting

Set the input voltage parameter to the nominal voltage of the AC power supply. This parameter adjusts the levels of some protective features of the drive (overvoltage, Stall Prevention, etc.).

NOTICE: Set parameter E1-01 to match the input voltage of the drive. The drive input voltage (not motor voltage) must be set in E1-01 for the protective features to function properly. Failure to set the correct drive input voltage may result in improper drive operation.

No.	Parameter Name	Setting Range	Default
E1-01 <1>	Input Voltage Setting	155 to 255 V	200 V

<1> The setting range and default value shown here are for 200 V class drives. Double this for 400 V class units.

E1-01 Related Values

The input voltage setting determines the overvoltage/undervoltage detection level.

Voltage	Setting Value of E1-01	(Approximate Values)		
		ov Detection Level	Braking Transistor Operation Level	Uv Detection Level (L2-05)
200 V Class	All settings	410 V	394 V	190 V
400 V Class	setting ≥ 400 V	820 V	788 V	380 V
	setting < 400 V	820 V	788 V	350 V

Note: The braking transistor operation levels are valid for the drive internal braking transistor. If an external CDBR braking chopper is used, refer to the instruction manual of that unit.

■ E1-03: V/f Pattern Selection

No.	Parameter Name	Setting Range	Default
E1-03	V/f Pattern Selection	F	F

Note: Parameter setting value is not reset to the default value during drive initialization (A1-03).

■ V/f Pattern Settings E1-04 to E1-13

Figure 5.12 illustrates the V/f pattern setting.

No.	Parameter Name	Setting Range	Default
E1-04	Maximum Output Frequency	10.0 to 120.0 Hz <1>	<2>
E1-05	Maximum Voltage	0.0 to 255.0 V <3>	200.0 V <3>
E1-06	Base Frequency	0.0 to 120.0 Hz	<2>
E1-07	Middle Output Frequency	0.0 to 120.0 Hz	<2>
E1-08	Middle Output Frequency Voltage	0.0 to 255.0 V <3>	<3> <3> <4>
E1-09	Minimum Output Frequency	0.0 to 120.0 Hz	<2>
E1-10	Minimum Output Frequency Voltage	0.0 to 255.0 V <3>	<3> <3>
E1-11 <5>	Middle Output Frequency 2	0.0 to 120.0 Hz	0.0 Hz
E1-12 <5>	Middle Output Frequency Voltage 2	0.0 to 255.0 V <3>	0.0 V <3>
E1-13	Base Voltage	0.0 to 255.0 V <3>	0.0 V <3> <6>

<1> Setting range depends on the control mode being used. CLV allows a setting range of 10.0 to 120.0 Hz, while CLV/PM allows a setting range of 4.0 to 120.0 Hz.

<2> Default setting is determined by the control mode (A1-02).

<3> Values shown here are for 200 V class drives. Double values when using a 400 V class unit.

<4> Default setting is determined by the drive model (o2-04).

<5> Parameter ignored when E1-11 and E1-12 are set to 0.0.

<6> Auto-Tuning will set E1-13 to the same value as E1-05.

The availability of the following parameters depends on the control mode.

No.	V/f	OLV	CLV	CLV/PM
E1-07	Yes	Yes	N/A	N/A
E1-08	Yes	Yes	N/A	N/A
E1-10	Yes	Yes	N/A	N/A

No.	V/f	OLV	CLV	CLV/PM
E1-11	Yes	Yes	Yes	N/A
E1-12	Yes	Yes	Yes	N/A
E1-13	Yes	Yes	Yes	N/A

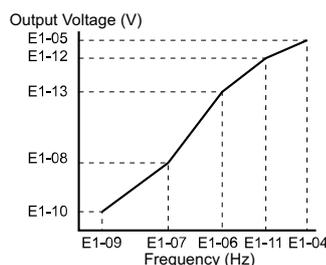


Figure 5.12 V/f Pattern

- Note:**
1. The following condition must be true when setting up the V/f pattern: $E1-09 \leq E1-07 < E1-06 \leq E1-11 \leq E1-04$
 2. To make the V/f pattern a straight line below E1-06, set $E1-09 = E1-07$. In this case the E1-08 setting is disregarded.
 3. E1-03 is unaffected when the parameters are initialized using parameter A1-03, but the settings for E1-04 through E1-13 are returned to their default values.
 4. Parameters E1-11, E1-12, and E1-13 should only be used to fine-tune the V/f pattern in the constant output range. These parameters rarely need to be changed.

◆ E2: Motor Parameters

These parameters contain the motor data for induction motors. They are set automatically when Auto-Tuning is performed (this includes Rotational Auto-Tuning, Stationary Auto-Tuning 1 and 2). If Auto-Tuning cannot be performed, then manually enter the motor data directly to these parameters.

Note: As the motor parameters for a PM motor are set up in the E5-□□ parameters, parameters for induction motors (E2-□□) are hidden when a PM motor control mode is selected (i.e., parameter A1-02 is set to 7).

■ E2-01: Motor Rated Current

Set E2-01 to the full load amps (FLA) stamped on the motor nameplate. This value is used for motor protection and to calculate torque limits. If Auto-Tuning completes successfully, the value entered to T1-04 will automatically be saved to E2-01.

No.	Parameter Name	Setting Range	Default
E2-01	Motor Rated Current	10% to 200% of the drive rated current.	Determined by o2-04

- Note:**
1. The display resolution depends on the rated output power of the drive. Models CIMR-L□2A0018 to 0033 and CIMR-L□4A0009 to 0018 display values in 0.01 A units, while models CIMR-L□2A0047 to 0180 and CIMR-L□4A0024 to 0150 display values in 0.1 A units.
 2. If the motor rated current in E2-01 is set lower than the motor no-load current in E2-03, than a parameter setting error will occur (oPE02). E2-03 must be set correctly to prevent this error.

■ E2-02: Motor Rated Slip

Sets the motor rated slip in Hz. The setting in E2-02 is used for motor protection and to calculate torque limits. This value is automatically set during Auto-Tuning (Rotational Auto-Tuning, Stationary Auto-Tuning 1 and 2).

No.	Parameter Name	Setting Range	Default
E2-02	Motor Rated Slip	0.00 to 20.00 Hz	Determined by o2-04

■ E2-03: Motor No-Load Current

Set the no-load current for the motor in amperes when operating at the rated frequency and the no-load voltage. The drive sets E2-03 during the Auto-Tuning process (Rotational Auto-Tuning and Stationary Auto-Tuning 1, 2). The motor no-load current listed in the motor test report can also be entered to E2-03 manually. Contact the motor manufacturer to receive a copy of the motor test report.

No.	Parameter Name	Setting Range	Default
E2-03	Motor No-Load Current	0 to [E2-01]	Determined by o2-04

5.5 E: Motor Parameters

Note: The display resolution depends on the rated output power of the drive. Models CIMR-L□2A0018 to 0033 and CIMR-L□4A0009 to 0018 display values in 0.01 A units, while models CIMR-L□2A0047 to 0180 and CIMR-L□4A0024 to 0150 display values in 0.1 A units.

■ E2-04: Number of Motor Poles

Set the number of motor poles to E2-04. If Auto-Tuning completes successfully, the value entered to T1-06 will automatically be saved to E2-04.

No.	Parameter Name	Setting Range	Default
E2-04	Number of Motor Poles	2 to 48	4

■ E2-05: Motor Line-to-Line Resistance

Sets the line-to-line resistance of the motor stator winding. If Auto-Tuning completes successfully, this value is automatically calculated. Remember that this value must be entered as line-to-line and not for each motor phase.

If Auto-Tuning is not possible, then contact the motor manufacturer to find out the line-to-line resistance or measure it manually. When using the manufacturer motor test report, calculate E2-05 by the formulas below.

- E-type insulation: Multiply 0.92 times the resistance value (Ω) listed on the test report at 75°C
- B-type insulation: Multiply 0.92 times the resistance value (Ω) listed on the test report at 75°C.
- F-type insulation: Multiply 0.87 times the resistance value (Ω) listed on the test report at 115°C.

No.	Parameter Name	Setting Range	Default
E2-05	Motor Line-to-Line Resistance	0.000 to 65.000 Ω	Determined by o2-04

■ E2-06: Motor Leakage Inductance

Sets the voltage drop due to motor leakage inductance as a percentage of motor rated voltage. This value is automatically set during Auto-Tuning (Rotational Auto-Tuning, Stationary Auto-Tuning 1, 2).

No.	Parameter Name	Setting Range	Default
E2-06	Motor Leakage Inductance	0.0 to 40.0%	Determined by o2-04

■ E2-07: Motor Iron-Core Saturation Coefficient 1

Sets the motor iron saturation coefficient at 50% of the magnetic flux. If Rotational Auto-Tuning completes successfully, then this value is automatically calculated and set to E2-07. This coefficient is used when operating with constant output.

No.	Parameter Name	Setting Range	Default
E2-07	Motor Iron-Core Saturation Coefficient 1	0.00 to 0.50	0.50

■ E2-08: Motor Iron-Core Saturation Coefficient 2

Sets the motor iron saturation coefficient at 75% of the magnetic flux. If Rotational Auto-Tuning completes successfully, then this value is automatically and set to E2-08. This coefficient is used when operating with constant output.

No.	Parameter Name	Setting Range	Default
E2-08	Motor Iron-Core Saturation Coefficient 2	E2-07 to 0.75	0.75

■ E2-09: Motor Mechanical Loss

This parameter sets to the motor mechanical loss as a percentage of motor rated power (kW) capacity.

Adjust this setting when there is a large amount of torque loss due to motor bearing friction.

The setting for the mechanical loss is added to the torque.

No.	Parameter Name	Setting Range	Default
E2-09	Motor Mechanical Loss	0.0 to 10.0%	0.0%

■ E2-10: Motor Iron Loss for Torque Compensation

This parameter sets the motor iron loss in watts.

No.	Parameter Name	Setting Range	Default
E2-10	Motor Iron Loss for Torque Compensation	0 to 65535 W	Determined by o2-04

■ E2-11: Motor Rated Power

This parameter sets the motor rated power in kW. If Auto-Tuning completes successfully, the value entered to T1-02 will automatically be saved to E2-11.

No.	Parameter Name	Setting Range	Default
E2-11	Motor Rated Power	0.00 to 650.00 kW	Determined by o2-04

■ Setting Motor Parameters Manually

Follow the instructions below when setting motor-related parameters manually instead of using the Auto-Tuning feature. Refer to the motor test report included with the motor to make sure the correct data is entered into the drive.

Setting the Motor Rated Current

Enter the motor rated current listed on the nameplate of the motor to E2-01.

Setting the Motor Rated Slip

Use the base speed listed on the motor nameplate to calculate the rated slip. Refer to the formula below, then enter that value to E2-02.

$$\text{Motor rated slip} = \text{rated frequency [Hz]} - \text{base speed [r/min]} \times (\text{no. of motor poles}) / 120$$

Setting the No-Load Current

Enter the no-load current at rated frequency and rated voltage to E2-03. The no-load current is not usually listed on the nameplate. Contact the motor manufacturer if the data cannot be found.

The default setting of the no-load current is for performance with a 4-pole Yaskawa motor.

Setting the Number of Motor Poles

Only required in V/f Control with PG and Closed Loop Vector Control. Enter the number of motor poles as indicated on motor nameplate.

Setting the Line-to-Line Resistance

E2-05 is normally set during Auto-Tuning. If Auto-Tuning cannot be performed, contact the manufacturer of the motor to find out what the correct resistance is between motor lines. The motor test report can also be used to calculate this value:

- E-type insulation: Multiply 0.92 times the resistance value (Ω) listed on the test report at 75°C.
- B-type insulation: Multiply 0.92 times the resistance value (Ω) listed on the test report at 75°C.
- F-type insulation: Multiply 0.87 times the resistance value (Ω) listed on the test report at 115°C.

Setting the Motor Leakage Inductance

The motor leakage inductance set to E2-06 determines the amount of voltage drop relative to the motor rated voltage. This value should be entered particularly for motors with a low degree of inductance, such as high-speed motors. As this information is not listed on the motor nameplate, contact the motor manufacturer to find out the correct value for the motor leakage inductance.

Setting the Motor Iron-Core Saturation Coefficient 1, 2

E2-07 and E2-08 are set when Auto-Tuning is performed.

Setting the Motor Mechanical Loss

The drive only requires this information when using Closed Loop Vector Control. The drive compensates for the degree of mechanical loss with torque compensation. Although E2-09 rarely needs to be changed, adjustment may benefit when there is a large amount of torque loss due to motor bearing friction.

Setting the Motor Iron Loss for Torque Compensation

This value only needs to be set when using V/f Control. Enter this value in watts to E2-10. The drive uses this setting to improve the precision of torque compensation.

5.5 E: Motor Parameters

◆ E5: PM Motor Settings

These parameters set the motor data of a PM motor.

For PM motors, Auto-Tuning can be performed. If motor data is known, it can also be entered manually.

- Note:**
1. E5-□□ parameters are visible only when a PM motor control mode is selected (A1-02 = 7).
 2. E5-□□ parameters are not reset when the drive is initialized using parameter A1-03.

■ E5-02: Motor Rated Power

Sets the rated power of the motor. Determined by the value set to T2-04 during the Auto-Tuning process.

No.	Parameter Name	Setting Range	Default
E5-02	Motor Rated Power	0.10 to 650.00 kW	Determined by o2-04

■ E5-03: Motor Rated Current

Sets the motor rated current in amps. This parameter is automatically set when the value is entered to T2-06 during the Auto-Tuning process.

No.	Parameter Name	Setting Range	Default
E5-03	Motor Rated Current	10 to 200% of drive rated current	Determined by o2-04

- Note:** The display resolution depends on the rated output power of the drive. Models CIMR-L□2A0018 to 0033 and CIMR-L□4A0009 to 0018 display values in 0.01 A units, while models CIMR-L□2A0047 to 0180 and CIMR-L□4A0024 to 0150 display values in 0.1 A units.

■ E5-04: Motor Poles

Sets the number of motor poles. This parameter is automatically set when the value is entered to T2-08 during the Auto-Tuning process.

No.	Parameter Name	Setting Range	Default
E5-04	Motor Poles	2 to 48	12

■ E5-05: Motor Stator Resistance (Single Phase)

Sets the resistance for one motor phase. When measuring the resistance manually, make sure not to enter the line-to-line resistance into E5-05.

No.	Parameter Name	Setting Range	Default
E5-05	Motor Stator Resistance (Single Phase)	0.000 to 65.000 Ω	Determined by o2-04

■ E5-06: Motor d-Axis Inductance

Sets the d-axis inductance in 0.01 mH units. This parameter is set during the Auto-Tuning process.

No.	Parameter Name	Setting Range	Default
E5-06	Motor d-Axis Inductance	0.00 to 600.00 mH	Determined by o2-04

■ E5-07: Motor q-Axis Inductance

Sets the q-axis inductance in 0.01 mH units. This parameter is set during the Auto-Tuning process.

No.	Parameter Name	Setting Range	Default
E5-07	Motor q-Axis Inductance	0.00 to 600.00 mH	Determined by o2-04

■ E5-09: Motor Induction Voltage Constant 1

Sets the induced peak voltage per phase in units of 0.1 mV/(rad/s) [electrical angle]. This data can be obtained from either the motor nameplate or from the motor test report issued by the manufacturer of the motor.

No.	Parameter Name	Setting Range	Default
E5-09	Motor Induction Voltage Constant 1	0.0 to 6500.0 mV/(rad/s)	Determined by o2-04

- Note:**
1. Ensure that E5-24 = 0 when setting parameter E5-09. An alarm will be triggered, however, if both E5-09 and E5-24 are set 0, or if neither parameter is set to 0.
 2. This parameter is not reset when the drive is initialized using parameter A1-03.

■ E5-11: Encoder Offset

Sets the offset between the rotor magnetic axis and the Z-pulse of the encoder connected. This parameter is set during Parameter Auto-Tuning for PM motors and during Encoder Offset Tuning.

No.	Parameter Name	Setting Range	Default
E5-11	Encoder Offset	-180.0 to 180.0 deg	0.0 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]. This data can be obtained from either the motor nameplate or from the motor test report issued by the manufacturer of the motor.

No.	Parameter Name	Setting Range	Default
E5-24	Motor Induction Voltage Constant 2	0.0 to 6500.0 mV/(r/min)	0.0 mv/(r/min)

- Note:**
1. Ensure that E5-09 = 0 when setting parameter E5-24. An alarm will be triggered, however, if both E5-09 and E5-24 are set 0, or if neither parameter is set to 0.
 2. This parameter is not reset when the drive is initialized using parameter A1-03.

5.6 F: Option Settings

◆ F1: Encoder/PG Feedback Settings

The F1 parameters are used to set the drive up for operation using a motor encoder option card. Note that all speed feedback option cards must be connected to the CN5-C port.

■ F1-01: Encoder 1 Resolution

Sets the encoder resolution.

No.	Parameter Name	Setting Range	Default
F1-01	Encoder 1 Resolution	1 to 60000 ppr </>	Determined by A1-02

<1> In CLV/PM mode, the maximum setting is 15000 ppr.

■ F1-02, F1-14: PG Open (PGo) Circuit Operation Selection, Detection Time

A PGo fault is triggered if the drive receives no pulse signal for longer than the time set in F1-14. The stopping method when PGo occurs should be set to parameter F1-02.

No.	Parameter Name	Setting Range	Default
F1-02	Operation Selection at PG Open Circuit (PGo)	0 to 3	1
F1-14	PG Open-Circuit Detection Time	0.0 to 10.0 s	2.0 s

Parameter F1-02 Settings:

Setting 0: Ramp to stop (uses the deceleration ramp set to C1-02)

Setting 1: Coast to stop

Setting 2: Emergency Stop (uses the Emergency Stop ramp set to C1-09)

Setting 3: Alarm only

Note: Due to potential damage to motor and machinery, the “Alarm only” setting should be used only under special circumstances.

■ F1-03, F1-08, F1-09: Overspeed (oS) Operation Selection, Detection Level, Delay Time

An overspeed error (oS) is triggered when the speed feedback exceeds the value set in F1-08 for longer than the time set in F1-09. The stopping method when an overspeed fault occurs can be selected in parameter F1-03.

No.	Parameter Name	Setting Range	Default
F1-03	Operation Selection at Overspeed (oS)	0 to 3	1
F1-08	Overspeed Detection Level	0 to 120%	115%
F1-09	Overspeed Detection Delay Time	0.0 to 2.0 s	0.0 s

Parameter F1-03 Settings:

Setting 0: Ramp to stop (uses the deceleration ramp set to C1-02)

Setting 1: Coast to stop

Setting 2: Emergency Stop (uses the Emergency Stop ramp set to C1-09)

Setting 3: Alarm only

Note: Due to potential damage to motor and machinery, the “Alarm only” setting should be used only under special circumstances.

■ F1-04, F1-10, F1-11: Operation at Speed Deviation (dEv), Detection Level, Delay Time

A speed deviation error (dEv) is triggered when the difference between the speed reference and the speed feedback exceeds the value set in F1-10 for longer than the time set in F1-11. The stopping method when a speed deviation fault occurs can be selected in parameter F1-04.

No.	Parameter Name	Setting Range	Default
F1-04	Operation Selection at Deviation	0 to 3	Determined by A1-02
F1-10	Excessive Speed Deviation Detection Level	0 to 50%	10%
F1-11	Excessive Speed Deviation Detection Delay Time	0.0 to 10.0 s	0.5 s

Settings for Parameter F1-04:**Setting 0: Ramp to stop (uses the deceleration ramp set to C1-02)****Setting 1: Coast to stop****Setting 2: Emergency Stop (uses the Emergency Stop ramp set to C1-09)****Setting 3: Alarm only (drive continues operating while “dE_u” flashes on the screen)****■ F1-05: Encoder 1 Rotation Direction Selection**

Determines the direction indicated by the motor encoder signal.

Refer to [Encoder Setup on page 91](#) for details on how to set the direction for the encoder and the motor.

No.	Parameter Name	Setting Range	Default
F1-05	Encoder 1 Rotation Direction Selection	0 or 1	Determined by A1-02

Setting 0: Phase A leads phase B with an Up command.**Setting 1: Phase B leads phase A with an Up command.****■ F1-06: PG1 Pulse Monitor Output Division Ratio**

Sets the ratio between the pulse input and the pulse output of a speed feedback option card as a three digit number, where the first digit (n) sets the numerator and the second and third digit (m) set the denominator as shown below:

$$f_{\text{Pulse Input}} = f_{\text{Pulse Output}} \cdot \frac{(1 + n)}{m}$$

Example: To have a ratio of 1/32 between the speed feedback option card pulse input and output, set F1-06 = 032.

No.	Parameter Name	Setting Range	Default
F1-06	PG1 Pulse Monitor Output Division Ratio	1 to 132 (1 to $\frac{1}{32}$)	1

■ F1-18: dv3 Detection Selection (CLV/PM)

A dv3 situation is detected when the torque reference and speed reference are in opposite directions while the difference between the actual motor speed and the speed reference is greater than 30%. Parameter F1-18 sets the number of times such a situation must occur before a dv3 fault is triggered. Setting F1-18 to 0 disables dv3 detection.

No.	Parameter Name	Setting Range	Default
F1-18	dv3 Detection Selection	0 to 10	10

Note: A common cause for a dv3 fault is the incorrect setting of E5-11. Make sure the correct encoder offset has been entered to E5-11.**■ F1-19: dv4 Detection Selection (CLV/PM)**

A dv4 fault is triggered when there is a motor speed deviation opposite to the speed reference and larger than the number of pulses set in F1-19. Setting F1-19 to 0 disables dv4 detection.

No.	Parameter Name	Setting Range	Default
F1-19	dv4 Detection Selection	0 to 5000	128

Note: A common cause for a dv4 fault is the incorrect setting of E5-11. Make sure the correct encoder offset is set to E5-11.**■ F1-20: PG Option Card Disconnect Detection 1**

Sets whether the drive detects a fault or not when a speed feedback card is disconnected.

No.	Parameter Name	Setting Range	Default
F1-20	PG Option Card Disconnect Detect 1	0 or 1	1

Setting 0: Disabled**Setting 1: Enabled**

5.6 F: Option Settings

■ F1-29: dEv Detection Condition Selection

Selects when dEv error detection is active.

No.	Parameter Name	Setting Range	Default
F1-29	dEv Detection Condition Selection	0 to 2	2

Setting 0: After speed reference, SFS output and motor speed have matched once.

Setting 1: After speed reference, SFS output have matched once.

Setting 2: Always during Run.

■ F1-51: PGoH Detection Level

Sets the level for detecting PG Hardware Fault (PGoH).

Usually the relation between the sin and cos track is $\sqrt{\sin^2\theta + \cos^2\theta} = 1$. If the value of the square root falls below the the level set in F1-51, a speed feedback hardware fault is detected. Available when F1-20 = 1.

No.	Parameter Name	Setting Range	Default
F1-51	PGoH Detection Level	1 to 100%	80%

■ F1-63: PG-E3 R Track Selection

Enables or disables the R phase when a PG-E3 option card is used.

No.	Parameter Name	Setting Range	Default
F1-63	PG-E3 R Track Selection	0, 1	0

0: Disabled

The R track is not used. The rotor magnet position is calculated from the C and D track signal only.

1: Enabled

The R track signals are used to determine the rotor magnet position.

◆ F3: Digital Input Card Settings

These parameters set up the drive for operation with the option card DI-A3. This section describes parameters that govern operation with a digital input option card. Refer to the instruction manual packaged with the option card for specific details on installation, wiring, input signal level selection, and parameter setup.

■ F3-01: DI-A3 Option Card Input Selection

Determines the type of input for digital option card DI-A3 when o1-03 is set to 0 or 1.

No.	Parameter Name	Setting Range	Default
F3-01	DI-A3 Option Card Input Selection	0 to 7	0

Setting 0: BCD, 1% units

Setting 1: BCD, 0.1% units

Setting 2: BCD, 0.01% units

Setting 3: BCD, 1 Hz units

Setting 4: BCD, 0.1 Hz units

Setting 5: BCD, 0.01 Hz units

Setting 6: BCD, special setting (5 digit input), 0.02 Hz units

Setting 7: Binary

Note: BCD input when o1-03 = 2 or 3. Units are determined by o1-03.

■ F3-03: DI-A3 Option Card Data Length Selection

Determines the number of bits for the option card input that sets the speed reference.

No.	Parameter Name	Setting Range	Default
F3-03	DI-A3 Option Card Data Length Selection	0 to 2	2

Setting 0: 8 bit

Setting 1: 12 bit

Setting 2: 16 bit

◆ F4: Analog Monitor Card Settings

These parameters set up the drive for operation with the analog output option card AO-A3. This section describes parameters that govern operation with an analog output option card. Refer to the instruction manual packaged with the option card for specific details on installation, wiring, input signal level selection, and parameter setup.

■ F4-01, F4-03: Terminal V1, V2 Function Selection

Selects the data to output from analog terminal V1. Enter the final three digits of U□-□□ to determine which monitor data is output from the option card. Some monitors are only available in certain control modes.

No.	Parameter Name	Setting Range	Default
F4-01	Terminal V1 Function Selection	000 to 999	102
F4-03	Terminal V2 Function Selection	000 to 999	103

■ F4-02, F4-04, F4-05, F4-06: Terminal V1, V2 Gain and Bias

Parameters F4-02 and F4-04 determine the gain, while parameters F4-05 and F4-06 set the bias. These parameters are set as a percentage of the output signal from V1 and V2 where 100% equals 10 V output. The terminal output voltage is limited to 10 V.

No.	Parameter Name	Setting Range	Default
F4-02	Terminal V1 Gain	-999.9 to 999.9%	100.0%
F4-04	Terminal V2 Gain	-999.9 to 999.9%	50.0%
F4-05	Terminal V1 Bias	-999.9 to 999.9%	0.0%
F4-06	Terminal V2 Bias	-999.9 to 999.9%	0.0%

Using Gain and Bias to Adjust Output Signal Level

When viewing the values set to F4-02 or F4-05 on the digital operator, a voltage equal to 100% of the parameter being viewed (including current gain and bias settings) will be output from terminal V1 or V2. When viewing the value set to F4-05 or F4-06, terminal V1 or V2 will output a voltage equal to 0% of the parameter being viewed (including current gain and bias settings).

Example 1: F4-02 = 0%, F4-02 = 80%. When the parameter setting display for F4-02 is accessed using the digital operator, terminal V1 will output a voltage of 8 V, even when the drive is stopped.

Example 2: F4-03 = 5%. When the parameter setting display for F4-03 is accessed using the digital operator, terminal V1 will output a voltage of 0.5 V, even when the drive is stopped.

■ F4-07, F4-08: Terminal V1, V2 Signal Level Selection

Sets the output signal level for terminals V1 and V2.

No.	Parameter Name	Setting Range	Default
F4-07	Terminal V1 Signal Level Selection	0, 1	1
F4-08	Terminal V2 Signal Level Selection	0, 1	1

Setting 0: 0 to 10 V

Setting 1: -10 to 10 V

5.6 F: Option Settings

◆ F5: Digital Output Card Settings

These parameters set up the drive for operation with the digital output option card DO-A3. This section describes parameters that govern operation with a digital output option card. Refer to the instruction manual packaged with the option card for specific details on installation, wiring, input signal level selection, and parameter setup.

■ F5-01 through F5-08: Digital Output Option Card Terminal Function Selection

When F5-09 = 2, the parameters listed in the table below are used to assign functions to the output terminals on the option card.

No.	Name	Setting Range	Default
F5-01	Terminal P1-PC Output Selection	0 to 161	0: During run
F5-02	Terminal P2-PC Output Selection	0 to 161	1: Zero speed
F5-03	Terminal P3-PC Output Selection	0 to 161	2: Speed agree
F5-04	Terminal P4-PC Output Selection	0 to 161	4: Speed detection 1
F5-05	Terminal P5-PC Output Selection	0 to 161	6: Drive ready
F5-06	Terminal P6-PC Output Selection	0 to 161	37: During frequency output
F5-07	Terminal M1-M2 Output Selection	0 to 161	F: Not used
F5-08	Terminal M3-M4 Output Selection	0 to 161	F: Not used

■ F5-09: DO-A3 Output Mode Selection

Determines how the DO-A3 option card is to work with the drive.

No.	Parameter Name	Setting Range	Default
F5-09	DO-A3 Output Mode Selection	0 to 2	0

Setting 0: Separate output functions for each of 8 terminals

Setting 1: Binary output

Setting 2: Output functions assigned by F5-01 through F5-08

◆ F6: Communication Option Card

These parameters are to configure communication option cards and communication fault detection methods.

■ F6-01: Operation Selection after Communications Error

Determines drive operation if a communication error (bUS) occurs.

No.	Parameter Name	Setting Range	Default
F6-01	Operation Selection after Communications Error	0 to 3	1

Setting 0: Ramp to stop (uses the deceleration ramp set to C1-02)

Setting 1: Coast to stop

Setting 2: Emergency Stop (uses the Emergency Stop ramp set to C1-09)

Setting 3: Alarm only (continue operation)

■ F6-02: External Fault from Communication Option Detection Selection

Determines the detection method of an external fault (EF0) initiated by a communication option card.

No.	Parameter Name	Setting Range	Default
F6-02	External Fault from Communication Option Detection Selection	0 or 1	0

Setting 0: Always detected

Setting 1: Detection during run only

■ F6-03: External Fault from Communication Option Operation Selection

Determines the operation when an external fault (EF0) is initiated by a communication option card.

No.	Parameter Name	Setting Range	Default
F6-03	External Fault from Communication Option Operation Selection	0 to 3	1

Setting 0: Ramp to stop (uses the deceleration ramp set to C1-02)

Setting 1: Coast to stop

Setting 2: Emergency Stop (uses the Emergency Stop ramp set to C1-09)

Setting 3: Alarm only (continue operation)

■ F6-04: bUS Error Detection Time

Sets the delay time for “bUS” error detection.

No.	Parameter Name	Setting Range	Default
F6-04	bUS Error Detection Time	0.0 to 5.0 s	2.0 s

■ F6-06: Torque Limit Selection from Communications Option

Used to select if the torque limit can be set to the drive from the network.

No.	Parameter Name	Setting Range	Default
F6-06	Torque Limit Selection from Communications Option	0, 1	0

Setting 0: Disabled

Setting 1: Enabled

■ F6-08: Reset Communication Parameters

Determines whether communication-related parameters (F6-□□) are reset when the drive is initialized using parameter A1-03.

No.	Parameter Name	Setting Range	Default
F6-08	Reset Communication Parameters	0, 1	0

Setting 0: Do not reset parameters F6-□□ when the drive is initialized with A1-03

Setting 1: Reset F6-□□ when the drive is initialized with A1-03

Note: F6-08 is not reset when the drive is initialized, but does determine whether initializing the drive with A1-03 resets the other communication parameters, F6-□□.

◆ CANopen Parameters

Parameters F6-35 and F6-36 set up the drive to operate on a CANopen network.

For details on parameter settings, refer to the CANopen Option Card (SI-S3) Installation Manual and Technical Manual.

5.7 H: Terminal Functions

H parameters are used to assign functions to the external terminals.

◆ H1: Multi-Function Digital Inputs

■ H1-03 to H1-08: Functions for Terminals S3 to S8

These parameters assign functions to the multi-function digital inputs. The various functions and their settings are listed below in [Table 5.7](#).

No.	Parameter Name	Setting Range	Default
H1-03	Terminal S3 Function Selection	3 to 79	Determined by d1-18 <1>
H1-04	Terminal S4 Function Selection	3 to 79	
H1-05	Terminal S5 Function Selection	3 to 79	
H1-06	Terminal S6 Function Selection	3 to 79	
H1-07	Terminal S7 Function Selection	3 to 79	
H1-08	Terminal S8 Function Selection	3 to 79	F: Through Mode

<1> 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, 13, 3, 4, and 5 respectively. When d1-18 is set to 1 or 2, the default settings for H1-03 to H1-7 become 50, 54, 51, 53, and F respectively.

Table 5.7 Multi-Function Digital Input Terminal Settings

Setting	Function	Page	Setting	Function	Page
3	Multi-Step Speed Reference 1	166	20 to 2F	External Fault	167
4	Multi-Step Speed Reference 2		50	Nominal Speed	168
5	Multi-Step Speed Reference 3		51	Intermediate Speed	168
7	Accel/decel Ramp Selection 1	166	52	Releveling Speed	168
8	Baseblock Command (N.O.)	166	53	Leveling Speed	168
9	Baseblock Command (N.C.)		54	Inspection Operation	168
F	Not used (Through Mode)	166	55	Rescue Operation	168
14	Fault Reset	167	56	Motor Contactor Feedback	168
15	Emergency Stop (N.O.)	167	57	High Speed Limit Up	168
17	Emergency Stop (N.C.)	167	58	High Speed Limit Down	168
18	Timer Function Input	167	67	Communications Test Mode	169
1A	Accel/decel Ramp Selection 2	167	79	Brake Feedback	169

Setting 3 to 5: Multi-Step Speed Reference 1 to 3

Used to switch multi-step speed references d1-01 to d1-08 by digital inputs. Refer to [Speed Selection Using Digital Inputs \(b1-01 = 0\) on page 105](#).

Setting 7: Accel/decel ramp selection 1

Used to switch between accel/decel ramps 1 (C1-01 and C1-02) and 2 (C1-03 and C1-04). Refer to [C1-01 to C1-08: Accel, Decel Ramps 1 to 4 on page 142](#) for details.

Setting 8, 9: Baseblock command (N.O., N.C.)

When the drive receives a Baseblock command, the output transistor stop switching and the motor coasts to stop. During this time, the alarm “ bb ” will flash on the digital operator to indicate baseblock.

Digital Input Function	Drive Operation	
	Input Open	Input Closed
Setting 8 (N.C.)	Baseblock (Interrupt output)	Normal operation
Setting 9 (N.O.)	Normal operation	Baseblock (Interrupt output)

NOTICE: Because a Baseblock command shuts off output from the drive, a proper sequence must be set up so that the brake applies properly prior to interrupting drive output. Failing to do so can cause the motor to suddenly coast when the Baseblock command is entered, causing rollback, or the car to fall.

Setting F: Not used (Through mode)

Select this setting when using the terminal in a pass-through mode. When set to F, an input does not trigger any function in the drive. Setting F, however, still allows the input status to be read out by a PLC via a communication option or MEMOBUS/Modbus communications.

Setting 14: Fault reset

Whenever the drive detects a fault condition, the fault output contact will close and the drive's output will shut off. The motor then coasts to stop (specific stopping methods can be selected for some faults such as L1-04 for motor overheat). Once the Up/Down command is removed, the fault can be cleared by either the RESET key on the digital operator or by closing a digital input configured as a Fault Reset (H1-□□ = 14).

Note: Fault Reset commands are ignored as long as the Up/Down command is present. To reset a fault, first remove the Up/Down command.

Setting 15, 17: Emergency Stop (N.O., N.C.)

If an Emergency Stop command is input while the drive is running, the drive will decelerate to a stop by the deceleration ramp set to C1-09 (Refer to [C1-09: Emergency Stop Ramp on page 143](#)). The drive can only be restarted after it has come to a complete stop, the Emergency Stop input is off, and the Up/Down command has been switched off.

- To trigger the Emergency Stop function with a N.O. switch, set H1-□□ = 15.
- To trigger the Emergency Stop function with a N.C. switch, set H1-□□ = 17.

[Figure 5.13](#) shows an operation example of Emergency Stop.

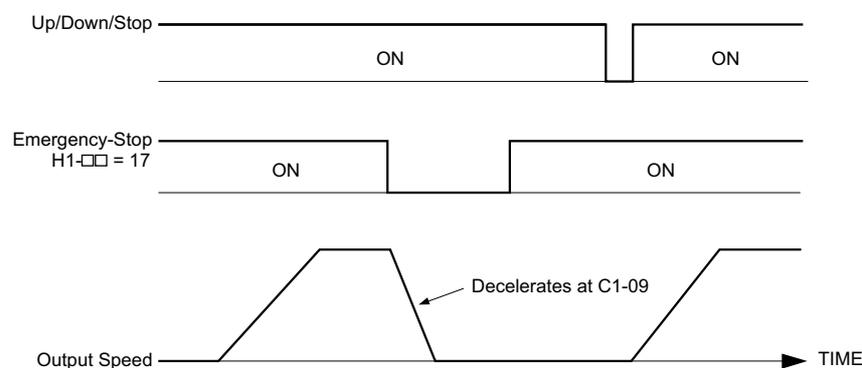


Figure 5.13 Emergency Stop Sequence

NOTICE: Rapid deceleration can trigger an overvoltage fault. When faulted, the drive output shuts off, and the motor coasts. To avoid this uncontrolled motor state and to ensure that the motor stops quickly and safely, set an appropriate Emergency Stop time to C1-09.

Setting 18: Timer function input

This setting configures a digital input terminal as the input for the timer function. Use this setting combination with the timer function output (H2-□□ = 12). Refer to [b4: Delay Timers on page 139](#) for details.

Setting 1A: Accel/decel ramp selection 2

Used to select accel/decel ramps 1 to 4 in combination with the Accel/decel ramp selection 1 command. Refer to [C1-01 to C1-08: Accel, Decel Ramps 1 to 4 on page 142](#) for details.

Setting 20 to 2F: External fault

By using the External fault command, the drive can be stopped when problems occur with external devices.

To use the External fault command, set one of the multi-function digital inputs to any value between 20 to 2F. The digital operator will display EF□ where □ is the number of the terminal to which the external fault signal is assigned.

For example, if an external fault signal is input to terminal S3, “EF3” will be displayed.

Select the value to be set in H1-□□ from a combination of any of the following three conditions:

- Signal input level from peripheral devices (N.O., N.C.)
- External fault detection method
- Operation after external fault detection

5.7 H: Terminal Functions

The following table shows the relationship between the conditions and the value set to H1-□□:

Setting	Terminal Status <1>		Detection Conditions <2>		Stopping Method			
	N.O.	N.C.	Always Detected	Detected during Run only	Ramp to Stop (fault)	Coast to Stop (fault)	Emergency Stop (fault)	Alarm Only (continue running)
20	0		0		0			
21		0	0		0			
22	0			0	0			
23		0		0	0			
24	0		0			0		
25		0	0			0		
26	0			0		0		
27		0		0		0		
28	0		0				0	
29		0	0				0	
2A	0			0			0	
2B		0		0			0	
2C	0		0					0
2D		0	0					0
2E	0			0				0
2F		0		0				0

<1> Determines the terminal status for each fault, i.e., whether the terminal is normally open or normally closed.

<2> Determines whether detection for each fault should be enabled only during run or always detected.

Setting 50: Nominal speed

Closing a terminal set for “Nominal speed” makes the drive run at the speed reference set to d1-19. Conditions change, however, according to the speed selection mode set in d1-18. For further explanation, see [Multi-Speed Inputs 1, 2 \(d1-18 = 0 or 3\) on page 106](#).

Setting 51: Intermediate speed

Closing a terminal set for “Intermediate speed” makes the drive run at the speed reference set to d1-20. This setting can also be used in combination with other input terminals set for 50 (Nominal speed) and 52 (Releveling speed) to switch between the speed reference set in d1-21 and d1-22. Conditions change, however, according to the speed selection mode set in d1-18. For further explanation, see [Multi-Speed Inputs 1, 2 \(d1-18 = 0 or 3\) on page 106](#).

Setting 52: Releveling speed

Closing a terminal set for “Releveling speed” makes the drive run at the speed reference set to d1-23. Conditions change, however, according to the speed selection mode set in d1-18. For further explanation, see [Multi-Speed Inputs 1, 2 \(d1-18 = 0 or 3\) on page 106](#).

Setting 53: Leveling speed

Closing a terminal set for “Leveling speed” makes the drive run at the speed reference set to d1-26. Conditions change, however, according to the speed selection mode set in d1-18. For further explanation, see [Multi-Speed Inputs 1, 2 \(d1-18 = 0 or 3\) on page 106](#).

Setting 54: Inspection operation

Causes the drive to operate at the speed reference set in d1-24. To use Inspection Run, this terminal must be close before the Up or Down command is entered. For further explanation, see [Inspection Operation on page 108](#).

Setting 55: Rescue operation

Initiates Rescue Operation when the terminal closes. For further explanation, see [Rescue Operation on page 113](#).

Setting 56: Motor contactor feedback

Can be used as monitoring input for the motor contactor and allows the drive to detect contactor malfunction.

Setting 57: High speed limit up

When this input is closed the speed in up direction will be limited to the leveling speed. No speed limit is applied when the car is going down.

Setting 58: High speed limit down

When this input is closed the speed in down direction will be limited to the leveling speed. No speed limit is applied when the car is going up.

Setting 67: Communication test mode

The drive has a built-in function for self-diagnosing serial communications operation. The test involves wiring the send and receive terminals of the RS-485/422 port together. The drive transmits data and then confirms that the communications are received normally. Refer to *Self-Diagnostics on page 367* for details on how to use this function.

Setting 79: Brake feedback

This input allows the drive to monitor the brake operation and issue a fault if the brake status does not match the brake command (digital output set to H2-□□ =50).

◆ H2: Multi-Function Digital Outputs**■ H2-01 to H2-05: Terminals M1-M2, M3-M4, M5-M6, P1-PC, and P1-P2 Function Selection**

The drive has three multi-function output terminals. *Table 5.8* lists the functions available for these terminals using H2-01 through H2-05.

No.	Parameter Name	Setting Range	Default
H2-01	Terminals M1-M2 Function Selection	0 to 161	50: Brake control
H2-02	Terminals M3-M4 Function Selection	0 to 161	51: Output control contactor
H2-03	Terminals M5-M6 Function Selection	0 to 161	6: Drive ready
H2-04	Terminals P1-C1 Function Selection (photocoupler)	0 to 161	37: During frequency output
H2-05	Terminals P2-C2 Function Selection (photocoupler)	0 to 161	F: Through Mode

Table 5.8 Multi-Function Digital Output Terminal Settings

Setting	Function	Page	Setting	Function	Page
0	During Run	169	1A	During Reverse	174
1	Zero Speed	169	1B	During Baseblock 2 (N.C.)	175
2	Speed Agree 1	170	1D	During Regeneration	175
3	User-set Speed Agree 1	170	1E	Restart Enabled	175
4	Speed Detection 1	170	1F	Motor Overload Alarm (oL1)	175
5	Speed Detection 2	171	20	Drive Overheat Pre-alarm (oH)	175
6	Drive Ready	171	2F	Maintenance Period	175
7	DC Bus Undervoltage	171	30	During Torque Limit	175
8	During Baseblock (N.O.)	172	33	Within Position Lock Bandwidth	175
9	Speed Reference Source	172	37	During Frequency Output	175
A	Up/Down Command Source	172	50	Brake Control	176
B	Torque Detection 1	172	51	Output Contactor Control	176
E	Fault	172	52	Door Zone Reached	176
F	Not used (Through Mode)	172	53	Not Zero Speed	176
10	Minor Fault	172	54	Light Load Direction	176
11	Fault Reset Command Active	172	55	Light Load Direction Detection Status	176
12	Timer Output	172	56	Cooling Fan Status	176
13	Speed Agree 2	173	57	Input Phase Loss	176
14	User-set Speed Agree 2	173	58	Safe Disable Status	176
15	Speed Detection 3	173	61	Motor Pole Search Status	176
16	Speed Detection 4	174	100 to 161	Functions 0 to 61 with Inverse Output	177
18	Torque Detection 2	172			

Setting 0: During Run

Output closes when the drive is outputting a voltage.

Status	Description
Open	Drive is stopped.
Closed	An Up/Down command is input or the drive is during deceleration or during DC injection.

Setting 1: Zero Speed

Terminal closes whenever the output speed or motor speed (CLV, CLV/PM) falls below the minimum output speed set to E1-09 or S1-01.

Status	Description
Open	Output speed is above the minimum output frequency set to E1-09 or S1-01
Closed	Output speed is less than the minimum output frequency set to E1-09 or S1-01

5.7 H: Terminal Functions

Note: When using CLV or CLV/PM control modes, the zero speed level is defined by S1-01. In all other control modes, the zero speed level is the minimum output speed set to E1-09.

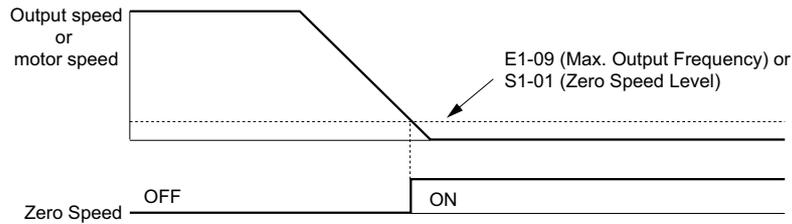


Figure 5.14 Zero-Speed Time Chart

Setting 2: Speed agree 1 (f_{ref}/f_{out} Agree 1)

Closes whenever the actual output speed (CLV, CLV/PM) is within the Speed Agree Width (L4-02) of the current speed reference regardless of the direction.

Status	Description
Open	Output speed or motor speed does not match the speed reference while the drive is running.
Closed	Output speed or motor speed is within the range of speed reference $\pm L4-02$.

Note: Detection works in both directions, forward and reverse.

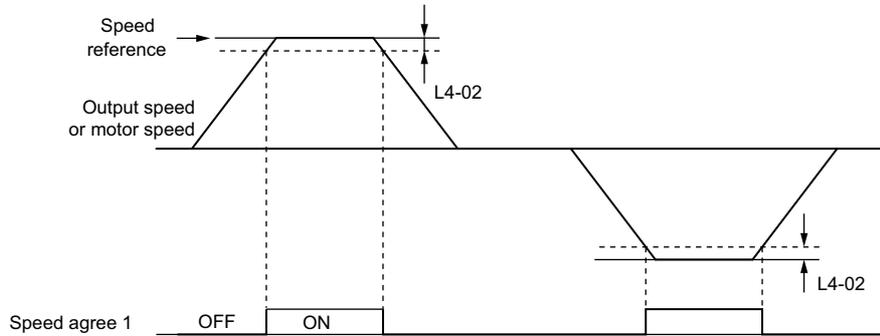


Figure 5.15 Speed Agree 1 Time Chart

Refer to [L4-01, L4-02: Speed Agreement Detection Level and Detection Width on page 186](#) for more details.

Setting 3: User-set speed agree 1 (f_{ref}/f_{set} Agree 1)

Closes whenever the actual output speed or motor speed (CLV, CLV/PM) and the speed reference are within the speed agree width (L4-02) of the programmed speed agree level (L4-01).

Status	Description
Open	Output speed or motor speed and the speed reference are not both within the range of $L4-01 \pm L4-02$.
Closed	Output speed or motor speed and the speed reference are both within the range of $L4-01 \pm L4-02$.

Note: Detection works in both forward and reverse. The value of L4-01 is used as the detection level for both directions.

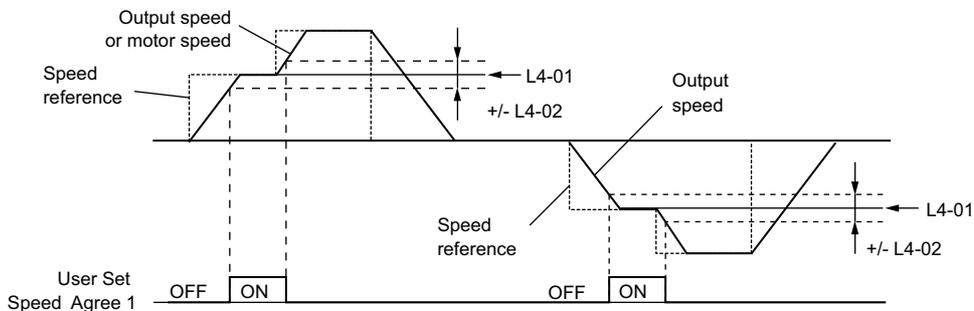


Figure 5.16 User Set Speed Agree 1 Time Chart

Refer to [L4-01, L4-02: Speed Agreement Detection Level and Detection Width on page 186](#) for more instructions.

Setting 4: Speed Detection 1

Output opens when the output speed (CLV, CLV/PM) rises above the detection level set in L4-01 plus the detection width set in L4-02. The terminal remains open until the output speed falls below the level set in L4-01.

Status	Description
Open	Output speed or motor speed exceeded $L4-01 + L4-02$.
Closed	Output speed or motor speed is below $L4-01$ or has not exceeded $L4-01 + L4-02$.

Note: Detection works in both forward and reverse. The value of L4-01 is used as the detection level for both directions.

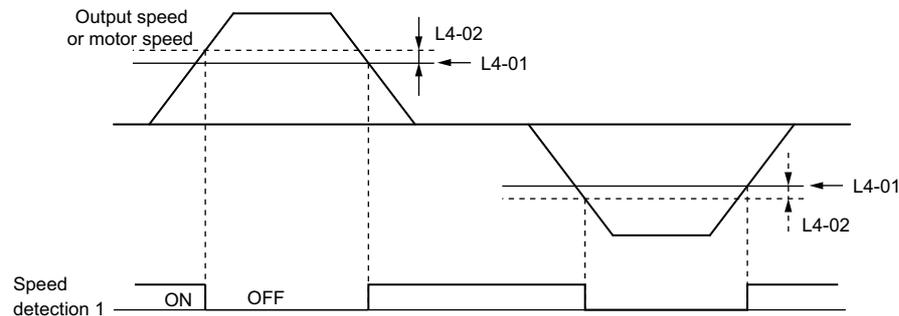


Figure 5.17 Speed Detection 1 Time Chart

Refer to [L4-01, L4-02: Speed Agreement Detection Level and Detection Width on page 186](#) for more details.

Setting 5: Speed Detection 2

Output closes whenever the output speed or motor speed (CLV, CLV/PM) is above the detection level set in L4-01. The terminal remains closed until the output speed or motor speed falls below $L4-01$ minus the setting of L4-02.

Status	Description
Open	Output speed or motor speed is below $L4-01$ minus $L4-02$ or has not exceeded $L4-01$.
Closed	Output speed or motor speed exceeded $L4-01$.

Note: Detection works in both forward and reverse. The value of L4-01 is used as the detection level for both directions.

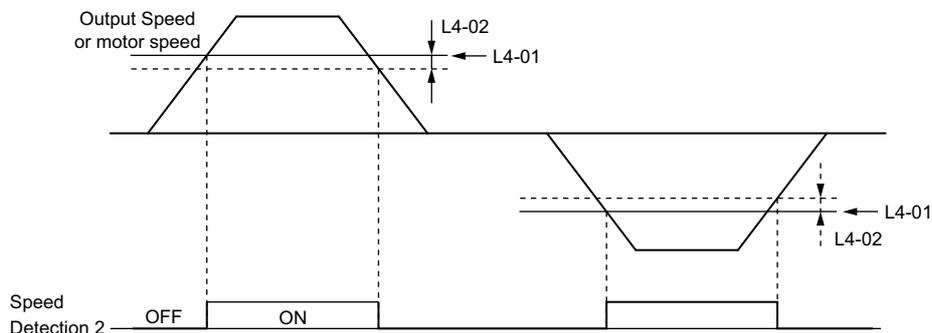


Figure 5.18 Speed Detection 2 Time Chart

Refer to [L4-01, L4-02: Speed Agreement Detection Level and Detection Width on page 186](#) for more details.

Setting 6: Drive ready

Output closes whenever the drive is ready to operate the motor. The terminal will not close under the conditions listed below, and any Up/Down commands will be disregarded.

- When the power is shut off
- During a fault
- When the drive's internal power supply has malfunctioned
- When a parameter setting error makes it impossible to run
- Although stopped, an overvoltage or undervoltage situation occurs
- While editing a parameter in the Programming Mode (when $b1-08 = 0$)
- When parameter $L8-88 = 0$ and at least one Safe Disable input is open

Setting 7: DC bus undervoltage

Output closes whenever the DC bus voltage or control circuit power supply drops below the trip level set in L2-05. A fault in the DC bus circuit will also cause the terminal to set for "DC bus undervoltage" to close.

5.7 H: Terminal Functions

Status	Description
Open	DC bus voltage is above the level set to L2-05
Closed	DC bus voltage has fallen below the trip level set to L2-05.

Setting 8: During baseblock (N.O.)

Output closes to indicate that the drive is in a baseblock state. While in baseblock, output transistors do not switch and no main circuit voltage is output.

Status	Description
Open	Drive is not in a baseblock state.
Closed	Baseblock is being executed.

Setting 9: Speed reference source

A digital output programmed for this function shows the speed reference source that is currently selected.

Status	Description
Open	Speed reference is provided from External reference 1 (b1-01).
Closed	Speed reference is being sourced from the digital operator.

Setting A: Up/Down command source

A digital output programmed for this function shows the Up/Down command source that is currently selected.

Status	Description
Open	Up/Down command is provided from External reference 1 (b1-02).
Closed	Up/Down command is being sourced from the digital operator.

Setting B, 18: Torque detection 1, Torque detection 2

These digital output functions can be used to signal an overtorque or undertorque situation to an external device.

Set up the torque detection levels and select the output function from the table below. Refer to [L6: Torque Detection on page 189](#) for details.

Setting	Status	Description
B	Closed	Torque detection 1 : Output current/torque exceeds (overtorque detection) or is below (undertorque detection) the torque value set in parameter L6-02 for longer than the time specified in parameter L6-03.
18	Closed	Torque detection 2 : Output current/torque exceeds (overtorque detection) or is below (undertorque detection) the torque value set in parameter L6-05 for longer than the time specified in parameter L6-06.

Setting E: Fault

The digital output will close whenever the drive experiences a fault (this excludes faults CPF00 and CPF01).

Setting F: Not used (Through mode)

Select this setting when using the terminal in a pass-through mode. When set to F, an output does not trigger any function in the drive. Setting F, however, still allows the output status to be read by a PLC via a communication option or MEMOBUS/Modbus communications.

Setting 10: Minor fault

Output closes when a minor fault condition is present.

Setting 11: Fault reset command active

Output closes whenever there is an attempt to reset a fault situation from the control circuit terminals, via serial communications, or using a communications option card.

Setting 12: Timer output

This setting configures a digital output terminal as output for the timer function. Refer to [b4: Delay Timers on page 139](#) for details.

Setting 13: Speed agree 2 (f_{ref}/f_{out} agree 2)

Closes whenever the actual output speed or motor speed (CLV, CLV/PM) is within the speed agree width (L4-04) of the current speed reference, regardless of the direction.

Status	Description
Open	Output speed or motor speed does not match the speed reference while the drive is running.
Closed	Output speed or motor speed is within the range of speed reference $\pm L4-04$.

Note: Detection works in both forward and reverse.

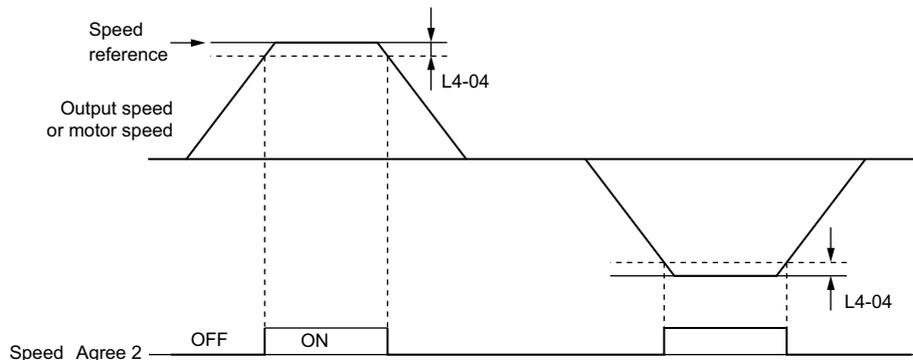


Figure 5.19 Speed Agree 2 Time Chart

Refer to [L4-03, L4-04: Speed Agreement Detection Level and Detection Width \(+/-\)](#) on page 187 for more details.

Setting 14: User-set speed agree 2 (f_{ref}/f_{set} agree 2)

Closes whenever the actual output speed or motor speed (CLV, CLV/PM) and the speed reference are within the speed agree width (L4-04) of the programmed speed agree level (L4-03). As the detection level L4-03 is a signed value, detection works in the specified direction only.

Status	Description
Open	Output speed or motor speed and speed reference are both outside the range of $L4-03 \pm L4-04$
Closed	Output speed or motor speed and the speed reference are both within the range of $L4-03 \pm L4-04$

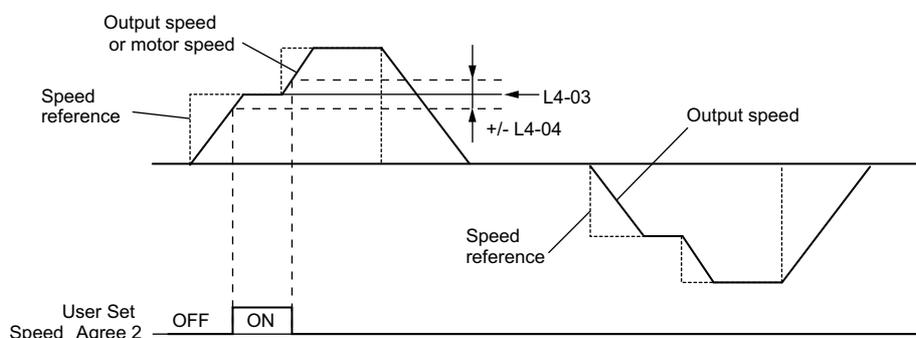


Figure 5.20 User Set Speed Agree 2 Example with a Positive L3-04 Value

Refer to [L4-03, L4-04: Speed Agreement Detection Level and Detection Width \(+/-\)](#) on page 187 for more details.

Setting 15: Speed detection 3

Output opens when the output speed or motor speed (CLV, CLV/PM) rises above the detection level set in L4-03 plus the detection width set in L4-04. The terminal remains open until the output speed or motor speed falls below the level set in L4-03. As the detection level L4-03 is a signed value, the detection works in the specified direction only.

Status	Description
Open	Output speed or motor speed exceeded $L4-03$ plus $L4-04$.
Closed	Output speed or motor speed is below $L4-03$ or has not exceeded $L4-03$ plus $L4-04$ yet.

5.7 H: Terminal Functions

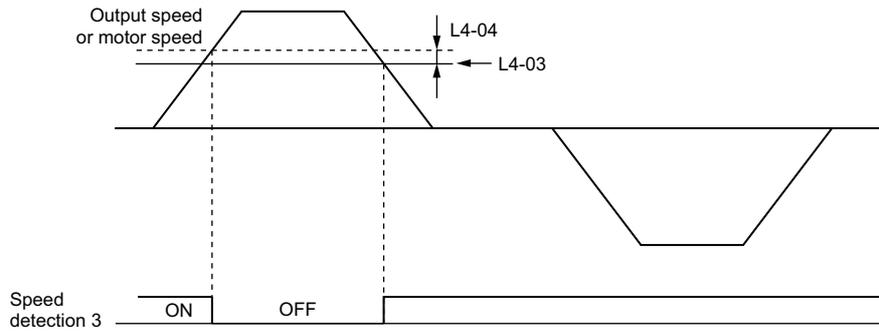


Figure 5.21 Speed Detection 3 Example with a Positive L3-04 Value

Refer to [L4-03, L4-04: Speed Agreement Detection Level and Detection Width \(+/-\) on page 187](#) for more details.

Setting 16: Speed detection 4

Output closes whenever the output speed or motor speed (CLV, CLV/PM) is above the detection level set in L4-03. The terminal remains closed until the output speed or motor speed falls below L4-03 minus the setting of L4-04. As the detection level L4-03 is a signed value, speed detection works in the specified direction only.

Status	Description
Open	Output speed or motor speed is below L4-03 minus L4-04 or has not exceeded L4-03 yet.
Closed	Output speed or motor speed exceeded L4-03.

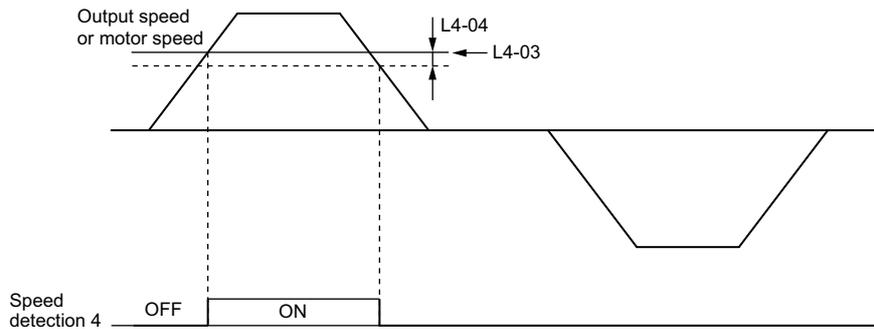


Figure 5.22 Speed Detection 4 Example with Positive L3-04 Value

Refer to [L4-03, L4-04: Speed Agreement Detection Level and Detection Width \(+/-\) on page 187](#) for more details.

Setting 1A: During down direction

A digital output set for “During down direction” will close whenever the drive is running the elevator in down direction.

Status	Description
Open	Elevator is being driven in up direction or stopped.
Closed	Elevator is being driven in down direction.

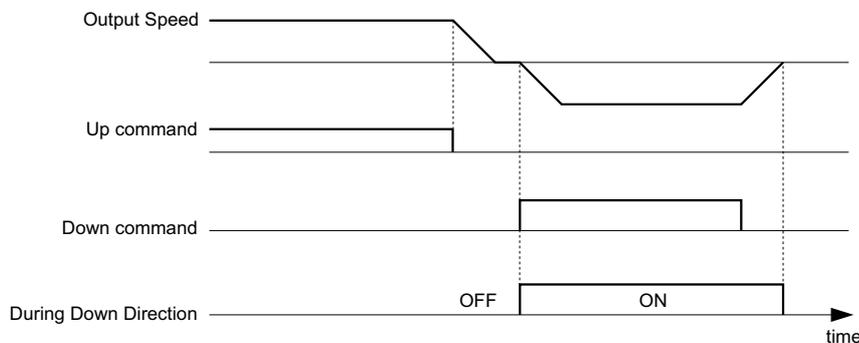


Figure 5.23 Down Direction Output Example Time Chart

Setting 1B: During baseblock (N.C.)

Output opens to indicate that the drive is in a baseblock state. While Baseblock is executed, output transistors do not switch and no main circuit voltage is output.

Status	Description
Open	Baseblock is being executed.
Closed	Drive is not in a baseblock state.

Setting 1D: During regeneration

Terminal closes when the motor is driven in the regenerative mode.

Setting 1E: Restart enabled

An output set for “Restart enabled” closes once the drive begins attempting to restart after a fault has occurred.

The fault restart function allows the drive to automatically clear a fault. The terminal set to 1E will close after the fault is cleared and the drive has begun attempting to restart. If the drive cannot successfully restart within the number of attempts permitted by L5-01, then a fault will be triggered and the terminal set to 1E will open. Refer to [L5: Fault Restart on page 188](#) for details on automatic restart.

Setting 1F: Motor overload alarm (oL1)

An output programmed for this function will close when the motor overload level estimated by the oL1 fault detection exceeds 90% of the oL1 detection level. Refer to [L1-01: Motor Overload Protection Selection on page 182](#).

Setting 20: Drive overhear pre-alarm (oH)

Output closes whenever the drive heatsink temperature reaches the level specified by parameter L8-02. Refer to [L8-02: Overheat Alarm Level on page 191](#) for details on drive overheat detection.

Setting 2F: Maintenance period

Output closes when the cooling fan, DC bus capacitors, or DC bus pre-charge relay may require maintenance as determined by the estimated performance life span of those components. Components performance life is displayed as a percentage on the digital operator screen. Refer to [Periodic Maintenance on page 261](#).

Setting 30: During torque limit

Output closes when the motor is operating at the torque limit specified by the L7-□□ parameters or an analog input. This setting can only be used in OLV, CLV and CLV/PM control modes. Refer to [L7-01 to L7-04: Torque Limits on page 191](#) for details.

Setting 33: Within position lock bandwidth

Output closes when the motor rotor position is within the position lock bandwidth (S3-04) during position lock at start or stop.

Setting 37: During frequency output

Output closes when the drive is outputting a frequency.

Status	Description
Open	Drive is stopped or one of the following functions is being performed: baseblock, DC Injection Braking, Short Circuit Braking.
Closed	Drive is outputting frequency.

5.7 H: Terminal Functions

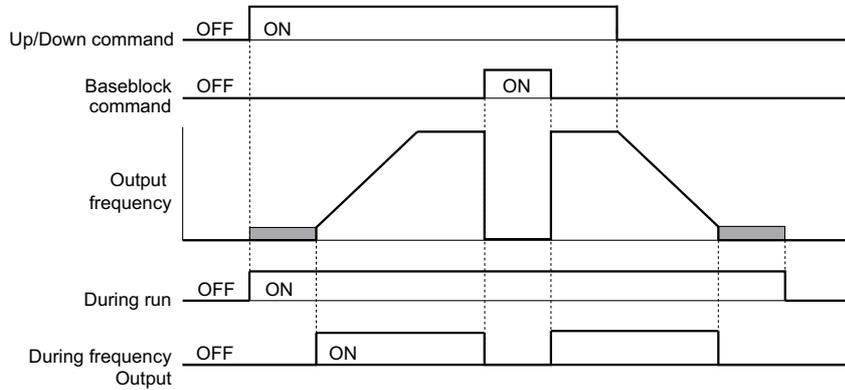


Figure 5.24 During Frequency Output Time Chart

Setting 50: Brake control

This setting can be used in the brake sequence for the elevator application. Closing the output terminal should cause the brake to release, and opening the terminal should apply the brake. For instructions, see [Brake Sequence on page 109](#).

Setting 51: Output contactor control

Assigning this command to an output terminal can send a signal to the controller to close the output contactor. The output contactor should open when the terminal is released.

Setting 52: Door zone reached

Terminal closes to indicate that the door zone speed level (L4-13) has been reached, and that controller should open the car door.

Setting 53: Not zero speed

Output closes as long as the drive is not operating at the zero speed level. Terminal opens when zero speed is reached.

Setting 54: Light load direction

Indicates the light load direction detected during emergency operation with light load search. When the terminal is closed the light load direction is up, when it is open the light load direction is down. Also refer to [Light Load Direction Search Function on page 124](#).

Setting 55: Light load direction detection status

This terminal is open during Light Load Direction Search. When the search function is complete, the terminal closes. Also refer to [Light Load Direction Search Function on page 124](#).

Setting 56: Cooling fan status

This terminal closes whenever the cooling fan is operating. If the cooling fan is shut off, the terminal opens.

Setting 57: Input phase loss

This terminal closes when input phase loss is detected.

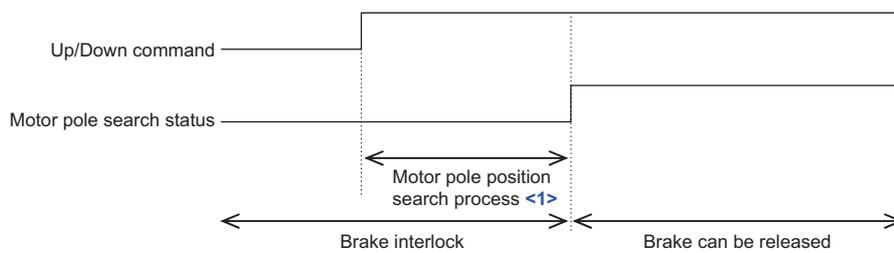
Setting 58: Safe disable status

This terminal closes if either of the Safe Disable inputs H1-HC or H2-HC are released and closes when both terminals H1 and H2 are closed.

Setting 61: Motor pole search status

This terminal closes when the Initial Motor Pole Position Search has been finished. [Refer to Initial Rotor Pole Position Search Settings on page 200](#) for details on Motor Pole Position Search.

It should be used in applications where the motor speed feedback is supplied from a non-absolute encoder (e.g. incremental) and where the drives brake sequence is not utilized. In this case the external brake sequence should be designed to interlock the brake as long as Motor Pole Position Search has not finished without any error.



<1> Takes 0.5 to 5.0 s depending on the Motor Pole Position Search method selected in n8-35 and if Motor Pole Search Error detection in parameter n8-86 is enabled or not.

Setting 100 to 161: Functions 0 to 61 with inverse output

These settings have the same function as settings 0 to 61 but with inverse output. Set as 1□□, where the “1” indicates inverse output and the last two digits specify the setting number of the function.

Examples:

- For inverse output of “8: During baseblock”, set 108.

◆ H3: Multi-Function Analog Inputs

The drive is equipped with two multi-function analog input terminals: A1 and A2. See [Table 5.9](#) for a listing of the functions that can be set to these terminals.

■ H3-01: Terminal A1 Signal Level Selection

Selects the input signal level for analog input A1.

No.	Name	Setting Range	Default
H3-01	Terminal A1 Signal Level Selection	0 or 1	0

Setting 0: 0 to 10 Vdc

The input level is 0 to 10 Vdc. The minimum input level is limited to 0%, so that a negative input signal due to gain and bias settings will be simply read as 0%.

Setting 1: –10 to 10 Vdc

The input level is –10 to 10 Vdc. If the resulting voltage is negative after being adjusted by gain and bias settings, then the motor will rotate in reverse.

■ H3-02: Terminal A1 Function Selection

Selects the input signal level for analog input A1. Refer to [Multi-Function Analog Input Terminal Settings on page 179](#) for instructions on how to adjust the signal level.

No.	Name	Setting Range	Default
H3-02	Terminal A1 Function Selection	0 to 1F	0

■ H3-03, H3-04: Terminal A1 Gain and Bias Settings

Parameter H3-03 sets the level of the selected input value that is equal to 10 Vdc input at terminal A1 (gain).

Parameter H3-04 sets the level of the selected input value that is equal to 0 V input at terminal A1 (bias).

Both can be used to adjust the characteristics of the analog input signal to terminal A1.

No.	Name	Setting Range	Default
H3-03	Terminal A1 Gain Setting	-999.9 to 999.9%	100.0%
H3-04	Terminal A1 Bias Setting	-999.9 to 999.9%	0.0%

5.7 H: Terminal Functions

Setting Examples

- Gain H3-03 = 200%, bias H3-04 = 0, terminal A1 as speed reference input (H3-02 = 0):

An input 10 Vdc will be equivalent to a 200% speed reference and 5 Vdc will be equivalent to a 100% speed reference. Since the drive output is limited by the maximum frequency parameter (E1-04), the speed reference will be equal to E1-04 above 5 Vdc.

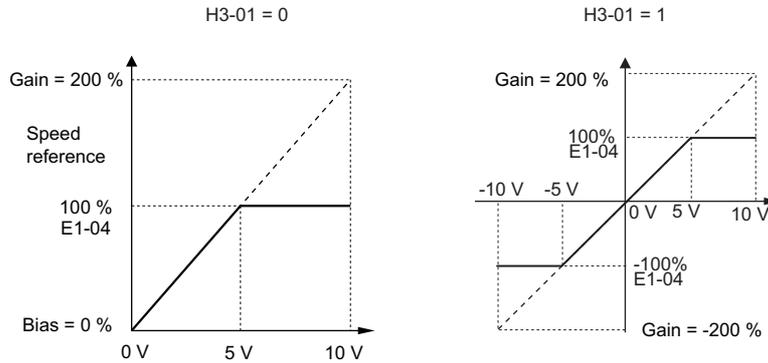


Figure 5.25 Speed Reference Setting by Analog Input with Increased Gain

- Gain H3-03 = 100%, bias H3-04 = -25%, terminal A1 as speed reference input:

An input of 0 Vdc will be equivalent to a -25% speed reference.

When parameter H3-01 = 0, the speed reference is 0% between 0 and 2 Vdc input.

When parameter H3-01 = 1, the motor will rotate in reverse between -10 and 2 Vdc input.

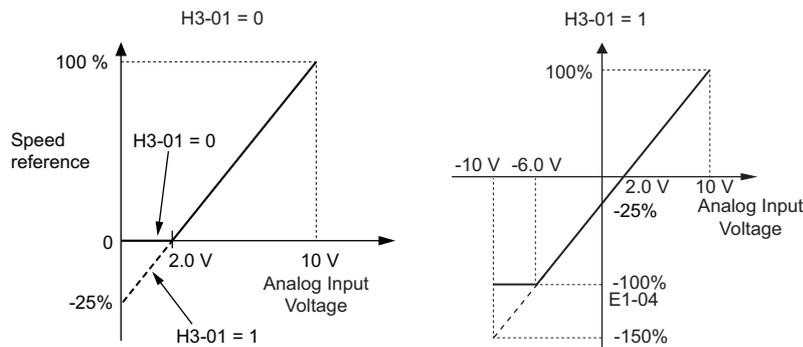


Figure 5.26 Speed Reference Setting by Analog Input with Negative Bias

■ H3-09: Terminal A2 Signal Level Selection

Selects the input signal level for analog input A2.

No.	Name	Setting Range	Default
H3-09	Terminal A2 Signal Level Selection	0 or 1	0

Setting 0: 0 to 10 Vdc

The input level is 0 to 10 Vdc. Refer to [Setting 0: 0 to 10 Vdc on page 177](#)

Setting 1: -10 to 10 Vdc

The input level is -10 to 10 Vdc. Refer to [Setting 1: -10 to 10 Vdc on page 177](#).

■ H3-10: Terminal A2 Function Selection

Determines the function assigned to analog input terminal A2. Refer to [Multi-Function Analog Input Terminal Settings on page 179](#) for a list of functions and descriptions.

No.	Name	Setting Range	Default
H3-10	Terminal A2 Function Selection	0 to 1F	1F

■ H3-11, H3-12: Terminal A2 Gain and Bias Setting

Parameter H3-11 sets the level of the input value selected that is equal to 10 Vdc input to terminal A2.

Parameter H3-12 sets the level of the input value selected that is equal to 0 V at terminal A2.

Both can be used to adjust the characteristics of the analog input signal to terminal A2. The settings work in the same way as parameters H3-03 and H3-04 for analog input A1.

No.	Name	Setting Range	Default
H3-11	Terminal A2 Gain Setting	-999.9 to 999.9%	100.0%
H3-12	Terminal A2 Bias Setting	-999.9 to 999.9%	0.0%

■ H3-13: Analog Input Filter Time Constant

Parameter H3-13 sets the time constant for a first order filter that will be applied to the analog inputs.

An analog input filter can be used to prevent erratic drive control when a “noisy” analog reference is used. The drive operation becomes more stable the longer the time programmed, but it becomes less responsive to rapidly changing analog signals.

No.	Name	Setting Range	Default
H3-13	Analog Input Filter Time Constant	0.00 to 2.00 s	0.03 s

■ H3-16/H3-17: Offset for Terminal A1/A2

Parameters H3-16 and H3-17 set the offset applied analog input values from terminals A1 and A2.

Although adjustment is rarely required, these parameters can be used for zero adjustment of the analog inputs.

No.	Name	Setting Range	Default
H3-16	Offset for Terminal A1	-500 to 500	0
H3-17	Offset for Terminal A2	-500 to 500	0

■ Multi-Function Analog Input Terminal Settings

See [Table 5.9](#) for information on how H3-02 and H3-10 determine functions for terminals A1 and A2.

Note: The scaling of all input functions depends on the gain and bias settings for the analog inputs. Set these to appropriate values when selecting and adjusting analog input functions.

Table 5.9 Multi-Function Analog Input Terminal Settings

Setting	Function	Page
0	Speed reference bias	179
2	Auxiliary speed reference 1 (used as a second speed reference)	179
3	Auxiliary speed reference 2 (used as a third speed reference)	180
14	Torque compensation (load cell input)	180
1F	Not used (through mode)	180

Setting 0: Speed reference bias

The input value of an analog input set to this function will be added to the analog speed reference value. When the speed reference is supplied by a different source other than the analog inputs, this function will have no effect. Use this setting also when only one of the analog inputs is used to supply the speed reference.

By default, analog inputs A1 and A2 are set for this function. Using A1 and A2 at the same time increases the speed reference by the total of all inputs.

Example: If the analog speed reference from analog input terminal A1 is 50% and a bias of 20% is applied by analog input terminal A2, the resulting speed reference will be 70% of the maximum output speed.

Setting 2: Auxiliary speed reference 1 (used as a second speed reference)

Sets the auxiliary speed reference 1 when multi-step speed operation is selected. Refer to [Speed Selection Using Digital Inputs \(b1-01 = 0\) on page 105](#) for details.

5.7 H: Terminal Functions

Setting 3: Auxiliary speed reference 2 (used as a third speed reference)

Sets the auxiliary speed reference 2 when multi-step speed operation is selected. Refer to [Speed Selection Using Digital Inputs \(b1-01 = 0\) on page 105](#) for details.

Setting 14: Torque compensation (load cell input)

This selection allows an analog signal to the input terminal adjust the amount of torque compensation to handle and unbalance at start when elevators sensors indicate that a large load has been added to the car. This helps to minimize shock and jerking at start. Setting 14 requires an analog signal from a load sensor. For more information on torque compensation, see [Adjusting the Torque Compensation at Start on page 111](#).

Setting 1F: Not used (Through mode)

When set to 1F, an input does not affect any drive function, but the input level can still be read out by a PLC via a communication option or MEMOBUS/Modbus communications.

◆ H4: Multi-Function Analog Outputs

These parameters assign functions to analog output terminals FM and AM for monitoring a specific aspect of drive performance.

■ H4-01, H4-04: Terminal FM, AM Monitor Selection

Sets the desired drive monitor parameter U□-□□ to output as an analog value via terminal FM and AM. Refer to [U: Monitor Parameters on page 219](#) for a list of all monitors. The “Analog Output Level” column indicates if a monitor can be used for analog output.

Example: Enter “103” for U1-03.

No.	Name	Setting Range	Default
H4-01	Terminal FM Monitor Selection	000 to 999	102
H4-04	Terminal AM Monitor Selection	000 to 999	103

A setting of 031 or 000 applies no drive monitor to the analog output. With this setting, terminal functions as well as FM and AM output levels can be set by a PLC via a communication option or MEMOBUS/Modbus (through mode).

■ H4-02, H4-03: Multi-Function Analog Output Terminal FM Gain and Bias H4-05, H4-06: Terminal AM Gain and Bias

Parameter H4-02 and H4-05 set the terminal FM and AM output signal level equal to 100% of the monitor (gain). Parameter H4-03 and H4-06 set the bias added to the monitor output for terminals FM and AM. Both are set as a percentage, where 100% equals 10 Vdc analog output. The output voltage of both terminals is limited to 10 Vdc.

The output signal range can be selected between 0 to +10 Vdc or -10 to +10 Vdc using parameter H4-07 and H4-08. [Figure 5.27](#) illustrates how gain and bias settings work.

No.	Name	Setting Range	Default
H4-02	Terminal FM Gain	-999.9 to 999.9%	100.0%
H4-03	Terminal FM Bias	-999.9 to 999.9%	0.0%
H4-05	Terminal AM Gain	-999.9 to 999.9%	50.0%
H4-06	Terminal AM Bias	-999.9 to 999.9%	0.0%

Using Gain and Bias to Adjust Output Signal Level

When viewing a gain setting parameter (H4-02 or H4-05) on the digital operator, the analog output will supply a voltage signal equal to 100% of the monitor value (including changes made from bias and gain settings). When viewing a bias setting parameter (H4-03 or H4-06), the analog output voltage will supply a signal equal to 0% monitor value (including changes made from bias and gain settings).

Example 1: To have an output signal of 5 V at terminal FM when the monitored value is at 100%, set H4-02 to 50%.

Example 2: To have an output signal of 10 V at terminal FM when the monitored value is at 76.7%, set H4-02 to 150%.

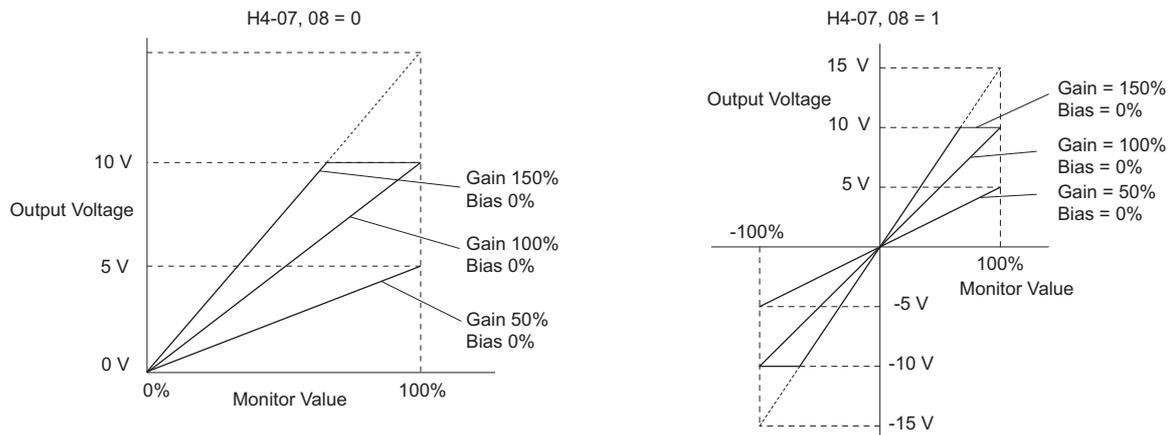


Figure 5.27 Analog Output Gain and Bias Setting Example 1 and 2

Example 3: To have an output signal of 3 V at terminal FM when the monitored value is at 0%, set H4-03 to 30%.

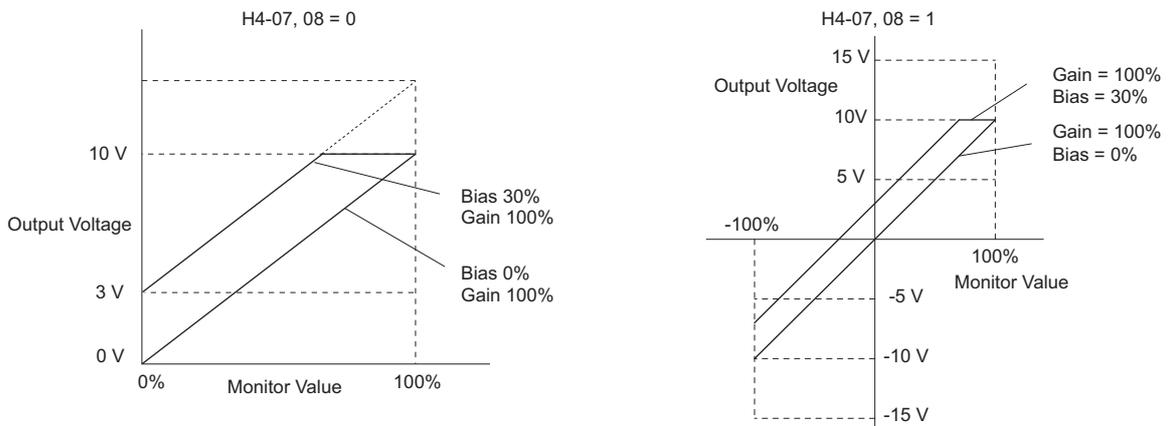


Figure 5.28 Analog Output Gain and Bias Setting Example 3

■ H4-07, H4-08: Terminal FM, AM Signal Level Selection

Sets the voltage output level of U parameter (monitor parameter) data to terminal FM and terminal AM using parameters H4-07 and H4-08.

No.	Name	Setting Range	Default
H4-07	Terminal FM Signal Level Selection	0 or 1	0
H4-08	Terminal AM Signal Level Selection	0 or 1	0

Setting 0: 0 to 10 V

Setting 1: -10 V to 10 V

◆ H5: MEMOBUS/Modbus Serial Communication

Through the drives built in RS-422/485 port (terminals R+, R-, S+, S-), serial communication is possible using programmable logic controllers (PLCs) or similar devices running the MEMOBUS/Modbus protocol.

The H5-□□ parameters are used to set up the drive for MEMOBUS/Modbus Communications. Refer to [MEMOBUS/Modbus Communications on page 341](#) for detailed descriptions of the H5-□□ parameters.

5.8 L: Protection Functions

◆ L1: Motor Protection

■ L1-01: Motor Overload Protection Selection

The drive has an electronic overload protection function that estimates the motor overload level based on output current, output speed, thermal motor characteristics, and time. An oL1 fault will be triggered when motor overload is detected and drive output will be shut off.

L1-01 sets the overload protection function characteristics according to the motor being used.

No.	Name	Setting Range	Default
L1-01	Motor Overload Protection Selection	0 to 3 or 5	Determined by A1-02

- Note:**
1. When the motor protection function is enabled (L1-01 ≠ 0), an oL1 alarm can be output through one of the multi-function outputs by setting H2-01 to 1F. The output will close when the motor overload level reaches 90% of the oL1 detection level.
 2. Select a method to protect the motor from overheat by setting L1-01 between 1 and 5 when running a single motor from the drive. An external thermal relay is not needed.

Setting 0: Disabled (motor overload protection is not provided)

This setting should be used if no motor overheat protection is desired.

Setting 1: General-purpose motor (standard self-cooled)

Because the motor is self-cooled, the overload tolerance drops when the motor speed is lowered. The drive appropriately adjusts the electrothermal trigger point according to the motor overload characteristics, protecting the motor from overheat throughout the entire speed range.

Overload Tolerance	Cooling Ability	Overload Characteristics
<p>A: Max. speed for 200LJ and above B: Max. speed for 160MJ to 180 LJ C: Max. speed for 132MJ and below</p>	<p>Motor designed to operate from line power. Motor cooling is most effective when running at rated base frequency (check the motor nameplate or specifications).</p>	<p>Continuous operation at less than line power frequency with 100% load can trigger motor overload protection (oL1). A fault is output and the motor will coast to stop.</p>

Setting 2: Drive dedicated motor (speed range for constant torque: 1:10)

Use this setting when operating a drive duty motor that allows constant torque in a speed range of 1:10. The drive will allow the motor to run with 100% load from 10% up to 100% speed. Running at slower speeds with full load can trigger an overload fault.

Overload Tolerance	Cooling Ability	Overload Characteristics
	<p>Motor is designed to effectively cool itself even at low speeds.</p>	<p>Continuous operation with 100% load from 5 Hz to 50 Hz.</p>

Setting 3: Vector motor (speed range for constant torque: 1:100)

Use this setting when operating a drive-dedicated motor that allows constant torque in a speed range of 1:100. This motor type is allowed to run with 100% load from 1% up to 100% speed. Running slower speeds with full load can trigger an overload fault.

Overload Tolerance	Cooling Ability	Overload Characteristics
	<p>Motor is designed to effectively cool itself at ultra-low speeds.</p>	<p>Continuous operation with 100% load from 0.5 Hz to 50 Hz.</p>

Setting 5: Constant torque PM motors (constant torque range of 1:500)

Sets protection characteristics needed when driving a PM with constant torque. These motors allow for a speed control from 0.2% to 100% when operating with 100% load. Slower speeds with 100% load will trigger overload.

Overload Tolerance	Cooling Ability	Overload Characteristics
	<p>Motor is designed to effectively cool itself at ultra-low speeds (about 0.2% of base speed).</p>	<p>Continuous operation with 100% load from 0.2% to 100% of base speed.</p>

Parameter Details

5

5.8 L: Protection Functions

■ L1-02: Motor Overload Protection Time

Sets the time it takes the drive to detect motor overheat due to overload. This setting rarely requires adjustment, but should correlate with the motor overload tolerance protection time for performing a hot start.

No.	Name	Setting Range	Default
L1-02	Motor Overload Protection Time	0.1 to 5.0 minutes	1.0 minutes

Defaulted to operate with an allowance of 150% overload operation for one minute in a hot start.

Figure 5.29 shows an example of the electrothermal protection operation time using a general-purpose motor operating at 50 Hz with L1-02 set to one minute.

During normal operation, motor overload protection operates in the area between a cold start and a hot start.

- Cold start: Motor protection operation time in response to an overload situation that was suddenly reached when starting a stationary motor.
- Hot start: Motor protection operation time in response to an overload situation that occurred during sustained operation at rated current.

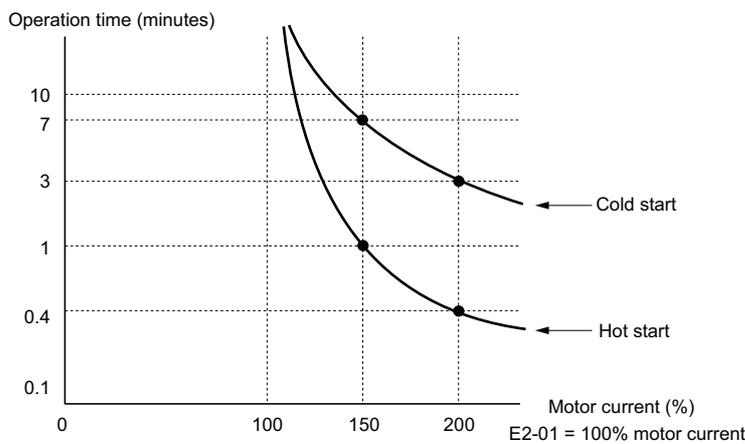


Figure 5.29 Motor Protection Operation Time

■ L1-13: Continuous Electrothermal Operation Selection

Determines whether or not to hold the current value of the electrothermal motor protection (L1-01) when the power supply is interrupted.

No.	Name	Setting Range	Default
L1-13	Continuous Electrothermal Operation Selection	0 or 1	1

Setting 0: Disabled

Setting 1: Enabled

◆ L2: Undervoltage Detection

■ L2-05: Undervoltage Detection Level (Uv)

Determines the voltage at which a Uv1 fault is triggered. This setting rarely needs to be changed.

No.	Name	Setting Range	Default
L2-05 <I>	Undervoltage Detection Level	150 to 210 Vdc	Determined by E1-01

<I> Values are for 200 V class drives and must be doubled for 400 V class drives.

Note: When setting L2-05 below the default value, an AC reactor option should be installed to the input side of the power supply to prevent damage to drive circuitry.

◆ L3: Stall Prevention

When the load is too heavy or acceleration ramps are too short, the motor may be unable to keep up with the speed reference, resulting in excessive slip. During acceleration, this usually causes an overcurrent (oC), drive overload (oL2), or motor overload (oL1). The drive can prevent the motor from stalling and still reach the desired speed without the user needing to change the acceleration or deceleration ramp settings. The Stall Prevention function can be set separately for acceleration, operating at constant speeds, and deceleration.

■ L3-01: Stall Prevention Selection during Acceleration

Stall Prevention during acceleration (L3-01) prevents tripping with overcurrent (oC), motor overload (oL1), or drive overload (oL2) faults common when accelerating with heavy loads.

L3-01 determines the type of Stall Prevention the drive should use during acceleration.

No.	Name	Setting Range	Default
L3-01	Stall Prevention Selection during Acceleration	0 to 2	1

Setting 0: Disabled

No Stall Prevention is provided. If the acceleration ramp is too short, the drive may not be able to get the motor up to speed fast enough, thus tripping an overload fault.

Setting 1: Enabled

Enables Stall Prevention during acceleration.

If the output current rises above the Stall Prevention level set in L3-02, then the drive stops accelerating. Acceleration will not resume until the output current falls 15% below the setting in L3-02.

The Stall Prevention level is automatically reduced in the constant power range.

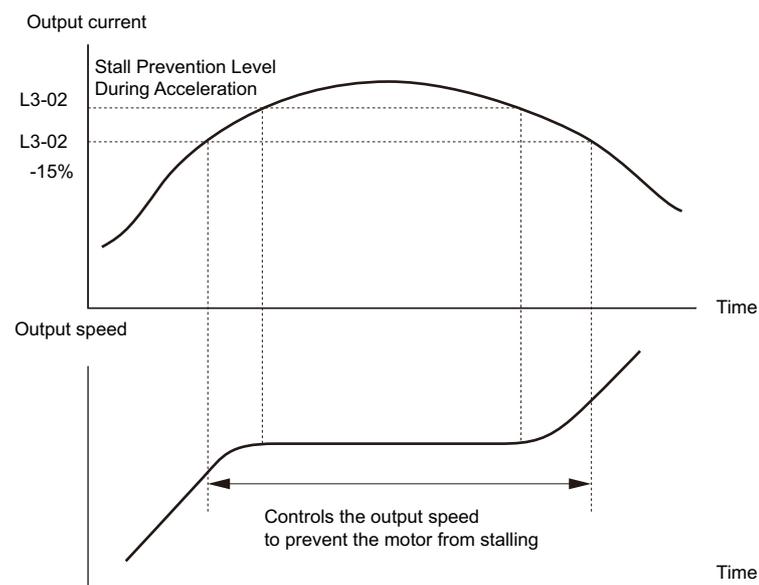


Figure 5.30 Stall Prevention During Acceleration for Induction Motors

Setting 2: Intelligent Stall Prevention

When L3-02 = 2, the drive will disregard the selected acceleration ramp and try to accelerate in the minimum time. The acceleration rate is adjusted so that the current does not exceed the value set in parameter L3-02.

5.8 L: Protection Functions

■ L3-02: Stall Prevention Level during Acceleration

Sets the output current level at which the Stall Prevention during acceleration is activated.

No.	Name	Setting Range	Default
L3-02	Stall Prevention Level during Acceleration	0 to 150% </>	</>

<1> The upper limit and default value are determined by the carrier frequency reduction (L8-38).

- Stalling may occur when the motor is rated at a smaller capacity than the drive and the Stall Prevention default settings are used. Set L3-02 as appropriate if stalling occurs.
- When operating the motor in the constant power range, also set parameter L3-03.

■ L3-05: Stall Prevention Selection during Run

Stall Prevention during run can prevent a motor from stalling by automatically reducing the speed when a transient overload occurs while the motor is running at constant speed.

This parameter determines how Stall Prevention works during run.

No.	Name	Setting Range	Default
L3-05	Stall Prevention Selection during Run	0 to 2	1

Note: 1. This function is available in V/f control mode.

2. When output speed is 6 Hz or less, Stall Prevention during run is disabled regardless of the setting in L3-05 and L3-06.

Setting 0: Disabled

Drive runs at the set speed reference. A heavy load may cause the motor to stall and trip the drive with an oC or oL fault.

Setting 1: Decelerate using C1-02

If the current exceeds the Stall Prevention level set in parameter L3-06, then the drive will decelerate at decel ramp 1 (C1-02). Once the current level drops below the value of L3-06 minus 2% for 100 ms, the drive accelerates back to the speed reference at the active acceleration ramp.

Setting 2: Decelerate using C1-04

Same as setting 1 except the drive decelerates at decel ramp 2 (C1-04).

■ L3-06: Stall Prevention Level during Run

Sets the Stall Prevention level during run as a percentage of the drive rate output current.

No.	Name	Setting Range	Default
L3-06	Stall Prevention Level during Run	30 to 150% </>	</>

<1> The upper limit and default for this setting is determined by L8-38.

◆ L4: Speed Detection

These parameters set up the speed agree and speed detection functions which can be assigned to the multi-function output terminals.

■ L4-01, L4-02: Speed Agreement Detection Level and Detection Width

Parameter L4-01 sets the detection level for the digital output functions “Speed agree 1,” “User-set speed agree 1,” “Speed detection 1,” and “Speed detection 2.”

Parameter L4-02 sets the hysteresis level for these functions.

No.	Name	Setting Range	Default
L4-01	Speed Agreement Detection Level	0.0 to 100.0%	0.0%
L4-02	Speed Agreement Detection Width	0.0 to 40.0%	4.0%

For details on setting 2, 3, 4, and 5, refer to [H2-01 to H2-05: Terminals M1-M2, M3-M4, M5-M6, P1-PC, and P1-P2 Function Selection on page 169](#).

■ L4-03, L4-04: Speed Agreement Detection Level and Detection Width (+/-)

Parameter L4-03 sets the detection level for the digital output functions “Speed agree 2,” “User-set speed agree 2,” “Speed detection 3,” and “Speed detection 4.”

Parameter L4-04 sets the hysteresis level for these functions.

No.	Name	Setting Range	Default
L4-03	Speed Agreement Detection Level (+/-)	-100.0 to 100.0%	0.0%
L4-04	Speed Agreement Detection Width (+/-)	0.0 to 40.0%	4.0%

For details on setting 13, 14, 15, and 16, refer to [H2-01 to H2-05: Terminals M1-M2, M3-M4, M5-M6, P1-PC, and P1-P2 Function Selection on page 169](#).

■ L4-05: Speed Reference Loss Detection Selection

The drive can detect a loss of an analog speed reference from input A1 and A2. Speed reference loss is detected when the speed reference drops below 10% of the reference before or below 5% of the maximum output speed within 400 ms.

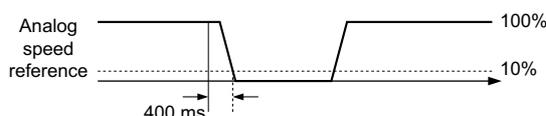


Figure 5.31 Loss of Reference Function

Parameter L4-05 selects the operation when a speed reference loss is detected.

No.	Name	Setting Range	Default
L4-05	Speed Reference Loss Detection Selection	0 or 1	0

Setting 0: Stop

Drive follows the speed reference (which is no longer present) and simply stops the motor.

Setting 1: Continue operation with reduced speed reference

The drive will continue operation at the speed reference value set in parameter L4-06. When the external speed reference value is restored, the operation is continued with the speed reference.

■ L4-06: Speed Reference at Reference Loss

Sets the speed reference level the drive runs with when L4-05 = 1 and a reference loss was detected. The value is set as a percentage of the speed reference before the loss was detected.

No.	Name	Setting Range	Default
L4-06	Speed Reference at Reference Loss	0.0 to 100.0%	80.0%

■ L4-13: Door Zone Level

Sets the speed level for the car door to open. Once the car slows to the speed set in L4-13, a multi-function output terminal set for “Door zone reached” will close (H2-□□ = 52).

No.	Name	Setting Range	Default
L4-13	Door Zone Level	0.0 to 100.0%	0.0%

◆ L5: Fault Restart

This function allows the drive to attempt to restart after a fault occurs in order to keep the application running. If a fault occurs during run, drive output is shut off and self-diagnostics begin. If the fault is deemed to be safe to continue running, then the drive resets itself and starts back up again.

DANGER! Some applications may not be safe to restart automatically following a fault. The fault restart function should not be enabled in such applications.

Faults Allowing for Automatic Restart

The drive attempts to restart itself after one of the faults listed below has occurred. All other faults will need to be reset externally.

Fault	Name	Fault	Name
GF	Ground Fault	oL4	Overtorque Detection 2
LF	Output Phase Loss	ov	DC Bus Overvoltage
oC	Overcurrent	PF	Input Phase Loss
oL1	Motor Overload	rr	Braking Transistor Fault
oL2	Drive Overload	UL3	Undertorque Detection 1
oL3	Overtorque Detection 1	UL4	Undertorque Detection 2

Fault Restart Time Chart

Parameter L5-01 sets the number of times the drive can attempt to restart itself after on of the faults in the table above occurs. The time chart below illustrates how fault restart works.

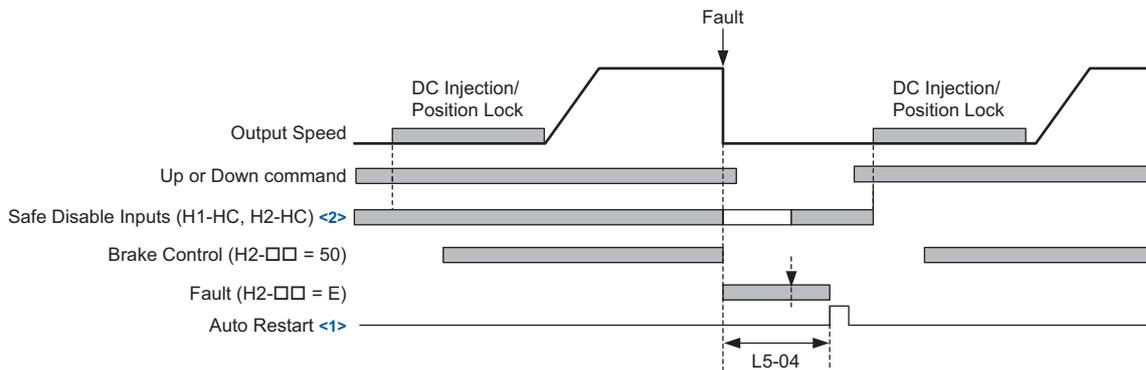


Figure 5.32 Fault Restart Time Chart

- <1> The drive will accept an auto restart signal once the Up and Down commands have been removed.
- <2> Software baseblock (H1-□□ = 8, or 9) can also be used instead of Safe Disable inputs

Use parameters L5-04 and L5-06 to set up automatic fault restart.

To output a signal during fault restart, set one of the output terminals to "Restart enabled" (H2-□□ = 1E).

■ L5-01: Number of Auto Restart Attempts

Sets the number of times that the drive may attempt to restart itself.

The drive will continuously attempt to restart. If it restarts successfully, the restart counter is increased. This operation is repeated each time a fault occurs.

When the counter reaches the number set in L5-01, the operation stops and the fault has to be reset manually after correcting the cause.

The number of fault restarts is reset back to zero when:

- The drive operates normally for ten minutes following a fault restart.
- A fault is cleared manually after protective functions are triggered.
- The power supply is cycled.

No.	Name	Setting Range	Default
L5-01	Number of Auto Restart Attempts	0 to 10 Times	0 Time

■ **L5-02: Fault Output Operation during Auto Restart**

Determines if a fault output is triggered (H2-□□ = E) when the drive attempts to restart.

No.	Name	Setting Range	Default
L5-02	Fault Output Operation during Auto Restart	0 or 1	0

Setting 0: No fault output

Setting 1: Fault output is set

■ **L5-04: Fault Reset Interval Time**

Sets a time interval that must pass before another restart attempt can be made. A setting of 0.0 essentially disables this parameter.

No.	Name	Setting Range	Default
L5-04	Fault Reset Interval Time	0.5 to 600.0 s	10.0 s

■ **L5-06: Under Voltage Fault Restart Selection**

Determines whether a limit should be placed on the number of restart attempts after a Uv1 fault.

No.	Name	Setting Range	Default
L5-06	Undervoltage Fault Restart Selection	0 or 1	0

Setting 0: Restrict auto restart attempts to L5-01 after Uv1

Setting 1: No limit on auto-restart attempts after Uv1

◆ **L6: Torque Detection**

The drive provides two independent torque detection functions that trigger an alarm or fault signal when the load is too heavy (oL), or suddenly drops (UL). They are set up using the L6-□□ parameters. To indicate the underload or overload condition to an external device, digital outputs should be programmed as shown below.

Note: When overtorque occurs in the application, the drive may stop due to overcurrent (oC) or overload (oL1). To prevent this, an overload situation should be indicated to the controller before oC or oL1 occur in the drive. Use the torque detection for this purpose.

H2-01 through H2-05 Setting	Description
B	Torque detection 1, N.O. (output closes when overload or underload is detected)
18	Torque detection 2, N.O. (output close when overload or underload is detected)

Figure 5.33 and Figure 5.34 show the function of overtorque and undertorque detection.

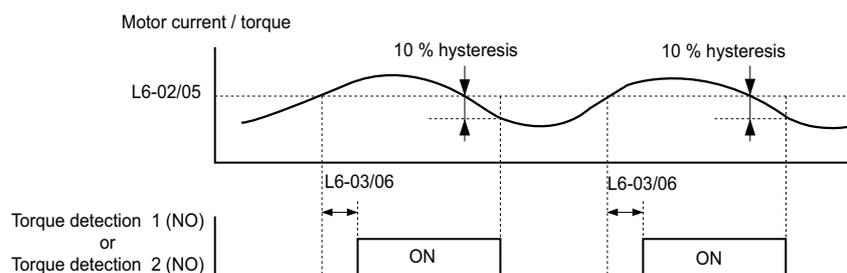


Figure 5.33 Overtorque Detection Operation

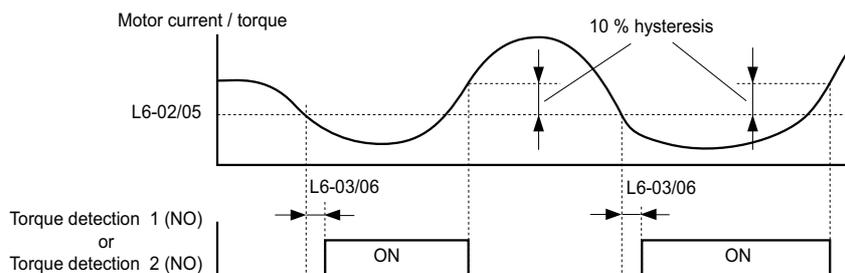


Figure 5.34 Undertorque Detection Operation

- Note:**
1. The torque detection function uses a hysteresis of 10% of the drive rated output current and motor rated torque.
 2. In V/f, the level is set as a percentage of the drive rated output current. In OLV, CLV, and CLV/PM, it is set as a percentage of the motor rated torque.

5.8 L: Protection Functions

■ L6-01, L6-04: Torque Detection Selection 1, 2

The torque detection function is triggered when the current or torque exceeds the levels set in L6-02 and L6-05 for longer than the time set in L6-03 and L6-06. L6-01 and L6-04 select the conditions for detection and the operation that follows.

No.	Name	Setting Range	Default
L6-01	Torque Detection Selection 1	0 to 8	0
L6-04	Torque Detection Selection 2	0 to 8	0

Setting 0: Disabled

Setting 1: oL3, oL4 at speed agree (alarm)

Overtorque detection is active only when the output speed is equal to the speed reference, i.e., no detection during acceleration and deceleration. The operation continues after detection and an oL3/oL4 alarm is triggered.

Setting 2: oL3, oL4 at run (alarm)

Overtorque detection works as long as the Up/Down command is active. The operation continues after detection and an oL3 or oL4 alarm is triggered.

Setting 3: oL3, oL4 at speed agree (fault)

Overtorque detection is active only when the output speed is equal to the speed reference, i.e., no detection during acceleration and deceleration. The operation is stopped and an oL3 or oL4 fault is triggered.

Setting 4: oL3, oL4 at run (fault)

Overtorque detection works as long as a Up/Down command is active. Operation stops and an oL3 or oL4 fault is triggered.

Setting 5: UL3, UL4 at speed agree (alarm)

Undertorque detection is active only when the output speed is equal to the speed reference, i.e., no detection during acceleration and deceleration. The operation continues after detection and an oL3 or oL4 alarm is triggered.

Setting 6: UL3, UL4 at run (alarm)

Undertorque detection works as long as the Up/Down command is active. The operation continues after detection and an oL3 or oL4 alarm is triggered.

Setting 7: UL3, UL4 at speed agree (fault)

Undertorque detection is active only when the output speed is equal to the speed reference, i.e., no detection during acceleration and deceleration. The operation is stopped and an oL3 or oL4 fault is triggered.

Setting 8: UL3, UL4 at run (fault)

Undertorque detection works as long as a Up/Down command is active. Operation stops and an oL3 or oL4 fault is triggered.

■ L6-02, L6-05: Torque Detection Level 1, 2

These parameters set the detection levels for the torque detection functions 1 and 2. In V/f control mode these levels are set as a percentage of the drive rated output current, while in vector control modes these levels are set as a percentage of the motor rated torque.

No.	Name	Setting Range	Default
L6-02	Torque Detection Level 1	0 to 300%	150%
L6-05	Torque Detection Level 2	0 to 300%	150%

■ L6-03, L6-06: Torque Detection Time 1, 2

These parameters determine the time required to trigger an alarm or fault after exceeding the levels in L6-02 and L6-05.

No.	Name	Setting Range	Default
L6-03	Torque Detection Time 1	0.0 to 10.0 s	0.1 s
L6-06	Torque Detection Time 2	0.0 to 10.0 s	0.1 s

◆ L7: Torque Limit

The torque limit function can be used to limit the torque in each of the four quadrants individually and thereby protect the elevator. It can be used in vector control modes. The limit can be set by parameters. A digital output programmed for “During torque limit” (H2-01 through H2-05 = 30) will be switched when the drive is operating at the torque limit.

■ Setting Torque Limits

The torque limits are defined by parameters L7-01 to L7-04 for each of the four operation quadrants. *Figure 5.35* shows which of the limit settings is applied in each quadrant.

Note: The maximum output torque is ultimately limited by the drive output current. Output torque will not exceed the limit set for the drive rated current, even if the torque limits are set to higher values.

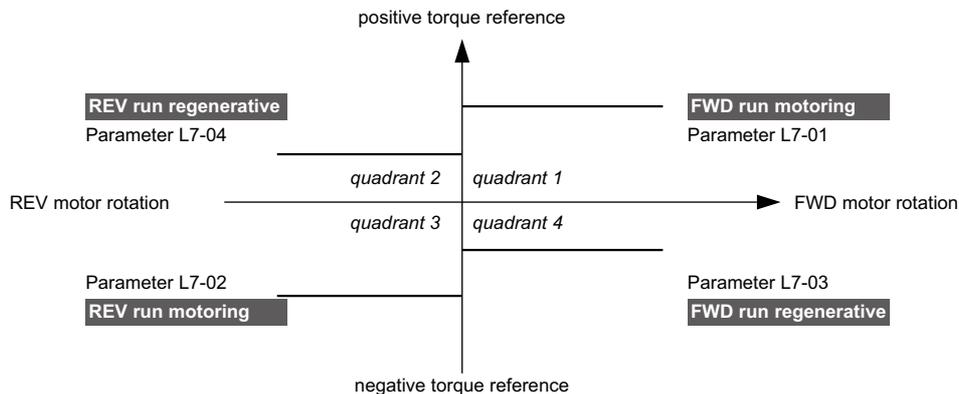


Figure 5.35 Torque Limit Parameters

■ L7-01 to L7-04: Torque Limits

These parameters set the torque limits in each operation mode.

No.	Name	Setting Range	Default
L7-01	Forward Torque Limit	0 to 300%	200%
L7-02	Reverse Torque Limit	0 to 300%	200%
L7-03	Forward Regenerative Torque Limit	0 to 300%	200%
L7-04	Reverse Regenerative Torque Limit	0 to 300%	200%

◆ L8: Drive Protection

■ L8-02: Overheat Alarm Level

Sets the overheat alarm (oH) detection level.

The drive will output an alarm when the heatsink temperature exceeds the alarm level set in parameter L8-02.

When an output terminal is set for the oH pre-alarm (H2-□□ = 20), the switch will close when the heatsink temperature rises above L8-02.

No.	Name	Setting Range	Default
L8-02	Overheat Alarm Level	50 to 150 °C	Determined by o2-04

5.8 L: Protection Functions

■ L8-03: Overheat Pre-Alarm Operation Selection

Sets the operation when an overheat pre-alarm is detected.

No.	Name	Setting Range	Default
L8-03	Overheat Pre-Alarm Operation Selection	0 to 3	3

Setting 0: Ramp to stop

If an overheat alarm occurs, the drive decelerates to stop using the deceleration ramp currently selected. If a digital output is programmed for “fault” (H2-□□ = E), this output will be triggered.

Setting 1: Coast to stop

If heatsink overheat (oH) occurs, the drive switches off the output and the motor coasts to stop. If a digital output is programmed for “fault” (H2-□□ = E), this output will be triggered.

Setting 2: Emergency Stop

If an overheat alarm occurs, the drive decelerates to stop using the Emergency Stop ramp (C1-09). If a digital output is programmed for “fault” (H2-□□ = E), this output will be triggered.

Setting 3: Alarm only

If an overheat alarm occurs, an alarm is output and the drive continues operation.

■ L8-05: Input Phase Loss Protection Selection

Enables or disables the input phase loss detection.

No.	Name	Setting Range	Default
L8-05	Input Phase Loss Protection Selection	0 to 3	1

Setting 0: Disabled

Setting 1: Enabled

Setting 2: Enabled during operation

Setting 3: Enabled during constant speed

A phase loss on the power supply side is detected by measuring the voltage ripple in the DC bus and the drive input voltage.

Input phase loss (PF) detection is typically triggered by single phase losses, voltage drop or phase imbalance.

Input phase loss detection is disabled when Rescue Operation is activated by one of the input terminals.

■ L8-06: Input Phase Loss Detection Level

Determines the level for input phase loss detection when a ripple is observed in the DC bus. Phase loss is detected when the value set to L8-06 is greater than the difference between the peak value and the lowest value of the voltage ripple.

100% detection level = voltage (200 V or 400 V) × $\sqrt{2}$

No.	Name	Setting Range	Default
L8-06	Input Phase Loss Detection Level	0.0 to 50.0%	Determined by o2-04

■ L8-62: Operation Selection at Input Phase Loss

Sets stopping method when a input phase loss fault (PF) occurs.

No.	Name	Setting Range	Default
L8-62	Operation Selection at Input Phase Loss	0 to 3	1

0: Ramp to stop. Decelerates to stop using the deceleration ramp in C1-02.

1: Coast to stop

2: Emergency stop. Decelerates to stop using the deceleration ramp in C1-09.

3: Alarm only. Drive continues operation.

■ L8-07: Output Phase Loss Protection

Enables or disables the output phase loss detection, which is triggered when the output current falls below 5% of the drive rated current.

- Note:**
1. Output phase loss detection can mistakenly be triggered if the motor rated current is very small compared to the drive rating. Disable this parameter in such cases.
 2. Output phase loss detection is not possible when the drive is running a PM motor with light load.

No.	Name	Setting Range	Default
L8-07	Output Phase Loss Protection	0 to 2	0

Setting 0: Disabled

Setting 1: Fault when one phase is lost

An output phase loss fault (LF) is triggered when one output phase is lost. The output shuts off and the motor coasts to stop.

Setting 2: Fault when two phases are lost

An output phase loss fault (LF) is triggered when two output phases are lost. The output shuts off and the motor coasts to stop.

■ L8-09: Output Ground Fault Detection Selection

Enables or disables the output ground fault detection.

No.	Name	Setting Range	Default
L8-09	Output Ground Fault Detection Selection	0 or 1	1

Setting 0: Disabled

Ground faults are not detected.

Setting 1: Enabled

A ground fault (GF) is triggered when high leakage current or a ground short circuit occurs in one or two output phases.

■ L8-10: Heatsink Cooling Fan Operation Selection

Selects the heatsink cooling fan operation.

No.	Name	Setting Range	Default
L8-10	Heatsink Cooling Fan Operation Selection	0 to 2	0

Setting 0: Run with timer

The fan is switched on when a Up/Down command is active. It is switched off with the delay set in parameter L8-11 after the Up/Down command has been released. Using this setting extends the fan lifetime.

Setting 1: Run always

The fan runs whenever power is supplied to the drive.

Setting 2: Temperature controlled

Cooling fan operated depending on the temperature of the drives heatsink.

■ L8-11: Heatsink Cooling Fan Off Delay Time

Sets the cooling fan switch off-delay time if parameter L8-10 is set to 0.

No.	Name	Setting Range	Default
L8-11	Heatsink Cooling Fan Off Delay Time	0 to 300 s	60 s

5.8 L: Protection Functions

■ L8-12: Ambient Temperature Setting

If the temperature where the drive is mounted is above the specified values, the drive rated current must be reduced for optimal performance life. By setting the ambient temperature to parameter L8-12 and adjusting the installation method setting in L8-35, the drive rating automatically adapts to safe values.

No.	Name	Setting Range	Default
L8-12	Ambient Temperature Setting	-10 to 50 °C	40 °C

■ L8-15: oL2 (Drive Overload) Characteristics Selection at Low Speeds

Selects whether the drive overload capability (oL fault detection level) is reduced at low speeds in order to prevent premature output transistor failures.

Note: Contact Yaskawa for consultation first before disabling this setting.

No.	Name	Setting Range	Default
L8-15	oL2 Characteristics Selection at Low Speed	0 or 1	1

Setting 0: Protection disabled at low speed

The overload protection level is not reduced. Frequently operating the drive with high output current at low speed can lead to premature drive faults.

Setting 1: protection enabled at low speed

The overload protection level (oL2 fault detection level) is automatically reduced at speeds below 6 Hz.

■ L8-27: Overcurrent Detection Gain

Adjusts the overcurrent detection level when running in CLV/PM. A setting of 100% is equal to the motor rated current. When the drive rated current is considerably higher than the motor rated current, use this parameter to decrease the overcurrent level in order to prevent motor demagnetization by too high current.

Overcurrent detection will use whichever value is the lowest: the overcurrent level for the drive, or the motor rated current multiplied by L8-27.

No.	Name	Setting Range	Default
L8-27	Overcurrent Detection Gain	0.0 to 300.0%	300.0%

■ L8-29: Current Unbalance Detection (LF2)

Enables or disables output current imbalance detection when running in CLV/PM. Current unbalance can heat up a PM motor and lead to demagnetization of the magnets. The current imbalance detection function prevents such motor damage by monitoring output current and triggering the LF2 fault when current unbalance occurs.

No.	Name	Setting Range	Default
L8-29	Current Unbalance Detection (LF2)	0 or 1	1

Setting 0: Disabled

No current unbalance protection is provided to the motor.

Setting 1: Enabled

The LF2 fault is triggered if an output current imbalance is detected. Drive output shuts off and the motor coasts to stop.

■ L8-35: Installation Selection

Selects the type of installation for the drive and changes the drive overload (oL2) limits accordingly.

Note: This parameter is not reset when the drive is initialized.

No.	Name	Setting Range	Default
L8-35	Installation Selection	0 or 2	Determined by o2-04

Setting 0: IP20 enclosure

For an IP20 enclosure drive installed with at a minimum of 30 mm space to the next drive or a cabinet wall.

Setting 2: NEMA Type 1 enclosure

For drives compliant with NEMA Type 1 enclosure specifications.

■ L8-38: Automatic Torque Boost Function

When the output current reaches a certain level the drive automatically reduces the carrier frequency to the level set in L8-39. Because lowering the carrier frequency increases the overload tolerance, the drive is capable of creating considerably more torque. When the output current falls, the carrier frequency switches back to the value set in C6-03.

- Note:**
1. Automatically lowering the carrier frequency increases motor noise.
 2. Be sure the capacity of the drive so that maximum output current is less than the current limit.

No.	Name	Setting Range	Default
L8-38	Automatic Torque Boost Function	0 or 3	0

Setting 0: Disabled

The carrier frequency is not automatically reduced.

Setting 3: Enabled

The torque capability is improved by reducing the carrier frequency when the output current exceeds a certain value.

■ L8-39: Reduced Carrier Frequency

Determines value the carrier frequency is reduced to by the torque boost function.

No.	Name	Setting Range	Default
L8-39	Reduced Carrier Frequency	1.0 to 15.0 kHz	3.0 kHz

■ L8-55: Internal Braking Transistor Protection

Enables or disables protection for the internal braking transistor.

No.	Name	Setting Range	Default
L8-55	Internal Braking Transistor Protection	0 or 1	1

Setting 0: Disabled

Braking transistor protection should be disabled whenever the internal braking transistor is not used. This includes,

- when using a regen converter such as DC5.
- when using a regen unit such as RC5.
- when using external braking units like CDBR units.
- when the drive is used in common DC bus applications and the internal braking chopper is not used.

Enabling this L8-55 under such conditions can incorrectly trigger a braking transistor fault (rF).

Setting 1: Enabled

The following models come with a built-in braking transistor:

- CIMR-L□2A0018 to 0115
- CIMR-L□4A0009 to 0060

Enable L8-55 when connecting a braking resistor or a braking resistor unit to the drive built-in braking transistor.

5.8 L: Protection Functions

Overload Tolerance for Internal Braking Transistor

Below, *Figure 5.36* show the overload tolerance level for the drive's built-in braking transistor.

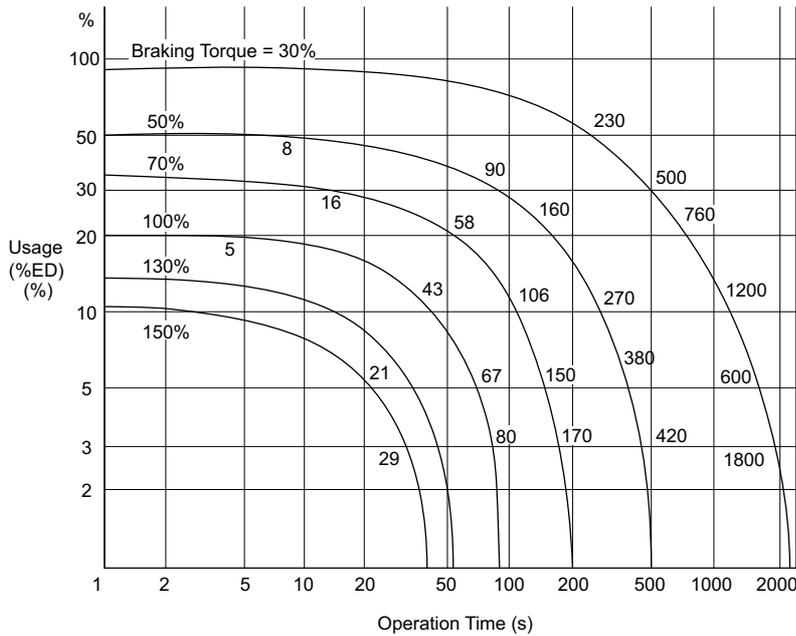


Figure 5.36 Overload Tolerance for Braking Transistor (CIMR-L□2A0018 to 2A0115, CIMR-L□4A0009 to 4A0060)

■ L8-77: Oscillation Suppression

If speed oscillations with the same frequency as the output frequency occur with an unloaded motor, parameter L8-77 can be adjusted to suppress these oscillations. While watching the motor speed, increase or decrease L8-77 until the oscillation disappears.

This parameter rarely requires adjustment.

No.	Name	Setting Range	Default
L8-77	Oscillation Suppression	-100 to 100	0

■ L8-88: Safe Disable Operation Mode

Depending on the selection in parameter L8-88, the characteristics of certain drive function change like shown in the table below.

Item	L8-88=0 (Mode 0)	L8-88=1 (Mode 1)
Alarm output (H2-□□ = 10) when the Safe Disable Inputs are open	Yes	No
Drive Ready signal (operator display and digital output H2-□□ = 6) on when Safe Disable Inputs are open.	No	Yes
Drive starts operation when Up/Down command is switched on before Safe Disable inputs are set	No	Yes

No.	Name	Setting Range	Default
L8-88	Safe Disable Operation Mode	0 or 1	1

Setting 0: Mode 0

Setting 1: Mode 1 (Yaskawa Varispeed L7 compatible)

5.9 n: Special Adjustments

These parameters handle a variety of specialized adjustments and functions, including AFR Control, resistance between motor lines, PM motor control functions, and current detection adjustments.

◆ n2: Speed Feedback Detection Control (AFR) Tuning

These parameters are used to achieve speed stability when a load is suddenly applied or removed.

Note: Before making changes to the AFR parameters, make sure all motor parameters are set properly or perform Auto-Tuning.

■ n2-01: Speed Feedback Detection Control (AFR) Gain

Sets the internal speed feedback detection control gain in the AFR.

No.	Name	Setting Range	Default
n2-01	Speed Feedback Detection Control (AFR) Gain	0.00 to 10.00	1.00

Normally there is no need to adjust n2-01 from the default setting. Make adjustments in the following cases:

- If hunting occurs, increase the setting value in steps of 0.05 while checking the response.
- If response is low, decrease the setting value in steps of 0.05 while checking the response.

■ n2-02, n2-03: Speed Feedback Detection Control (AFR) Time Constant 1, 2

Parameter n2-02 sets the time constant normally used by AFR.

Parameter n2-03 sets the time constant during regenerative operation.

No.	Name	Setting Range	Default
n2-02	Speed Feedback Detection Control (AFR) Time Constant 1	0 to 2000 ms	50 ms
n2-03	Speed Feedback Detection Control (AFR) Time Constant 2	0 to 2000 ms	750 ms

Note: Parameter n2-02 cannot be set higher than n2-03 or an oPE08 error will result.

These parameters rarely need to be changed. Adjust settings only under the following conditions:

- If hunting occurs, increase n2-02. If response is low, decrease it.
- Increase n2-03 if overvoltage occurs with high inertia loads at the end of acceleration or with sudden load changes.
- If setting n2-02 to a higher value, also increase C4-02 (Torque Compensation Delay Time Constant 1) proportionally.

◆ n5: Inertia Compensation

Enabling Inertia Compensation can improve the drives responsiveness to speed reference changes in applications where a high speed control proportional gain setting (C5-01, C5-03, C5-13) would lead to problems with overshoot, undershoot, or oscillation. [Figure 5.37](#) gives an example of overshoot reduction by Inertia Compensation. Parameters related to this function and the function principle are illustrated in [Figure 5.38](#). Inertia Compensation can only be used in Closed Loop Vector Control for induction or PM motors (A1-02 = 3 or 7).

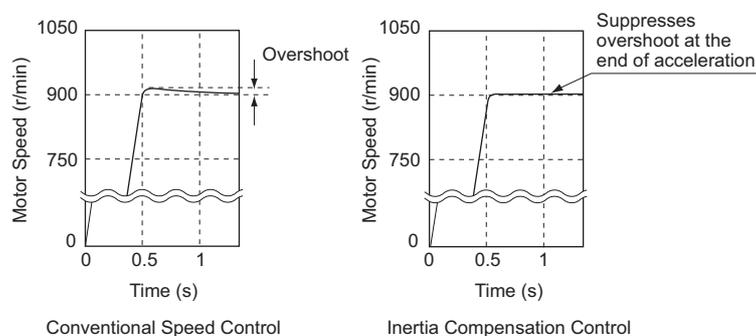


Figure 5.37 Overshoot Suppression by Inertia Compensation

5.9 n: Special Adjustments

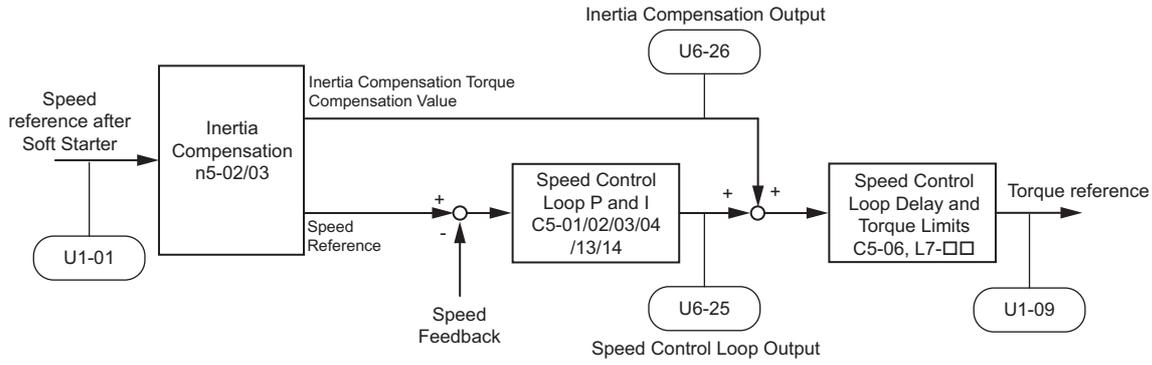


Figure 5.38 Inertia Compensation

Note: Prior to using Inertia Compensation, always perform Auto-Tuning or set the correct motor data manually. Also adjust the Speed Control Loop.

■ n5-01: Inertia Compensation Selection

Enables or disables the Inertia Compensation function.

No.	Name	Setting Range	Default
n5-01	Inertia Compensation Selection	0 or 1	0

Setting 0: Disabled

Setting 1: Enabled

■ n5-02: Motor Acceleration Time

Sets the time required to accelerate the motor from a full stop up to the rated speed at the rated torque.

No.	Parameter Name	Setting Range	Default
n5-02	Motor Acceleration Time	0.001 to 10.000 s	Determined by o2-04

Calculation

The motor acceleration time can be calculated by,

$n5-02 = \frac{\pi \cdot J_{\text{Motor}} \cdot n_{\text{rated}}}{30 \cdot T_{\text{rated}}}$	<p>Where:</p> <ul style="list-style-type: none"> • J_{Motor} is the motor inertia in kgm/s^2. • n_{rated} is the rated speed of the motor in r/min • T_{rated} is the rated torque of the motor in $\text{N}\cdot\text{m}$.
---	---

Measuring Acceleration Time

Take the following steps when measuring the motor acceleration time.

1. Decouple motor and load.
2. Make sure Auto-Tuning has been performed or that the correct motor data has been entered manually.
3. Make sure that the speed control loop has been set up properly.
4. Set the acceleration time to zero.
5. Set the forward torque limit in parameter L7-01 to 100%.
6. Set the speed reference equal to the motor rated speed.
7. While monitoring the motor speed in U1-05, start the motor in the forward direction and measure the time it takes to reach the rated speed.
8. Reverse the parameter settings above and set the measured time to parameter n5-02.

■ n5-03: Inertia Compensation Gain

Parameter n5-03 sets the inertia ratio of the load connected to the motor.

No.	Parameter Name	Setting Range	Default
n5-03	Inertia Compensation Gain	0.00 or 100.00	1.00

Calculate the value for n5-03 as explained below.

$\Sigma J = J_{TS} \cdot i^2 + \Sigma m \cdot \left(\frac{30 \cdot v_{r_Elev}}{\pi \cdot n_{r_Mot}} \right)^2$ $n5-03 = \Sigma J / J_{Mot}$	<ul style="list-style-type: none"> • J_{Mot} - Motor inertia in kgm^2 • n_{r_Mot} - Rated motor speed in r/min • T_{r_Mot} - Rated motor torque in Nm • J_{TS} - Traction sheave inertia in kgm^2 • i - Gear ratio (n_{Load}/n_{Mot}) • v_{r_Elev} - Rated elevator speed in m/s • Σm - Mass of all moved parts (car, counterweight, ropes, load <I>) in kg
--	---

<I> Insert 0 kg for the load to calculate the lowest setting, insert the elevator rated load to calculate the maximum setting for n5-03. Use the lower of calculated values for initial trials and increase n5-03 gradually until the desired performance is achieved.

◆ n6: Online Tuning

Online Tuning compensates insufficient torque and diminished speed control accuracy due to fluctuating motor temperature.

■ n6-01: Online Tuning Selection

Selects the type of motor data Online Tuning uses for Open Loop Vector Control.

No.	Name	Setting Range	Default
n6-01	Online Tuning Selection	0 to 2	2

Setting 0: Disabled

Setting 1: Line-to-line resistance tuning

This setting enables line-to-line resistance online tuning. This procedure is effective for speed values up to 6 Hz and improves the overload capacity in the low speed range by adjusting the value set for the motor resistance.

Setting 2: Voltage correction

The drive adjusts the output voltage during run to improve overload tolerance and minimize the effects of high temperatures on speed accuracy.

Note: This setting can only be selected if the Energy Saving function is disabled ($b8-01 = 0$).

■ n6-05: Online Tuning Gain

Sets the compensation gain for the voltage correction in the Online Tuning function ($n6-01 = 2$). Normally there is no need to adjust n6-05, but increase the set value in steps of 0.1 if an overload fault occurs during voltage correction.

No.	Name	Setting Range	Default
n6-05	Online Tuning Gain	0.1 to 50.0	1.0

◆ n8: PM Motor Control Tuning

Parameters in the n8 group are used to adjust the Initial Rotor Pole Position Search function and other PM motor control related functions like the current control loop in CLV/PM or voltage saturation prevention (voltage limit).

■ Initial Rotor Pole Position Search Settings

When a PM motor with a non-absolute encoder such as an incremental encoder with a PG-X3 option is used, the drive needs to search for the rotor pole position before it can operate the motor. This search is performed always:

- when the Up/Down command is issued for the first time after the power has been switched on.
- after one of the following errors occurred: dv1, dv2, dv3, dv4, dv6, dv7, PGo, PGoH.
- when an Up/Down command issued after the setting of parameter n8-35 had been changed.

With default settings the drive will generate a dv8 error if initial rotor pole position search fails (n8-86 = 1). The brake control output (H2-□□ = 50) will not open in this case.

When not using the drives brake sequence, include the Motor Pole Search Status signal (digital output programmed for H2-□□ = 61) so that the brake can open only if motor pole position search has been finished successfully. Refer to [Setting 61: Motor pole search status on page 176](#) for details.

■ n8-01: Initial Polarity Estimation Current

Sets the current used for the initial polarity estimation. The value is set as a percentage of the motor rated current.

No.	Name	Setting Range	Default
n8-01	Initial Polarity Estimation Current	0 to 100%	50%

■ n8-02: Pole Attraction Current

Sets the pull-in current used to detect rotor position. This setting rarely needs to be changed.

No.	Name	Setting Range	Default
n8-02	Pole Attraction Current	0 to 150%	80%

■ n8-35: Initial Rotor Position Detection Selection

Selects how the rotor position is detected at start.

No.	Name	Setting Range	Default
n8-35	Initial Rotor Position Detection Selection	1 or 2	1

Setting 1: High Frequency Injection

High frequency is injected in order to detect the rotor position. Some noise may be generated from the motor at start.

Setting 2: Pulse injection

A pulse signal is injected into the motor in order to detect the rotor position.

■ n8-36: High Frequency Injection Level

Sets the frequency level used for High Frequency Injection.

No.	Name	Setting Range	Default
n8-36	High Frequency Injection	25 to 1000 Hz	500 Hz

■ n8-37: High Frequency Injection Amplitude

Sets the amplitude for High Frequency Injection as a percentage of the voltage (200 V or 400 V).

No.	Name	Setting Range	Default
n8-37	High Frequency Injection Amplitude	0.0 to 99.9%	20.0%

■ n8-81: High Frequency Injection during Rescue Operation

Sets the frequency used for High Frequency Injection during Rescue Operation.

No.	Name	Setting Range	Default
n8-81	High Frequency Injection during Rescue Operation	25 to 1000 Hz	90 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).

No.	Name	Setting Range	Default
n8-82	High Frequency Injection Amplitude during Rescue Operation	0.1 to 99.9%	15.0%

■ n8-84: Polarity Detection Current

Sets the current level (E5-03) as a percentage for detecting polarity during Initial Polarity Estimation.

No.	Name	Setting Range	Default
n8-84	Polarity Detection Current	0 to 150%	100%

■ n8-86: Magnet Pole Search Error Detection Selection

Enables fault detection for Initial Polarity Estimation (dv8).

No.	Name	Setting Range	Default
n8-86	Magnet Pole Search Error Detection Selection	0 or 1	0

0: Disabled

After the rotor pole position is searched once, the drive starts using the detected rotor position. If the detected position was wrong, an error will occur when the drive attempts running the motor. The initial pole search takes approximately 1.5 s.

1: Enabled

The rotor pole position is searched multiple times. Only if there is no difference between the search results, the drive starts using the detected rotor position. Otherwise a dv8 error will be output. The initial pole search takes approximately 1.5 to 5.0 s.

■ Other Settings

Parameters n8-29 to n8-33 can be used to adjust the current control loop. These setting do normally not need to be changed.

Furthermore parameter n8-62 sets a voltage limit in order to prevent voltage saturation.

■ n8-29: q-Axis Current Control Gain during Normal Operation

Sets the q axis proportional gain for the automatic current regulator.

No.	Name	Setting Range	Default
n8-29	q-Axis Current Control Gain during Normal Operation	0 to 2000 rad/s	1000 rad/s

■ n8-30: q-Axis Current Control Integral Time during Normal Operation

Sets the q axis integral time for the automatic current regulator.

No.	Name	Setting Range	Default
n8-30	q-Axis Current Control Integral Time during Normal Operation	0.0 to 100.0 ms	10.0 ms

5.9 n: Special Adjustments

■ n8-32: d-Axis Current Control Gain during Normal Operation

Sets the d axis proportional gain for the automatic current regulator.

No.	Name	Setting Range	Default
n8-32	d-Axis Current Control Gain during Normal Operation	0 to 2000 rad/s	1000 rad/s

■ n8-33: d-Axis Current Control Integral Time during Normal Operation

Sets the d axis integral time for the automatic current regulator.

No.	Name	Setting Range	Default
n8-33	d-Axis Current Control Integral Time during Normal Operation	0.0 to 100.0 ms	10.0 ms

■ n8-62: Output Voltage Limit

Sets the output voltage limit to prevent voltage saturation. Never set this value higher than the actual input voltage.

No.	Name	Setting Range	Default
n8-62 </>	Output Voltage Limit	0.0 to 230.0 Vac	200 Vac

</> Values shown here are for 200 V class drives. Double values when using a 400 V class unit.

◆ n9: Current Detection Adjustments

■ n9-60: A/D Conversion Start Delay

Sets a delay time used for A/D conversion of the current. This value rarely needs to be changed. However, it can help to resolve speed ripple problems at constant speed when using a PM motor. Prior to adjusting this value, make sure all other parameters (motor data, speed loop settings) are adjusted correctly.

No.	Name	Setting Range	Default
n9-60	A/D Conversion Start Delay	0.0 to 40.0 μ s	Determined by o2-04

5.10 o: Operator Related Settings

These parameters are for controlling the various functions, features, and display of the digital operator.

◆ o1: Digital Operator Display Selection

These parameters determine how data appears on the operator display.

■ o1-01: Drive Mode Unit Monitor Selection

When the drive is powered up, the monitor selected in parameter o1-02 appears first on the display. If o1-02 is set to 5, o1-01 can be used to change the content of this monitor.

When using an LED operator, pressing the up arrow key will display the following data: speed reference → rotational direction → output speed → output current → o1-01 selection.

Parameter o1-01 lets the user select the content of the last monitor in this sequence. There is no effect like this on an LCD operator.

No.	Name	Setting Range	Default
o1-01	Drive Mode Unit Monitor Selection	105 to 699 U1-04 (Control Mode) to U6-99 (Option Monitor 20) <I>	106 (U1-06)

<I> U2-□□ and U3-□□ parameters cannot be selected.

■ o1-02: User Monitor Selection after Power Up

Selects which monitor parameter is displayed upon power up. This is done by entering the 1□□ part of U1-□□. Certain monitors are not available in some control modes. [Refer to U: Monitor Parameters on page 219](#) for a list of monitors.

No.	Name	Setting Range	Default
o1-02	User Monitor Selection after Power Up	1 to 5	1

Setting 1: Speed reference (U1-01)

Setting 2: Motor direction

Setting 3: Output speed (U1-02)

Setting 4: Output current (U1-03)

Setting 5: User-selected monitor (set by o1-01)

■ o1-03: Digital Operator Display Unit Selection

Sets the units used to display speed related settings and monitors as well as accel/decel rate settings and jerk settings. Refer to [Digital Operator Display Unit Selection on page 92](#).

No.	Name	Setting Range	Default
o1-03	Digital Operator Display Unit Selection	0 to 6	1

Setting 0: 0.01 Hz units

Setting 1: 0.01% units (100% = max. output frequency)

Setting 2: r/min units (calculated by the max output frequency and the no. of motor poles)

Setting 3: User-set units (use o1-10, o1-11)

Set o1-03 to 3 for user-set units, then set parameters o1-10 and o1-11.

Set the value use for the maximum frequency reference to o1-10. The placement of the decimal point in this number should be set to o1-11.

For example, to have the maximum output speed displayed as “100.00”, set the o1-10 = 1000 and o1-11 = 2 (i.e., 1000 with 2 decimal points).

5.10 o: Operator Related Settings

Setting 4: Elevator units 1 (speed in m/s, accel/decel rate and jerk in s)

Setting 5: Elevator units 2 (speed in m/s, accel/decel rate in m/s², jerk in m/s³)

Setting 6: Elevator units 3 (speed in ft/min, accel/decel rate in ft/s², jerk in ft/s³)

■ o1-04: V/f Pattern Setting Units

Determines the units used for the frequency reference when setting parameters that create the V/f pattern: E1-04, E1-06, E1-07, E1-09 and E1-11.

Enabled only in vector control modes (CLV and CLV/PM).

No.	Name	Setting Range	Default
o1-04	V/f Pattern Setting Units	0 or 1	Determined by A1-02

Setting 0: Hz

Setting 1: r/min

■ o1-10: User-Set Display Units Maximum Value

Determines the display value that is equal to the maximum output frequency.

No.	Name	Setting Range	Default
o1-10	User-Set Display Units Maximum Value	1 to 60000	Determined by o1-03

Note: This parameter is displayed only when the drive is set to allow for user-set units (o1-03 = 3).

■ o1-11: User-Set Display Units Decimal Display

Determines how many decimal points should be used to set and display the speed reference.

No.	Name	Setting Range	Default
o1-11	User-Set Display Units Decimal Display	0 to 3	Determined by o1-03

Setting 0: No decimal point

Setting 1: One decimal point

Setting 2: Two decimal points

Setting 3: Three decimal points

■ o1-20: Traction Sheave Diameter

Sets the traction sheave diameter.

No.	Name	Setting Range	Default
o1-20	Traction Sheave Diameter	100 to 2000 mm	400 mm

■ o1-21: Roping Ratio

Sets the roping ratio.

No.	Name	Setting Range	Default
o1-21	Roping Ratio	1 to 4	2

Setting 1: 1: 1

Setting 2: 1: 2

Setting 3: 1: 3

Setting 4: 1: 4

■ o1-22: Mechanical Gear Ratio

Sets the gear ratio of the mechanical gear.

No.	Name	Setting Range	Default
o1-22	Mechanical Gear Ratio	0.10 to 50.00	Determined by A1-02

◆ o2: Digital Operator Keypad Functions

These parameters determine the functions assigned to the operator keys.

■ o2-01: LO/RE (LOCAL/REMOTE) Key Function Selection

Parameter o2-01 determines whether the LO/RE key on the digital operator will be enabled or not for switching between LOCAL and REMOTE.

No.	Name	Setting Range	Default
o2-01	LO/RE Key Function Selection	0 or 1	0

Setting 0: Disabled

The LO/RE key is disabled.

Setting 1: Enabled

The LO/RE switches between LOCAL and REMOTE operation. Switching is possible during stop only. When LOCAL is selected, the LED indicator on the LO/RE key will light up.

■ o2-02: STOP Key Function Selection

Determines if the STOP key on the digital operator can still be used to stop drive operation when the drive is being controlled from a remote source (i.e., not from digital operator).

No.	Name	Setting Range	Default
o2-02	STOP Key Function Selection	0 or 1	0

Setting 0: Disabled

Setting 1: Enabled

The STOP key can be used to terminate drive operation, even if the Up/Down command source is not assigned to the digital operator. If the drive is stopped by pressing the STOP key, the Up/Down command must be cycled to restart the drive.

■ o2-03: User Parameter Default Value

Once drive parameters are set up completely, the values set can be saved as user-set default values using parameter o2-03. Once this has been done, the “Initialize Parameters” parameter (A1-03) will offer the choice of “1110: User Initialize”. Choosing A1-03 = “1110: User Initialize” will reset all parameters to the values saved as user-set defaults.

Refer to A1-03: Initialize Parameters on page 133 for details on drive initialization.

No.	Name	Setting Range	Default
o2-03	User Parameter Default Value	0 to 2	0

Setting 0: No change (awaiting command)

Setting 1: Set User Initialize values

The current parameter settings are saved as user-set default for a later User Initialize. Once o2-03 is set to 1 and the ENTER key is pressed, the values are saved and the display returns to 0.

Setting 2: Clear User Initialize Values

All user-set defaults for “User Initialize” are cleared. Once o2-03 is set to 2 and the ENTER key is pressed, the values are erased and the display returns to 0.

5.10 o: Operator Related Settings

■ o2-04: Drive Model Selection

This parameter must be set when replacing the control board or the terminal board for any reason. For information on the drive model selection, see [Defaults by Drive Model Selection \(o2-04\) on page 338](#).

NOTICE: Drive performance will suffer if the correct drive capacity is not set to o2-04, and protective functions will fail to operate properly.

No.	Name	Setting Range	Default
o2-04	Drive Model Selection	–	Determined by drive capacity

■ o2-05: Speed Reference Setting Method Selection

Determines if the ENTER key must be pressed after changing the speed reference using the digital operator while in the Drive Mode.

No.	Name	Setting Range	Default
o2-05	Speed Reference Setting Method Selection	0 or 1	0

Setting 0: ENTER key required

Every time the speed reference is changed using the digital operator, the ENTER key must be pressed for the drive to accept the change.

Setting 1: ENTER key not required

The output speed changes immediately when the reference is changed by the up or down arrow keys on the digital operator. The ENTER key does not need to be pressed. The speed reference is saved for 5 s after it is changed.

■ o2-06: Operation Selection when Digital Operator is Disconnected

Determines if the drive will stop when the digital operator is removed in LOCAL mode or when b1-02 is set to 0. When the operator is reconnected, the display will indicate that it was disconnected.

No.	Name	Setting Range	Default
o2-06	Digital Operator Disconnection Operation	0 or 1	0

Setting 0: Continue operation

The operation is continued.

Setting 1: Trigger a fault

The operation is stopped and an “oPr” fault is triggered. The motor coasts to stop.

◆ o3: Copy Function

These parameters control the digital operator’s Copy function. The Copy function lets the user store all parameter settings into the memory of the digital operator, and easily transfer those settings to other drives (requires that the other drives be the same model, capacity, and have the same control mode setting). See [Copy Function Related Displays on page 251](#) for a description of errors and displays.

■ o3-01 Copy Function Selection

Setting o3-01 will instruct the drive to Read, Write, or Verify parameters settings.

No.	Name	Setting Range	Default
o3-01	Copy Function Selection	0 to 3	0

0: Copy Select (no function)

1: INV --> OP READ

All parameters are copied from the drive to the digital operator.

Note: The copy protection for the digital operator is enabled by default. To unlock copy protection, set o3-01 = 1.

2: OP --> INV WRITE

All parameters are copied from the digital operator to the drive.

3: OP<-->INV VERIFY

Parameters in the drive are compared with the parameter settings saved on the digital operator to see if they match.

■ o3-02 Copy Allowed Selection

Restricts or allows the use of the Copy function.

No.	Name	Setting Range	Default
o3-02	Copy Allowed Selection	0 or 1	0

0: Disabled

1: Enabled

◆ o4: Maintenance Monitor Settings**■ o4-01: Cumulative Operation Time Setting**

Parameter o4-01 sets the cumulative operation time of the drive. The user can also manually set this parameter to begin keeping track of operation time from some desired value. Total operation time can be viewed in monitor U4-01.

Note: The value in o4-01 is set in 10 h units. For example, a setting of 30 will set the cumulative operation time counter to 300 h. 300 h will also be displayed in monitor U4-01.

No.	Name	Setting Range	Default
o4-01	Cumulative Operation Time Setting	0 to 9999 H	0 H

■ o4-02: Cumulative Operation Time Selection

Selects the conditions for how the drive keeps track of its total operation time. This time log can be viewed in U4-01.

No.	Name	Setting Range	Default
o4-02	Cumulative Operation Time Selection	0 or 1	0

Setting 0: Power on time

The drive logs the time it is connected to a power supply, regardless if the motor is running or not.

Setting 1: Run time

The drive logs the time that the output is active. This includes whenever the Up/Down command is active (even if the motor is not rotating) and when there is voltage output.

■ o4-03: Cooling Fan Operation Time Setting

Sets the value for how long the cooling fan has been operating. This value can be viewed in monitor U4-03. Parameter o4-03 also sets the base value used for the cooling fan maintenance, which is displayed in U4-04. Be sure to reset this parameter back to 0 if the cooling fan is replaced.

- Note:**
1. The value in o4-03 increases after every 10 hours of use. A setting of 30 will set the cooling fan operation time counter to 300 h. "300" will be displayed in monitor U4-03.
 2. The cooling fan may require maintenance at an earlier date in harsher environments.

No.	Name	Setting Range	Default
o4-03	Cooling Fan Operation Time Setting	0 to 9999 H	0 H

■ o4-05: Capacitor Maintenance Setting

Sets value of the maintenance monitor for the DC bus capacitors displayed in U4-05 as a percentage of the total expected performance life. This value should be reset to 0 when the DC bus capacitors have been replaced.

Note: The actual maintenance time will depend on the environment where the drive is used.

No.	Name	Setting Range	Default
o4-05	Capacitor Maintenance Setting	0 to 150%	0%

5.10 o: Operator Related Settings

■ o4-07: DC Bus Pre-charge Relay Maintenance Setting

Sets the value of the softcharge bypass relay maintenance time displayed in U4-06 as a percentage of the total expected performance life. This value should be reset to 0 when the bypass relay has been replaced.

Note: The actual maintenance time will depend on the environment where the drive is used.

No.	Name	Setting Range	Default
o4-07	DC Bus Pre-charge Relay Maintenance Setting	0 to 150%	0%

■ o4-09: IGBT Maintenance Setting

Sets the value of the IGBT maintenance time displayed in U4-07 as a percentage of the total expected performance life. This value should be reset to 0 when the IGBTs have been replaced.

Note: The actual maintenance time will depend on the environment where the drive is used.

No.	Name	Setting Range	Default
o4-09	IGBT Maintenance Setting	0 to 150%	0%

■ o4-11: U2, U3 Initialization

When the drive is initialized, the fault trace and fault history monitors (U2-□□ and U3-□□) are not reset. Parameter o4-11 can be used to reset them.

No.	Name	Setting Range	Default
o4-11	U2, U3 Initialization	0 or 1	0

Setting 0: No action

The drive keeps the record already saved concerning fault trace and fault history.

Setting 1: Reset fault data

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.

■ o4-12: kWh Monitor Initialization

The kWh monitors U4-10 and U4-11 are not initialized when power is shut off or the drive is initialized. Use o4-12 to manually reset them.

No.	Name	Setting Range	Default
o4-12	kWh Monitor Initialization	0 or 1	0

Setting 0: No Action

The kWh data are kept as they are.

Setting 1: Reset kWh Data

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.

■ o4-13: Number of Travels Counter Reset

The number of travels counter displayed in U4-24/25 is not reset when the power is cycled or the drive is initialized. Use o4-13 to reset U4-24/25.

No.	Name	Setting Range	Default
o4-13	Number of Travels Counter Reset	0 or 1	0

Setting 0: No Action

Keeps the number of travels counter.

Setting 1: Resets the Number of Travels

Resets the number of 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.

5.11 S: Elevator Parameters

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

◆ S1: Brake Sequence

The drive supports braking sequences using an analog input terminal to control torque compensation at start (H3-□□ = 14), and braking sequences that do not require an analog input to set the torque compensation level. For more information, refer to [Brake Sequence on page 109](#).

■ 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 Open Loop Vector 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.
- Closed Loop Vector Control or Closed Loop Vector Control for PM Motors (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 Open Loop Vector Control, the DC injection current is determined by multiplying S1-03 with 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

5.11 S: Elevator Parameters

■ 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 isn't 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 Apply 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 Apply Delay Time	0.00 to [S1-05]	0.10 s

■ S1-10: Run Command Delay Time

Sets the time the drive waits from receiving an Up/Down command before starting operation in order to 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

◆ S2: Slip Compensation for Elevators

The slip compensation function automatically adjusts the speed reference for leveling operation depending on the load measured at constant speed. S2 parameters are used to tune the slip compensation function in order to improve the landing accuracy. Requires that the drive be set for V/f Control or Open Loop Vector Control.

■ 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. This can 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: Start/Stop Optimization

■ 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 in order 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. Lower this setting 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. This is used to hold the car in place while the brake applies. Setting S3-03 to a high value will increase the drive's ability to hold the car in place, but too high of a setting can result in motor oscillation.

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. 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 S3-03, or increase the number of pulses needed to trigger dv4 (F1-19).

■ S3-04: Position Lock Bandwidth

Determines the bandwidth around the locked position for that a digital output set for H2-□□ = 33 (Within position lock bandwidth) is enabled. 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

5.11 S: Elevator Parameters

■ 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 Down direction.

For more information, see [Adjusting the Torque Compensation at Start on page 111](#).

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 Fade Out Speed

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

No.	Parameter Name	Setting Range	Default
S3-14	Torque Compensation Fade Out Speed	0.0 to 100.0%	0.0%

■ S3-15: Torque Compensation Fade Out Time

Sets the time for torque compensation to fade out once motor speed reaches the level set in S3-14.

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

■ S3-16: Torque Limit Reduction Time

After Position Lock at stop, S3-16 determines how long to reduce the torque limit for. $\text{Rate} = \frac{\text{Torque } 300\%}{\text{S3-16}}$

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

■ S3-25: DC Injection Gain in Regenerative Operation

In Open Loop Vector 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 $\text{S1-03} \times \text{S3-25}$.

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 Open Loop Vector Control, S3-26 sets a gain level for DC Injection at stop (S1-03) for when the motoring load reaches 100%. At that time, the current applied during DC Injection at stop is determined as $\text{S1-03} \times \text{S3-26}$.

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

Used for adjusting the analog signal from a load cell for torque compensation. For instructions on setting this parameter, see [Adjusting the Torque Compensation at Start on page 111](#).

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

Used for adjusting the analog signal from a load cell for torque compensation. For instructions on setting this parameter, see [Adjusting the Torque Compensation at Start on page 111](#).

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 Cell with Load Condition 1

Used for adjusting the analog signal from a load cell for torque compensation. For instructions on setting this parameter, see [Adjusting the Torque Compensation at Start on page 111](#).

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

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

Used for adjusting the analog signal from a load cell for torque compensation. For instructions on setting this parameter, see [Adjusting the Torque Compensation at Start on page 111](#).

No.	Parameter Name	Setting Range	Default
S3-30	Analog Input from Load Cell 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 an 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 ARB Torque Bias 1

Sets the position deviation level to active 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 ARB Torque Bias 1	0 to 32767	0

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

Determines the position deviation level for 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 ARB Torque Bias 2	0 to 32767	0

5.11 S: Elevator Parameters

■ S3-39: Anti-Rollback Integral Gain

Determines the drive's 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. If oscillation occurs, then lower S3-39. 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 than the movement detection level set to S3-40, then the drive will reduce the Anti-Rollback gain according to the gain reduction level set here.

No.	Parameter Name	Setting Range	Default
S3-41	Position Lock Gain at Start 2 Reduction	0.00 to 1.00	0.05

◆ S4: Rescue Operation

Rescue Operation switches to a backup battery or some other UPS during a power outage. For a detailed explanation, refer to [Rescue Operation on page 113](#).

■ S4-01: Light Load Direction Search Selection

Enables or disables the Light Load Direction Search.

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

0: Disabled

1: Enabled

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

0: Output current

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 a time limit for Light Load Direction Search.

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

0: Battery

1: UPS (single-phase)

2: UPS (3-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 (d1-25) 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

0: Disabled

1: Enabled until Light Load Direction Search is complete

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 800 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%

◆ S5: Short Floor Operation

■ 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 becomes short. In *Figure 5.39* below, area S indicates the distance for a stop from nominal speed.

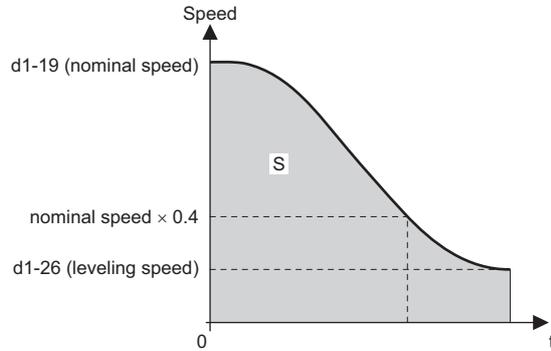
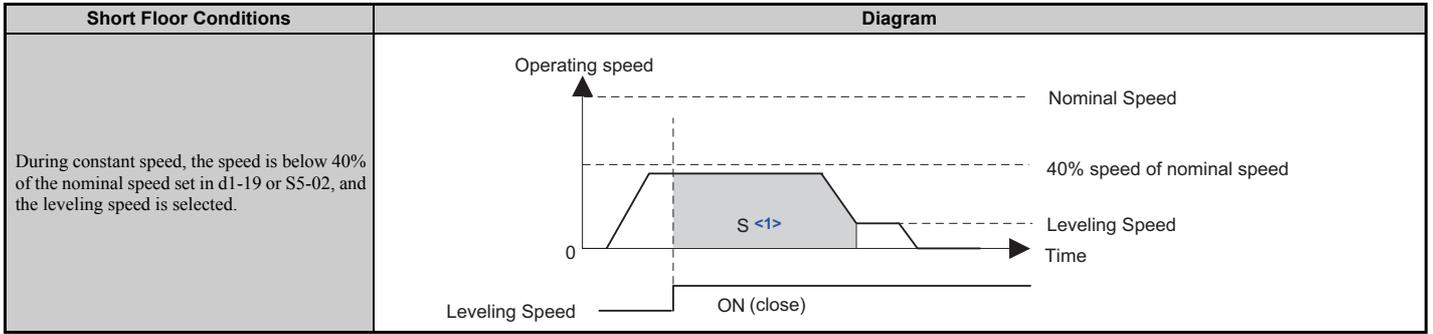


Figure 5.39 Speed During Normal Operation

Below, *Table 5.10* explains how Short Floor works.

Table 5.10 Short Floor Operation Example

Short Floor Conditions	Diagram
<p>During acceleration, the speed rises above 40% of the nominal speed set in d1-19 or S5-02, and the leveling speed is selected.</p>	
<p>During acceleration, the speed is below 40% of the nominal speed set in d1-19 or S5-02, and the leveling speed is selected.</p>	
<p>During constant speed, the speed is above 40% of the nominal speed set in d1-19 or S5-02, and the leveling speed is selected.</p>	



<1> The distance indicated by area S is the same in [Figure 5.39](#).

■ S5-01: Short Floor Operation Selection

Enables or disables the Short Floor function.

No.	Parameter Name	Setting Range	Default
S5-01	Short Floor Operation Selection	0 or 1	0

0: Disabled

1: Enabled

■ S5-02: Nominal Speed for Short Floor Calculation

When d1-18 (Speed Priority Selection) is set to 0 or 3, S5-02 determines the nominal speed used during Short Floor.

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

◆ S6: Faults for Elevator Applications

■ 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

0: Detect during stop, SE1 must be manually reset

1: Detect during stop, SE1 can be automatically reset

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 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

■ S6-04: 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

5.11 S: Elevator Parameters

■ 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 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 has the motor coast to stop. Parameter S6-10 determines the acceleration rate that triggers a fault. If set to 0.0 m/s², then overacceleration detection is essentially disabled.

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> Default setting is determined by parameter o1-03. If o1-03 is set to 0 through 5 then the default is 1.5 m/s². If the o1-03 is set to 6, then the default is 5.0 m/s².

■ S6-11: Overacceleration Detection Time

Sets the time for 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 over acceleration situation.

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

0: Always enabled

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

0: Disabled

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

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 on.

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. In order to use this function with the Safe Disable function parameter L8-88 must be set to 1.

◆ T: Motor Tuning

Auto-Tuning automatically sets and tunes parameters required for optimal motor performance. [Refer to Auto-Tuning on page 96](#) for details on Auto-Tuning parameters.

5.12 U: Monitor Parameters

Monitor parameters let the user view various aspects of drive performance using the digital operator display. Some monitors can be output from terminals FM and AM by assigning the specific monitor parameter number (U□-□□) to H4-01 and H4-04. *Refer to H4-01, H4-04: Terminal FM, AM Monitor Selection on page 180* for details on assigning functions to an analog output.

◆ U1: Operation Status Monitors

Status monitors display drive status data such as output speed and output current. Refer to *U1: Operation Status Monitors on page 330* for a complete list of U1-□□ monitors and descriptions.

◆ U2: Fault Trace

These monitor parameters are used to view the status of various drive aspects when a fault occurs.

This information is helpful for finding out why a fault occurred. Refer to *U2: Fault Trace on page 332* for a complete list of U2-□□ monitors and descriptions.

U2-□□ monitors are not reset when the drive is initialized. *Refer to o4-11: U2, U3 Initialization on page 208* for instructions on how to reset these monitor values.

◆ U3: Fault History

These parameters display faults that have occurred during operation as well as the drive operation time when those faults occurred. Refer to *U3: Fault History on page 333* for a complete list of U3-□□ monitors and descriptions.

U3-□□ monitors are not reset when the drive is initialized. *Refer to o4-11: U2, U3 Initialization on page 208* for instructions on how to reset these monitor values.

◆ U4: Maintenance Monitors

Maintenance monitors show:

- Runtime data of the drive and cooling fans, and number of Up/Down commands issued
- Maintenance data and replacement information for various drive components
- kWh data
- Highest peak current that has occurred and output speed at the time the peak current occurred
- Motor overload status information
- Detailed information about the present Up/Down command and speed reference source selection

Refer to U4: Maintenance Monitors on page 334 for a complete list of U4-□□ monitors and descriptions.

◆ U6: Control Monitors

Control monitors show:

- Reference data for the output voltage and vector control
- Data on PM motor rotor synchronization, forward phase compensation, and flux positioning
- Pulse data from the motor encoder
- Pulse data for Position Lock control
- Speed Loop and Inertia Compensation control monitors

Refer to *Figure 5.9* on page 147 for details and an illustration showing where monitors are located in the speed control loop block.



Troubleshooting

This chapter provides descriptions of the drive faults, alarms, errors, related displays, and guidance for troubleshooting.

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6.1 Section Safety

DANGER

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 any 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.

The internal capacitor remains charged even after the power supply is turned off.

Failure to comply can result in serious electric shock.

WARNING

Sudden Movement Hazard

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.

Electrical Shock Hazard

Do not operate equipment with covers removed.

Failure to comply could result in death or serious injury.

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

Always ground the motor-side grounding terminal.

Improper equipment grounding could result in death or serious injury by contacting the motor case.

Do not allow unqualified personnel to use 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.

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.

Do not remove covers or touch circuit boards while the power is on.

Failure to comply could result in death or serious injury.

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**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 drive input power before applying power.

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**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.

Never connect or disconnect the motor from the drive while the drive is outputting voltage.

Improper equipment sequencing could result in damage to the drive.

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.

Do not carelessly connect parts or devices to the drives braking transistor terminals.

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

Carefully review instruction manual TOBPC72060000 when connecting a braking option to the drive.

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 modification of the product made by the user.

Check all the wiring to ensure that all connections are correct after installing the drive and connecting other devices.

Failure to comply could result in damage to the drive.

6.2 Drive Alarms, Faults, and Errors

◆ Types of Alarms, Faults, and Errors

Check the digital operator for information about possible faults if the drive or motor fails to operate. *Refer to Using the Digital Operator on page 79.*

If problems occur that are not covered in this manual, contact the nearest Yaskawa representative with the following information:

- Drive model
- Software version
- Date of purchase
- Description of the problem

Table 6.1 contains descriptions of the various types of alarms, faults, and errors that may occur while operating the drive.

Contact Yaskawa in the event of drive failure.

Table 6.1 Types of Alarms, Faults, and Errors

Type	Drive Response
Faults	<p>When the drive detects a fault:</p> <ul style="list-style-type: none"> • The digital operator displays text that indicates the specific fault and the ALM indicator LED remains lit until the fault is reset. • The fault interrupts drive output and the motor coasts to a stop. • Some faults allow the user to select how the drive should stop when the fault occurs. • Fault output terminals MA-MC will close, and MB-MC will open. <p>The drive will remain inoperable until that fault has been cleared. <i>Refer to Fault Reset Methods on page 254.</i></p>
Minor Faults and Alarms	<p>When the drive detects an alarm or a minor fault:</p> <ul style="list-style-type: none"> • The digital operator displays text that indicates the specific alarm or minor fault, and the ALM indicator LED flashes. • The drive generally continues running the motor, although some alarms allow the user to select a stopping method when the alarm occurs. • One of the multi-function contact outputs closes if set to be tripped by a minor fault (H2- □□ = 10), but not by an alarm. • The digital operator displays text indicating a specific alarm and ALM indicator LED flashes. <p>To reset the a minor fault or alarm, remove whatever is causing the problem.</p>
Operation Errors	<p>When parameter settings conflict with one another or do not match hardware settings (such as with an option card), it results in an operation error. When the drive detects an operation error:</p> <ul style="list-style-type: none"> • The digital operator displays text that indicates the specific error. • Multi-function contact outputs do not operate. <p>The drive will not operate the motor until the error has been reset. Correct the settings that caused the operation error to clear the error.</p>
Tuning Errors	<p>Tuning errors occur while performing Auto-Tuning. When the drive detects a tuning error:</p> <ul style="list-style-type: none"> • The digital operator displays text indicating the specific error. • Multi-function contact outputs do not operate. • Motor coasts to stop. <p>Remove the cause of the error and repeat the Auto-Tuning process.</p>
Copy Function Errors	<p>These are the types of errors that can occur when using the optional digital operator or the USB Copy Unit to copy, read, or verify parameter settings.</p> <ul style="list-style-type: none"> • The digital operator displays text indicating the specific error. • Multi-function contact outputs do not operate. <p>Pressing any key on the operator will clear the fault. Find out what is causing the problem (such as model incompatibility) and try again.</p>

◆ Alarm and Error Displays

■ Faults

Table 6.2 gives an overview of possible fault codes. As conditions such as overvoltage can trip both a fault and an alarm, it is important to distinguish between faults and alarms in order to find the right corrective action.

When the drive detects a fault, the ALM indicator LEDs lights and the fault code appears on the display. The drive fault contact MA-MB-MC will be triggered. If the ALM LED blinks and the code appearing on the operator screen is flashes, then an alarm has been detected. See *Minor Faults and Alarms on page 226* for a list of alarm codes.

Table 6.2 Fault Displays (1)

Digital Operator Display	Name	Page	Digital Operator Display	Name	Page
boL	boL	229	FrL	FrL	232
bUS	bUS	229	GF	GF	232
CE	CE	229	LF	LF	233
CF	CF	229	LF2	LF2	233
CPF00, CPF01 <D>	CPF00, CPF01	229	oC	oC	233
CPF02	CPF02	229	oFA00	oFA00	233
CPF03	CPF03	230	oFA01	oFA01	234
CPF06	CPF06	230	oFA05, oFA06	oFA05, oFA06	234
CPF07, CPF08	CPF07, CPF08	230	oFA10, oFA11	oFA10, oFA11	234
CPF20, CPF21 <D>	CPF20, CPF21	230	oFA12 to oFA17	oFA12 to oFA17	234
CPF22	CPF22	230	oFA30 to oFA43	oFA30 to oFA43	234
CPF23	CPF23	230	oFb00	oFb00	234
CPF24	CPF24	230	oFb01	oFb01	234
CPF26 to CPF34	CPF26 to CPF34	230	oFb02	oFb02	234
dEv	dEv	230	oFb03, oFb11	oFb03, oFb11	234
dv1	dv1	231	oFb12 to oFb17	oFb12 to oFb17	234
dv2	dv2	231	oFC00	oFC00	234
dv3	dv3	231	oFC01	oFC01	234
dv4	dv4	231	oFC02	oFC02	235
dv6	dv6	231	oFC03, oFC11	oFC03, oFC11	235
dv7	dv7	231	oFC12 to oFC17	oFC12 to oFC17	235
dv8	dv8	232	oFC50	oFC50	235
EF0	EF0	232			
EF3 to EF8	EF3 to EF8	232			
Err	Err	232			

Table 6.3 Fault Displays (2)

Digital Operator Display		Name	Page	Digital Operator Display		Name	Page
<i>oFC51</i>	oFC51	Encoder Option Analog Circuit Error	235	<i>PGo</i>	PGo	Encoder Disconnected (for Control Mode with Encoder)	237
<i>oFC52</i>	oFC52	Encoder Communication Timeout	235	<i>PGoH</i>	PGoH	Encoder Disconnected (when using encoder)	237
<i>oFC53</i>	oFC53	Encoder Communication Data Error	235	<i>rr</i>	rr	Internal Braking Transistor Fault	237
<i>oFC54</i>	oFC54	Encoder Error	235	<i>SE1</i>	SE1	Motor Contactor Response Error	238
<i>oH</i>	oH	Heatsink Overheat	235	<i>SE2</i>	SE2	Starting Current Error	238
<i>oH1</i>	oH1	Heatsink Overheat	235	<i>SE3</i>	SE3	Output Current Error	238
<i>oL1</i>	oL1	Motor Overload	236	<i>SE4</i>	SE4	Brake Response Error	238
<i>oL2</i>	oL2	Drive Overload	236	<i>STo</i>	STo	Pull-Out Detection	238
<i>oL3</i>	oL3	Overtorque Detection 1	236	<i>SvE</i>	SvE	Position Lock Error	238
<i>oL4</i>	oL4	Overtorque Detection 2	236	<i>UL3</i>	UL3	Undertorque Detection 1	238
<i>oPr</i>	oPr	Operator Connection Fault	236	<i>UL4</i>	UL4	Undertorque Detection 2	238
<i>oS</i>	oS	Overspeed (for Control Mode with Encoder)	236	<i>Uv1</i>	Uv1	DC Bus Undervoltage	238
<i>ov</i>	ov	DC Bus Overvoltage	237	<i>Uv2</i>	Uv2	Control Power Supply Undervoltage	239
<i>PF</i>	PF	Input Phase Loss	237	<i>Uv3</i>	Uv3	Soft Charge Circuit Fault	239
<i>PF5</i>	PF5	Rescue Operation Power Supply Deterioration Error	237	<i>voF</i>	voF	Output Voltage Detection Error	239

<1> Displayed as *CPFD0* or *CPFD20* when occurring at drive power up. When one of the faults occurs after successfully starting the drive, the display will show *CPFD1* or *CPFD21*.

■ Minor Faults and Alarms

Table 6.4 give an overview of possible alarm codes. As conditions such as overvoltage can trip both a fault and alarm, it is important to distinguish between faults and alarms in order to find the right corrective action.

If an alarm is detected, the ALM LED will blink and the alarm code display flashes. The majority of alarms will trigger a digital output programmed for alarm output (H2-□□ = 10). If the ALM LED lights without blinking, this means that a fault has been detected (not an alarm). Information on fault codes can be found in [Faults on page 225](#).

Table 6.4 Minor Fault and Alarm Displays

Digital Operator Display		Name	Minor Fault Output (H2-□□ = 10)	Page
<i>AEr</i>	AEr	Node ID Setting Error (CANopen)	YES	240
<i>bb</i>	bb	Drive Baseblock	No output	240
<i>boL</i>	boL	Braking Transistor Overload	YES	240
<i>bUS</i>	bUS	Option Communication Error	YES	240
<i>CALL</i>	CALL	Serial Communication Stand By	YES	240
<i>CE</i>	CE	MEMOBUS/Modbus Communication Error	YES	241
<i>CrST</i>	CrST	Cannot Reset	YES	241
<i>dEv</i>	dEv	Speed Deviation (for Control Mode with Encoder)	YES	241
<i>EF</i>	EF	Up/Down Command Error	YES	241
<i>EF0</i>	EF0	Option Card External Fault	YES	241
<i>EF3 to EF8</i>	EF3 to EF8	External Fault (input terminal S3 to S8)	YES	241
<i>Hbb</i>	Hbb	Safe Disable	L8-88 = 0: YES L8-88 = 1: No (default)	242
<i>HbbF</i>	HbbF	Safe Disable Circuit Fault	L8-88 = 0: YES L8-88 = 1: No (default)	242
<i>HCA</i>	HCA	High Current Alarm	YES	242

Digital Operator Display		Name	Minor Fault Output (H2-□□ = 10)	Page
LT-1	LT-1	Cooling Fan Maintenance Time	No output <I>	242
LT-2	LT-2	Capacitor Maintenance Time	No output <I>	242
LT-3	LT-3	Soft Charge Bypass Relay Maintenance Time	No output <I>	242
LT-4	LT-4	IGBT Maintenance Time (90%)	No output <I>	242
oH	oH	Heatsink Overheat	YES	242
oL3	oL3	Overtorque Detection 1	YES	243
oL4	oL4	Overtorque Detection 2	YES	243
oS	oS	Overspeed (for Control Mode with Encoder)	YES	243
ov	ov	DC Bus Overvoltage	YES	243
PASS	PASS	MEMOBUS/Modbus Self Test Successful	No output	243
PGo	PGo	Encoder Disconnected (for Control Mode with Encoder)	YES	243
PGoH	PGoH	Encoder Disconnected (when using an encoder)	YES	243
SE	SE	MEMOBUS/Modbus Self Test Failed	YES	243
TrPC	TrPC	IGBT Maintenance Time (90%)	YES	244
UL3	UL3	Undertorque Detection 1	YES	244
UL4	UL4	Undertorque Detection 2	YES	244
Uv	Uv	Undervoltage	YES	244
voF	voF	Output Voltage Detection Error	YES	244

<I> Output when H2-□□ = 2F.

■ Operation Errors

Table 6.5 Operation Error Displays

Digital Operator Display		Name	Page	Digital Operator Display		Name	Page
oPE01	oPE01	Drive Capacity Setting Error	245	oPE07	oPE07	Multi-function Analog Input Selection Error	245
oPE02	oPE02	Parameter Setting Range Error	245	oPE08	oPE08	Parameter Selection Error	246
oPE03	oPE03	Multi-function Digital Input Setting Error	245	oPE10	oPE10	V/f Pattern Setting Error	246
oPE04	oPE04	Terminal Board Mismatch Error	245	oPE16	oPE16	Energy Saving Constants Error	246
oPE05	oPE05	Reference Source Selection Error	245	oPE18	oPE18	Parameter Setting Error	246
oPE06	oPE06	Control Mode Selection Error	245	oPE20	oPE20	PG-F3 Setting Error	246

■ Auto-Tuning Errors

Table 6.6 Auto-Tuning Error Displays

Digital Operator Display	Name	Page
<i>End1</i>	End1	Excessive V/f Setting 247
<i>End2</i>	End2	Motor Iron-Core Saturation Coefficient 247
<i>End3</i>	End3	Rated Current Setting Alarm 247
<i>End4</i>	End4	Adjusted Slip Calculation Error 247
<i>End5</i>	End5	Resistance Tuning Error 247
<i>End6</i>	End6	Leakage Inductance Alarm 247
<i>End7</i>	End7	No-Load Current Alarm 247
<i>End8</i>	End8	Rescue Operation Speed Warning 247
<i>End9</i>	End9	Rescue Operation Rotor Pole Position Search Warning 248
<i>End10</i>	End10	Rescue Operation Rotor Polarity Detection Warning 248
<i>Er-01</i>	Er-01	Motor Data Error 248
<i>Er-02</i>	Er-02	Alarm 248
<i>Er-03</i>	Er-03	STOP Key Pressed 248
<i>Er-04</i>	Er-04	Line-to-Line Resistance Error 248

Digital Operator Display	Name	Page
<i>Er-05</i>	Er-05	No-Load Current Error 248
<i>Er-08</i>	Er-08	Rated Slip Error 248
<i>Er-09</i>	Er-09	Acceleration Error 248
<i>Er-10</i>	Er-10	Motor Direction Error 249
<i>Er-11</i>	Er-11	Motor Speed Error 249
<i>Er-12</i>	Er-12	Current Detection Error 249
<i>Er-13</i>	Er-13	Leakage Inductance Error 249
<i>Er-18</i>	Er-18	Induction Voltage Error 249
<i>Er-19</i>	Er-19	Inductance Error 249
<i>Er-20</i>	Er-20	Stator Resistance Error 249
<i>Er-21</i>	Er-21	Encoder Offset Compensation Error 249
<i>Er-22</i>	Er-22	Initial Rotor Pole Search Error 250
<i>Er-23</i>	Er-23	Non-rotating Encoder Offset Tuning Warning 250

■ Errors and Displays When Using the Copy Function

Table 6.7 Copy Errors

Digital Operator Display	Name	Page
<i>CoPy</i>	CoPy	Writing parameter settings (flashing) 251
<i>CPeR</i>	CPeR	Control mode of the drive does not match 251
<i>CPyE</i>	CPyE	Error writing data 251
<i>CSEr</i>	CSEr	Error occurred in the copy function 251
<i>dFpS</i>	dFpS	Drive models do not match. 251
<i>End</i>	End	Task completed 251
<i>iFEr</i>	iFEr	Communication error 251
<i>ndAT</i>	ndAT	Model, voltage class, capacity, and/or control mode differ 251
<i>rdEr</i>	rdEr	Error reading data 252
<i>rEAd</i>	rEAd	Reading parameter settings (flashing) 252
<i>vAEr</i>	vAEr	Voltage class and/or drive capacity does not match 252
<i>vFyE</i>	vFyE	Parameter settings in the drive and those saved to the copy function are not the same 252
<i>vrFy</i>	vrFy	Comparing parameter settings (flashing) 252

6.3 Fault Detection

◆ Fault Displays, Causes, and Possible Solutions

Faults are detected for drive protection, and cause the drive to stop. When a fault occurs, the fault output terminal MA-MB-MC is triggered. Faults have to be cleared manually after removing the cause to start running the drive again.

Table 6.8 Detailed Fault Displays, Causes, and Possible Solutions

Digital Operator Display		Fault Name
<i>boL</i>	boL	Braking Transistor Overload
Cause		Possible Solution
The wrong braking resistor is installed.		<ul style="list-style-type: none"> Make sure the rating of the braking resistor fits drive and application. Use an external braking transistor if necessary.
Digital Operator Display		Fault Name
<i>bUS</i>	bUS	Option Communication Error
Cause		Possible Solution
No signal received from the PLC.		<ul style="list-style-type: none"> Check for faulty wiring. Correct the wiring. Check for disconnected cables and short circuits. Repair as needed.
Faulty communications wiring or a short circuit exists.		<ul style="list-style-type: none"> Check the various options available to minimize the effects of noise. Take steps to counteract noise in the control circuit, main circuit, and ground wiring. Ensure that other equipment such as switches or relays do not cause noise. Use surge suppressors if necessary. Use only recommended cables or other shielded line. Ground the shield on the controller side or on the drive input power side. Separate all communication wiring from drive power lines. Install an EMC noise filter to the drive power supply input.
A communications data error occurred due to noise.		<ul style="list-style-type: none"> Replace the option card if there are no problems with the wiring and the error continues to occur.
The option card is damaged.		<ul style="list-style-type: none"> The connector pins on the option card are not properly lined up with the connector pins on the drive. Reinstall the option card.
The option card is not properly connected to the drive.		
Digital Operator Display		Fault Name
<i>CE</i>	CE	MEMOBUS/Modbus Communication Error
Cause		Possible Solution
Faulty communications wiring or a short circuit exists.		<ul style="list-style-type: none"> Check for faulty wiring. Correct the wiring. Check for disconnected cables and short circuits. Repair as needed.
Communication data error occurred due to noise.		<ul style="list-style-type: none"> Check the various options available to minimize the effects of noise. Take steps to counteract noise in the control circuit, main circuit, and ground wiring. Use only recommended cables or other shielded line. Ground the shield on the controller side or on the drive input power side. Ensure that other equipment such as switches or relays do not cause noise and use surge suppressors if required. Separate all communication wiring from drive power lines. Install an EMC noise filter to the drive power supply input.
Digital Operator Display		Fault Name
<i>CF</i>	CF	Control Fault
Cause		Possible Solution
Motor parameters are not set properly.		Check the motor parameter settings and repeat Auto-Tuning.
Torque limit is too low.		Set the torque limit to the most appropriate setting (L7-01 through L7-04).
Load inertia is too big.		<ul style="list-style-type: none"> Adjust the deceleration ramp (C1-02, -04, -06, -08). Set the speed reference to the minimum value and interrupt the Up/Down command when the drive finishes decelerating.
Digital Operator Display		Fault Name
<i>CPF00</i> or <i>CPF01</i> </>	CPF00 or CPF01 </>	Control Circuit Error
Cause		Possible Solution
There is a self diagnostic error in control circuit.		<ul style="list-style-type: none"> Cycle power to the drive. If the problem continues, replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
Connector on the operator is damaged.		<ul style="list-style-type: none"> Replace the operator.
Digital Operator Display		Fault Name
<i>CPF02</i>	CPF02	A/D Conversion Error
Cause		Possible Solution
Control circuit is damaged.		<ul style="list-style-type: none"> An A/D conversion error or control circuit error occurred. Cycle power to the drive. If the problem continues, replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.

6.3 Fault Detection

Digital Operator Display		Fault Name
[PF03]	CPF03	Control Board Connection Error
Cause		Possible Solution
There is a connection error.		<ul style="list-style-type: none"> Turn the power off and check the connection between the control board and the drive. If the problem continues, replace the drive.
Drive fails to operate properly due to noise interference.		<ul style="list-style-type: none"> Check the various options available to minimize the effects of noise. Take steps to counteract noise in the control circuit, main circuit, and ground wiring. Use only recommended cables or other shielded line. Ground the shield on the controller side or on the drive input power side. Ensure that other equipment such as switches or relays do not cause noise and use surge suppressors if required. Separate all communication wiring from drive power lines. Install an EMC noise filter to the drive power supply input.
Digital Operator Display		Fault Name
[PF06]	CPF06	EEPROM Data Error
Cause		Possible Solution
There is an error in EEPROM control circuit.		<ul style="list-style-type: none"> Turn the power off and check the connection between the control board and the drive. If the problem continues, replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
The power supply was switched off when parameters were being saved to the drive.		Reinitialize the drive (A1-03).
Power to the control board was lost while writing parameter settings during Rescue Operation.		Reinitialize the drive (A1-03).
Digital Operator Display		Fault Name
[PF07]	CPF07	Terminal Board Connection Error
[PF08]	CPF08	
Cause		Possible Solution
There is a fault connection between the terminal board and control board.		<ul style="list-style-type: none"> Turn the power off and reconnect the control circuit terminal board. If the problem continues, replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
Digital Operator Display		Fault Name
[PF20] or [PF21 <>]	CPF20 or CPF21	Control Circuit Error
Cause		Possible Solution
Hardware is damaged.		<ul style="list-style-type: none"> Cycle power to the drive. If the problem continues, replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
Digital Operator Display		Fault Name
[PF22]	CPF22	A/D Conversion Error
Cause		Possible Solution
An A/D conversion error occurred in the power board circuit.		<ul style="list-style-type: none"> Cycle power to the drive. Refer to Diagnosing and Resetting Faults on page 253. If the problem continues, replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
Digital Operator Display		Fault Name
[PF23]	CPF23	Control Board Connection Error
Cause		Possible Solution
Hardware is damaged.		<ul style="list-style-type: none"> Turn the power off and check the connection between the control board and the drive. If the problem continues, replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
Digital Operator Display		Fault Name
[PF24]	CPF24	Drive Unit Signal Fault
Cause		Possible Solution
Hardware is damaged.		Replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
The drive capacity cannot be detected correctly (drive capacity is checked when the drive is powered up).		
Digital Operator Display		Fault Name
[PF26 to PF34]	CPF26 to CPF34	Control Circuit Error
Cause		Possible Solution
Hardware is damaged.		Replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
CPU error		
Digital Operator Display		Fault Name
dEv	dEv	Speed Deviation (for Control Mode with Encoder)
Cause		Possible Solution
Load is too heavy.		Reduce the load.
Accel/decel ramp is too short.		Shorten the acceleration and deceleration ramps set to the C1 parameters. (i.e., increase the accel/decel time)
The load is locked up.		Check the machine.
Parameters are not set appropriately.		Check the settings of parameters F1-10 and F1-11.
The motor brake is not applied.		Check if the brake really operates on a brake control command from the drive.

During Rescue Operation, either the DC bus voltage dropped below $S4-12 \times (S4-13 - 10\%)$, or 100 ms after triggering Rescue Operation, the DC bus voltage did not reach $S4-12 \times S4-13$ before the motor started.		<ul style="list-style-type: none"> Check the DC bus voltage setting for Rescue Operation (S4-12). Lower the speed reference set for Rescue Operation (d1-25). Check the backup power supply. It may need to be replaced with another UPS if it has become worn and can no longer provide enough power.
Digital Operator Display		Fault Name
$dU1$	dv1	Encoder Z Pulse Fault
Cause		Possible Solution
Encoder is not connected, not wired properly, or is damaged.		<ul style="list-style-type: none"> Make sure the encoder is properly connected and all shielded lines are properly grounded. If the problem continues after cycling power, then replace either the PG option card or the encoder itself.
Digital Operator Display		Fault Name
$dU2$	dv2	Encoder Z Pulse Phase Fault
Cause		Possible Solution
Noise interference along the encoder cable.		Separate the encoder cable lines from the source of the noise (very possibly drive output wiring).
Encoder cable is not wired properly.		Rewire the encoder and make sure all shielded lines are properly grounded.
PG option card or the encoder is damaged.		If the problem continues after cycling power, then replace either the PG option card or the encoder itself.
Digital Operator Display		Fault Name
$dU3$	dv3	Rotation Direction Fault
Cause		Possible Solution
The encoder offset is not set properly to E5-11.		Set the encoder offset to E5-11 as specified on the motor nameplate. Replacing the encoder or changing the motor/encoder rotation direction requires readjustment of the encoder offset.
An external force on the load side has caused the motor to move.		<ul style="list-style-type: none"> Make sure the motor is rotating in the right direction. Look for any problems on the load side that might be causing the motor to rotate in the opposite direction.
Noise interference along the encoder cable is disturbing the encoder signals.		Rewire the encoder and make sure all lines including shielded line are properly connected.
Encoder is disconnected, not wired properly, or the PG option card or the encoder itself is damaged.		
Rotational direction for the encoder set to F1-05 is the opposite of the order of the motor lines.		Make sure motor lines for each phase (U, V, W) are connected properly.
Digital Operator Display		Fault Name
$dU4$	dv4	Rotation Direction Fault
Cause		Possible Solution
The encoder offset is not set properly to E5-11.		<ul style="list-style-type: none"> Set the encoder offset to E5-11 as specified on the motor nameplate. If the problem continues after cycling power, then replace either the PG option card or the encoder itself. Replacing the encoder or changing the motor/encoder rotation direction requires readjustment of the encoder offset.
Noise interference along the encoder cable is disturbing the encoder signals.		<ul style="list-style-type: none"> Make sure the motor is rotating in the correct direction. Look for any problems on the load side that might be causing the motor to rotate in the opposite direction.
Encoder is disconnected, not wired properly, or the PG option card or the encoder itself is damaged.		<ul style="list-style-type: none"> Rewire the encoder and make sure all lines including shielded line are properly connected. If the problem continues after cycling power, then replace either the PG option card or the encoder itself.
Digital Operator Display		Fault Name
$dU5$	dv6	Overacceleration Detection
Cause		Possible Solution
The encoder offset (E5-11) is incorrect.		Set E5-11 to the encoder offset value written on the motor nameplate. The encoder offset needs to be adjusted whenever the encoder is replaced or when reversing the direction of the motor.
Noise along the encoder cable.		Check the encoder wiring for any loose connections. Make sure that the shielded line is properly grounded.
Cables for the motor encoder are not wired properly, or the PG option card (or the encoder itself) is damaged.		
Incorrect motor data has been set to the E5 parameters.		Check the values set to the E5 parameters to make sure that it matches the information on the motor nameplate.
Mechanical data for the elevator have not been set up correctly.		Check parameters o1-20, o1-21, and o1-22 and set them to the correct values for the elevator.
The acceleration is too fast.		Check and adjust the acceleration rate and also the jerk at acceleration start set in parameter C2-01.
Digital Operator Display		Fault Name
$dU7$	dv7	Rotor Polarity Detection Timeover
Cause		Possible Solution
Battery voltage is too low.		Charge the battery.
The output cable is disconnected.		<ul style="list-style-type: none"> Check for wiring errors and ensure the output cable is connected properly. Correct the wiring.
The motor winding is damaged.		<ul style="list-style-type: none"> Check the resistance between motor lines. Replace the motor if the winding is damaged.
The output terminal is loose.		Apply the tightening torque specified in this manual to fasten the terminals. <i>Refer to Wire Size and Torque Specifications on page 67.</i>

6.3 Fault Detection

Digital Operator Display		Fault Name
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.
Cause		Possible Solution
Motor characteristics have changed.		Repeat the setup process. Perform Stationary Auto-Tuning or Initial Pole Search Auto-Tuning.
Parameters that control Initial Pole Search are set incorrectly (set up may be incomplete).		
Parameters for the motor encoder are set to the wrong values (set up may be incomplete).		
Brake was released during Initial Pole Search or during power loss.		Check the brake sequence. The brake must remain applied during Initial Pole Search and whenever the power supply is interrupted.
Initial Pole Search cannot be performed on the motor being used.		Use a PG option card that is compatible with both L1000A and an absolute encoder.
Digital Operator Display		Fault Name
EF0	EF0	Option Card External Fault
		An external fault condition is present.
Cause		Possible Solution
An external fault was received from the PLC with other than F6-03 = 3 "alarm only" (the drive continued to run after external fault).		<ul style="list-style-type: none"> Remove the cause of the external fault. Remove the external fault input from the PLC.
Problem with the PLC program.		Check the PLC program and correct problems.
Digital Operator Display		Fault Name
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.
Cause		Possible Solution
An external device has tripped an alarm function.		Remove the cause of the external fault and reset the fault.
Wiring is incorrect.		<ul style="list-style-type: none"> Ensure the signal lines have been connected properly to the terminals assigned for external fault detection (H1-□□ = 20 to 2F). Reconnect the signal line.
Incorrect setting of multi-function contact inputs.		<ul style="list-style-type: none"> Check if the any unused terminals are set for H1-□□ = 20 to 2F (External Fault). Change the terminal settings.
Digital Operator Display		Fault Name
Err	Err	EEPROM Write Error
		Data cannot be written to the EEPROM.
Cause		Possible Solution
Noise has corrupted data while writing to the EEPROM.		<ul style="list-style-type: none"> Press the  button. Correct the parameter setting. Cycle power to the drive. Refer to Diagnosing and Resetting Faults on page 253. Replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
Hardware problem.		<ul style="list-style-type: none"> Replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
Digital Operator Display		Fault Name
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.
Cause		Possible Solution
Parameter d1-18 is set to 1, H1-□□ is not set to 53 and no speed was selected at start.		<ul style="list-style-type: none"> Make sure the selected speed selection method matches the elevator controller sequence. Check parameter d1-18 and H1-□□ settings. Make sure the elevator controller is connected properly. Make sure the elevator controller selects the speed properly.
Digital Operator Display		Fault Name
GF	GF	Ground Fault
		<ul style="list-style-type: none"> A current short to ground exceeded 50% of rated current on the output side of the drive. Setting L8-09 to 1 enables ground fault detection.
Cause		Possible Solution
Motor insulation is damaged.		<ul style="list-style-type: none"> Check the insulation resistance of the motor. Replace the motor.
A damaged motor cable is creating a short circuit.		<ul style="list-style-type: none"> Check the motor cable. Remove the short circuit and turn the power back on. Check the resistance between the cable and the ground terminal \oplus. Replace the cable.

The leakage current at the drive output is too high.	<ul style="list-style-type: none"> Reduce the carrier frequency. Reduce the amount of stray capacitance.
The drive started to run during a current offset fault or while coasting to a stop.	The value set exceeds the allowable setting range while the drive automatically adjusts the current offset (this happens only when attempting to restart a PM motor that is coasting to stop).
Hardware problem.	Replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
Digital Operator Display	Fault Name
$L F$	LF
Cause	Possible Solution
The output cable is disconnected.	<ul style="list-style-type: none"> Check for wiring errors and ensure the output cable is connected properly. Correct the wiring.
The motor winding is damaged.	<ul style="list-style-type: none"> Check the resistance between motor lines. Replace the motor if the winding is damaged.
The output terminal is loose.	<ul style="list-style-type: none"> Apply the tightening torque specified in this manual to fasten the terminals. <i>Refer to Wire Size and Torque Specifications on page 67.</i>
The rated current of the motor being used is less than 5% of the drive rated current.	Check the drive and motor capacities.
An output transistor is damaged.	Replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
A single-phase motor is being used.	The drive cannot operate a single phase motor.
Digital Operator Display	Fault Name
$L F 2$	LF2
Cause	Possible Solution
Phase loss has occurred on the output side of the drive.	<ul style="list-style-type: none"> Check for faulty wiring or poor connections on the output side of the drive. Correct the wiring.
Terminal wires on the output side of the drive are loose.	Apply the tightening torque specified in this manual to fasten the terminals. <i>Refer to Wire Size and Torque Specifications on page 67.</i>
The output circuit is damaged.	Replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
Motor impedance or motor phases are uneven.	<ul style="list-style-type: none"> Measure the line-to-line resistance for each motor phase. Ensure all values are the same. Replace the motor.
Digital Operator Display	Fault Name
$o C$	oC
Cause	Possible Solution
The motor has been damaged due to overheating or the motor insulation is damaged.	<ul style="list-style-type: none"> Check the insulation resistance. Replace the motor.
One of the motor cables has shorted out or there is a grounding problem.	<ul style="list-style-type: none"> Check the motor cables. Remove the short circuit and power the drive back up. Check the resistance between the motor cables and the ground terminal \oplus. Replace damaged cables.
The load is too heavy.	<ul style="list-style-type: none"> Measure the current flowing into the motor. Replace the drive with a larger capacity unit if the current value exceeds the rated current of the drive. Determine if there is sudden fluctuation in the current level. Reduce the load to avoid sudden changes in the current level or switch to a larger drive.
Accel/decel ramp is too fast.	<p>Calculate the amount of torque required for the desired acceleration and/or deceleration ramp relative to the inertia moment of the load.</p> <p>If the drive is not capable of producing that much torque in time, try the following setting changes:</p> <ul style="list-style-type: none"> Reduce the acceleration and/or deceleration ramp (i.e., increase the accel/decel time). Use a larger capacity drive.
The drive is attempting to operate a specialized motor or a motor larger than the maximum size allowed.	<ul style="list-style-type: none"> Check the motor capacity. Ensure that the rated capacity of the drive is greater than or equal to the capacity rating found on the motor nameplate.
Magnetic contactor (MC) on the output side of the drive has turned on or off.	Set up the operation sequence so that the MC is not tripped while the drive is outputting current.
V/f setting is not operating as expected.	<ul style="list-style-type: none"> Check the ratios between the voltage and frequency. Set parameter E1-04 through E1-10 appropriately. Lower the voltage if it is too high relative to the frequency.
Excessive torque compensation.	<ul style="list-style-type: none"> Check the amount of torque compensation. Reduce the torque compensation gain (C4-01) until there is no speed loss and less current.
Drive fails to operate properly due to noise interference.	<ul style="list-style-type: none"> Review the possible solutions provided for handling noise interference. Review the section on handling noise interference and check the control circuit lines, main circuit lines, and ground wiring.
The motor control method and motor do not match.	<ul style="list-style-type: none"> Check which motor control method the drive is set to (A1-02). For IM motors, set A1-02 = "0", "2", or "3". For PM motors, set A1-02 = "7".
The drives rated output current is too small.	Use a larger drive.
Digital Operator Display	Fault Name
$o F A 0 0$	oFA00
Cause	Possible Solution
The option card installed into port CN5-A is incompatible with the drive.	Check if the drive supports the option card that shall be installed. Contact Yaskawa for assistance.
A PG option card is connected to option port CN5-A	PG option cards are supported by option ports CN5-B and CN5-C only. Place the PG option card into the correct option port.

6.3 Fault Detection

Digital Operator Display		Fault Name
oFA01	oFA01	Option Card Connection Error
		Option not properly connected
Cause		Possible Solution
The option board connection to port CN5-A is faulty.		<ul style="list-style-type: none"> Turn the power off and reconnect the option card. Check if the option card is properly plugged into the option port. Make sure the card is fixed properly. If the option is not a communication option card, try to use the card in another option port. If it works there, replace the drive. If the error persists (oFb01 or oFC01 occur), replace the option card.
Digital Operator Display		Fault Name
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	
Cause		Possible Solution
Option card or hardware is damaged.		<ul style="list-style-type: none"> Cycle power to the drive. If the problem continues, replace the drive/option board. For instructions on replacing the drive/option board, contact Yaskawa or your nearest sales representative.
Digital Operator Display		Fault Name
oFb00	oFb00	Option Card Fault at Option Port CN5-B
		Option compatibility error
Cause		Possible Solution
The option card installed into port CN5-B is incompatible with the drive.		Check if the drive supports the option card that you are attempting to install. Contact Yaskawa for assistance.
A communication option card has been installed in option port CN5-B.		Communication option cards are supported by option port CN5-A only. More than one comm. option cannot be installed.
Digital Operator Display		Fault Name
oFb01	oFb01	Option Card Fault at Option Port CN5-B
		Option not properly connected
Cause		Possible Solution
The option board connection to port CN5-B is faulty.		<ul style="list-style-type: none"> Turn the power off and reconnect the option card. Check if the option card is properly plugged into the option port. Make sure the card is fixed properly. Try to use the card in another option port (in case of a PG option use port CN5-C). If option card still doesn't work there, replace the drive. If the error persists (oFA01 or oFC01 occur), replace the option board.
Digital Operator Display		Fault Name
oFb02	oFb02	Option Card Fault at Option Port CN5-B
		Same type of option card already connected
Cause		Possible Solution
An option card of the same type is already installed in option port CN5-A.		Except for PG options, each option card type can only be installed once. Make sure only one type of option card is connected.
An input option card is already installed in option port CN5-A.		Make sure that a comm. option or a digital input option is installed. The same type of card cannot be installed twice.
Digital Operator Display		Fault Name
oFb03 to oFb11	oFb03 to oFb11	Option card error occurred at Option Port CN5-B
oFb12 to oFb17	oFb12 to oFb17	
Cause		Possible Solution
Option card or hardware is damaged.		<ul style="list-style-type: none"> Cycle power to the drive. If the problem continues, replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
Digital Operator Display		Fault Name
oFC00	oFC00	Option Card Connection Error at Option Port CN5-C
		Option compatibility error
Cause		Possible Solution
The option card installed into port CN5-C is incompatible with the drive.		Check if the drive supports the option card you are attempting to instal. Contact Yaskawa for assistance.
A communication option card has been installed in option port CN5-C.		Communication option cards are supported by option port CN5-A only. More than one comm. option cannot be installed.
Digital Operator Display		Fault Name
oFC01	oFC01	Option Card Fault at Option Port CN5-C
		Option not properly connected
Cause		Possible Solution
The option board connection to port CN5-C is faulty.		<ul style="list-style-type: none"> Turn the power off and reconnect the option card. Check if the option card is properly plugged into the option port. Make sure the card is fixed properly. Try to use the card in another option port (in case of a PG option use port CN5-B). If it works there, replace the drive. If the error persists (oFA01 or oFb01 occur), replace the option board.

Digital Operator Display		Fault Name
oFC02	oFC02	Option Card Fault at Option Port CN5-C
		Same type of option card already connected
Cause		Possible Solution
An option card of the same type is already installed in option port CN5-A or CN5-B.		Except for PG options, each option card type can only be installed once. Make sure only one type of option card is connected.
An input option card is already installed in option port CN5-A or CN5-B.		Make sure that a comm. option, a digital input option, or an analog input option is installed. The same type of card cannot be installed twice.
Three PG option boards are installed.		Maximum two PG option boards can be used at the same time. Remove the PG option board installed into option port CN5-A.
Digital Operator Display		Fault Name
oFC03 to oFC11	oFC03 to oFC11	Option card error occurred at option port CN5-C
Cause		Possible Solution
Option card or hardware is damaged.		<ul style="list-style-type: none"> • Cycle power to the drive. • If the problem continues, replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
Digital Operator Display		Fault Name
oFC50	oFC50	Encoder Option AD Conversion Error
		Error with the A/D conversion level (VCC level), or A/D conversion timed out.
Cause		Possible Solution
The PG option card is damaged.		Replace the PG option card.
Digital Operator Display		Fault Name
oFC51	oFC51	Encoder Option Analog Circuit Error
		Incorrect signal level (+2.5 V signal)
Cause		Possible Solution
The PG option card is damaged.		Replace the PG option card.
Digital Operator Display		Fault Name
oFC52	oFC52	Encoder Communication Timeout
		Signal encoder timed out waiting to receive data
Cause		Possible Solution
Encoder cable wiring is wrong.		Correct the wiring.
Encoder cable is disconnected.		Reconnect the cable.
Digital Operator Display		Fault Name
oFC53	oFC53	Encoder Communication Data Error
		Serial encoder CRC checksum error
Cause		Possible Solution
Encoder cable wiring is wrong.		Correct the wiring.
Encoder cable is disconnected.		Reconnect the cable.
Digital Operator Display		Fault Name
oFC54	oFC54	Encoder Error
		Alarm reading EnDat absolute position data from encoder (OR flag from EnDat error for overvoltage, undervoltage, etc.)
Cause		Possible Solution
Power supply to encoder is wired incorrectly.		Correct the wiring.
The PG option card's power supply circuit is damaged.		Replace the PG option card.
Digital Operator Display		Fault Name
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).
Cause		Possible Solution
Surrounding temperature is too high.		<ul style="list-style-type: none"> • Check the temperature surrounding the drive. Verify temperature is within drive specifications. • Improve the air circulation within the enclosure panel. • Install a fan or air conditioner to cool the surrounding area. • Remove anything near the drive that might be producing excessive heat.
Load is too heavy.		<ul style="list-style-type: none"> • Measure the output current. • Decrease the load. • Lower the carrier frequency (C6-03).
Internal cooling fan is stopped.		<ul style="list-style-type: none"> • Replace the cooling fan. Refer to Cooling Fan Replacement on page 263. • After replacing the drive, reset the cooling fan maintenance parameter (o4-03 = 0).
Digital Operator Display		Fault Name
oH1	oH1	Heatsink Overheat
		The temperature of the heatsink exceeded the over temperature detection level.
Cause		Possible Solution
Surrounding temperature is too high.		<ul style="list-style-type: none"> • Check the temperature surrounding the drive. • Improve the air circulation within the enclosure panel. • Install a fan or air conditioner to cool the surrounding area. • Remove anything near the drive that might be producing excessive heat.
Load is too heavy.		<ul style="list-style-type: none"> • Measure the output current. • Lower the carrier frequency (C6-03). • Reduce the load.

6.3 Fault Detection

Digital Operator Display		Fault Name
oL1	oL1	Motor Overload
		The electronic motor overload protection tripped.
Cause		Possible Solution
Load is too heavy.		Reduce the load.
Cycle times are too short during acceleration and deceleration.		Lengthen the acceleration and deceleration ramps set to the C1 parameters. (i.e., increase the accel/decel time)
A general purpose motor is driven below the rated speed with too high load.		<ul style="list-style-type: none"> Reduce the load. Increase the speed. If the motor is supposed to operate at low speeds, either increase the motor capacity or use a motor specifically designed to operate in the desired speed range.
The output voltage is too high.		Adjust the user-set V/f patterns (E1-04 through E1-10). Parameters E1-08 and E1-10 may need to be reduced. Be careful not to lower E1-08 and E1-10 too much because this reduces load tolerance at low speeds.
The wrong motor rated current is set to E2-01.		<ul style="list-style-type: none"> Check the motor-rated current. Enter the value written on the motor nameplate to parameter E2-01.
The maximum output speed is set incorrectly.		<ul style="list-style-type: none"> Check the rated frequency indicated on the motor nameplate. Enter the rated frequency to E1-06 (Base Frequency).
The electrical thermal protection characteristics and motor overload characteristics do not match.		<ul style="list-style-type: none"> Check the motor characteristics. Correct the type of motor protection that has been selected (L1-01). Install an external thermal relay.
The drive's electrical thermal protection is operating at the wrong level.		<ul style="list-style-type: none"> Check the current rating listed on the motor nameplate. Check the value set for the motor rated current (E2-01).
Output current fluctuation due to input phase loss		Check the power supply for phase loss.
Digital Operator Display		Fault Name
oL2	oL2	Drive Overload
		The thermal sensor of the drive triggered overload protection.
Cause		Possible Solution
Load is too heavy.		Reduce the load.
Accel/decel ramp is too short.		Lengthen the acceleration and deceleration ramps set to the C1 parameters. (i.e., increase the accel/decel time)
The output voltage is too high.		<ul style="list-style-type: none"> Adjust the preset V/f pattern (E1-04 through E1-10). This will mainly involve reducing E1-08 and E1-10. Be careful not to lower E1-08 and E1-10 excessively because this reduces load tolerance at low speeds.
Drive capacity is too small.		Replace the drive with a larger model.
Overload occurred when operating at low speeds.		<ul style="list-style-type: none"> Reduce the load when operating at low speeds. Replace the drive with a model that is one frame size larger. Lower the carrier frequency (C6-03).
Excessive torque compensation.		Reduce the torque compensation gain (C4-01) until there is no speed loss but less current.
Output current fluctuation due to input phase loss		Check the power supply for phase loss.
Digital Operator Display		Fault Name
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).
Cause		Possible Solution
Parameter settings are not appropriate for the load.		Check the settings of parameters L6-02 and L6-03.
Fault on the machine side (e.g., machine is locked up).		Check the status of the load. Remove the cause of the fault.
Digital Operator Display		Fault Name
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).
Cause		Possible Solution
Parameter settings are not appropriate for the load.		Check the settings of parameters L6-05 and L6-06.
Digital Operator Display		Fault Name
oPr	oPr	Operator Connection Fault
		<ul style="list-style-type: none"> The external operator has been disconnected from the drive. Note: An oPr fault will occur when all of the following conditions are true: <ul style="list-style-type: none"> 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).
Cause		Possible Solution
External operator is not properly connected to the drive.		<ul style="list-style-type: none"> Check the connection between the operator and the drive. Replace the cable if damaged. Turn off the drive input power and disconnect the operator. Next reconnect the operator and turn the drive input power back on.
Digital Operator Display		Fault Name
oS	oS	Overspeed (for Control Mode with Encoder)
		The motor speed feedback exceeded the F1-08 setting.
Cause		Possible Solution
Overshoot is occurring.		<ul style="list-style-type: none"> Increase the settings for C5-01 (Speed Control Proportional Gain 1) and C5-02 (Speed Control Integral Time 1). If using a closed loop vector mode, enable Inertia Compensation.
Inappropriate parameter settings.		Check the setting for the overspeed detection level and the overspeed detection time (F1-08 and F1-09).

Digital Operator Display		Fault Name
OU	OV	DC Bus Overvoltage
		Voltage in the DC bus has exceeded the overvoltage detection level. <ul style="list-style-type: none"> For 200 V class: approximately 410 V For 400 V class: approximately 820 V
Cause		Possible Solution
Deceleration ramp is too short and regenerative energy is flowing from the motor into the drive.		<ul style="list-style-type: none"> Lengthen the deceleration ramp (C1-02, C1-04, C1-06, C1-08). Make sure the braking resistor rating/external braking transistor rating fits the application. If an external braking transistor is used, make sure it is connected properly and working as expected.
Fast acceleration ramp causes the motor to overshoot the speed reference.		<ul style="list-style-type: none"> Check if sudden drive acceleration triggers an overvoltage alarm. Increase the acceleration ramp (C1-01, C1-03, C1-05, C1-07). Increase the jerk setting in C2-02 (decrease if o1-03 > 3)
Surge voltage entering from the drive input power.		Install a DC reactor. Note: Voltage surge can result from a thyristor convertor and phase advancing capacitor using the same input power supply.
Ground fault in the output circuit causing the DC bus capacitor to overcharge.		<ul style="list-style-type: none"> Check the motor wiring for ground faults. Correct grounding shorts and turn the power back on.
Drive input power voltage is too high.		<ul style="list-style-type: none"> Check the voltage. Lower drive input power voltage within the limits listed in the specifications.
The braking transistor is wired incorrectly.		<ul style="list-style-type: none"> Check braking transistor wiring for errors. Properly rewire the braking resistor device.
Encoder cable is disconnected.		Reconnect the cable.
Encoder cable wiring is wrong.		Correct the wiring.
Noise interference along the encoder wiring.		Separate the wiring from the source of the noise (often the output lines from the drive).
Drive fails to operate properly due to noise interference.		<ul style="list-style-type: none"> Review the list of possible solutions provided for controlling noise. Review the section on handling noise interference and check the control circuit lines, main circuit lines, and ground wiring.
Motor hunting occurs.		<ul style="list-style-type: none"> Adjust the parameters that control hunting. Adjust the AFR time constant (n2-02 and n2-03).
Digital Operator Display		Fault Name
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).
Cause		Possible Solution
There is phase loss in the drive input power.		<ul style="list-style-type: none"> Check for wiring errors in the main circuit drive input power. Correct the wiring.
There is loose wiring in the drive input power terminals.		<ul style="list-style-type: none"> Ensure the terminals are tightened properly. Apply the tightening torque as specified in this manual. <i>Refer to Wire Gauges and Tightening Torque on page 59</i>
There is excessive fluctuation in the drive input power voltage.		<ul style="list-style-type: none"> Check the voltage from the drive input power. Review the possible solutions for stabilizing the drive input power.
There is poor balance between voltage phases.		<ul style="list-style-type: none"> Stabilize drive input power or disable phase loss detection.
The main circuit capacitors are worn.		<ul style="list-style-type: none"> Check the maintenance time for the capacitors (U4-05). Replace the drive if U4-05 is greater than 90%. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
		Check for anything problems with the drive input power. If drive input power appears normal but the alarm continues to occur, replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
Digital Operator Display		Fault Name
PF5	PF5	Rescue Operation Power Supply Deterioration Error
Cause		Possible Solution
During Rescue Operation, either the DC bus voltage dropped below S4-12 × (S4-13 - 10%), or 100 ms after triggering Rescue Operation, the DC bus voltage did not reach S4-12 × S4-13 before the motor started.		<ul style="list-style-type: none"> Check the DC bus voltage setting for Rescue Operation (S4-12). Lower the speed reference set for Rescue Operation (d1-25). Check the backup power supply. It may need to be replaced with another UPS if it has become worn and can no longer provide enough power.
Digital Operator Display		Fault Name
PGo	PGo	Encoder Disconnected (for Control Mode with Encoder)
		No encoder pulses are received for longer than the time set to F1-14.PGoH
Cause		Possible Solution
Encoder cable is disconnected.		Reconnect the cable.
Encoder cable wiring is wrong.		Correct the wiring.
Encoder has no power.		Check the power line to the encoder.
Motor brake is not released.		Ensure the motor brake releases properly.
During Rescue Operation, either the DC bus voltage dropped below S4-12 × (S4-13 - 10%), or 100 ms after triggering Rescue Operation, the DC bus voltage did not reach S4-12 × S4-13 before the motor started.		<ul style="list-style-type: none"> Check the DC bus voltage setting for Rescue Operation (S4-12). Lower the speed reference set for Rescue Operation (d1-25). Check the backup power supply. It may need to be replaced with another UPS if it has become worn and can no longer provide enough power.
Digital Operator Display		Fault Name
PGoH	PGoH	Encoder Disconnected (detected when using an encoder)
		Encoder cable is not connected properly.
Cause		Possible Solution
Encoder cable is disconnected.		Reconnect the cable.
Digital Operator Display		Fault Name
rr	rr	Braking Transistor Fault
		The built-in dynamic braking transistor failed.
Cause		Possible Solution
The braking transistor is damaged.		<ul style="list-style-type: none"> Cycle power to the drive and check if the fault reoccurs. <i>Refer to Diagnosing and Resetting Faults on page 253.</i>
The control circuit is damaged.		<ul style="list-style-type: none"> Replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.

6.3 Fault Detection

Digital Operator Display		Fault Name
SE1	SE1	Motor Contactor Response Error
		Motor contactor does not respond within the time set to S1-10 (Run Command Delay Time).
Cause		Possible Solution
There is a problem with the motor contactor or auxiliary switch.		Check the motor contactor, auxiliary switches and the wiring of the contactor feedback signal.
Digital Operator Display		Fault Name
SE2	SE2	Starting Current Error
		The output current was lower than 25% of the motor no-load current at start.
Cause		Possible Solution
The motor contactor is open.		Check the contactor for any problems.
Digital Operator Display		Fault Name
SE3	SE3	Output Current Error
		The output current was lower than 25% of the motor no-load current during operation.
Cause		Possible Solution
The motor contactor opened.		Check the contactor for any problems.
Digital Operator Display		Fault Name
SE4	SE4	Brake Feedback Error
		The input terminal set for "Brake feedback" (H1-□□ = 79) did not respond within the SE4 error time set to S6-05 after an output terminal set for "Brake release" (H2-□□ = 50) closed.
Cause		Possible Solution
The feedback contact on the brake is broken or the wiring is incorrect.		Check the brake feedback contact and the wiring.
The brake control circuit does not work properly.		Check if the brake really operates on a brake control command from the drive.
Digital Operator Display		Fault Name
STo	STo	Pull-Out Detection
		Motor pull out or step out has occurred. Motor has exceeded its pull-out torque.
Cause		Possible Solution
The motor parameters are incorrect.		Enter the correct data to all E5 parameters according to the test report provided for the motor.
Load is too heavy.		<ul style="list-style-type: none"> Reduce the load. Increase the motor or drive capacity.
Accel/decel ramp is too short.		<ul style="list-style-type: none"> Lengthen the acceleration and deceleration ramps set to the C1 parameters. (i.e., increase the accel/decel time) Increase the Jerk time set to C2-01
Digital Operator Display		Fault Name
SvE	SvE	Position Lock Error
		Position deviation during position lock.
Cause		Possible Solution
Torque limit is set too low.		Set the torque limit to an appropriate value using parameters L7-01 to L7-04.
Excessive load torque.		Reduce the amount of load torque.
Noise interference along encoder wiring.		Check the encoder signal for noise interference.
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).
Cause		Possible Solution
Parameter settings are not appropriate for the load.		Check the settings of parameters L6-02 and L6-03.
There is a fault on the machine side.		Check the load for any problems.
Digital Operator Display		Fault Name
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).
Cause		Possible Solution
Parameter settings are not appropriate for the load.		Check the settings of parameters L6-05 and L6-06.
There is a fault on the machine side.		Check the load for any problems.
Digital Operator Display		Fault Name
Uv1	Uv1	DC Bus Undervoltage
		One of the following conditions occurred while the drive was stopped: <ul style="list-style-type: none"> 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)
Cause		Possible Solution
Input power phase loss.		<ul style="list-style-type: none"> The main circuit drive input power is wired incorrectly. Correct the wiring.
One of the drive input power wiring terminals is loose.		<ul style="list-style-type: none"> Ensure there are no loose terminals. Apply the tightening torque specified in this manual to fasten the terminals. <i>Refer to Wire Gauges and Tightening Torque on page 59</i>
There is a problem with the voltage from the drive input power.		<ul style="list-style-type: none"> Check the voltage. Correct the voltage to be within the range listed in drive input power specifications. If there is no problem with the power supply to the main circuit, check for problems with the main circuit magnetic contactor.
The power has been interrupted.		Correct the drive input power.

The main circuit capacitors are worn.		<ul style="list-style-type: none"> • Check the maintenance time for the capacitors (U4-05). • Replace the drive if U4-05 exceeds 90%. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
The relay or contactor on the soft-charge bypass circuit is damaged.		<ul style="list-style-type: none"> • Cycle power to the drive and see if the fault reoccurs. • If the problem continues, replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative. • Check monitor U4-06 for the performance life of the soft-charge bypass. • Replace the drive if U4-06 exceeds 90%. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
Digital Operator Display		Fault Name
$Uv2$	Uv2	Control Power Supply Undervoltage
Cause		Possible Solution
Control power supply wiring is damaged.		<ul style="list-style-type: none"> • Cycle power to the drive. Check if the fault reoccurs. • If the problem continues, replace the drive.
Internal circuitry is damaged.		<ul style="list-style-type: none"> • Cycle power to the drive. Check if the fault reoccurs. • If the problem continues, replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
Digital Operator Display		Fault Name
$Uv3$	Uv3	Soft-Charge Bypass Circuit Fault
Cause		Possible Solution
The relay or contactor on the soft-charge bypass circuit is damaged.		<ul style="list-style-type: none"> • Cycle power to the drive and see if the fault reoccurs. • If the problem continues, replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative. • Check monitor U4-06 for the performance life of the soft-charge bypass. • Replace the drive if U4-06 exceeds 90%. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
Digital Operator Display		Fault Name
voF	voF	Output Voltage Detection Error
Cause		Possible Solution
Hardware is damaged.		Replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.

<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 $CPF21$.

6.4 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. [Refer to Minor Faults and Alarms on page 226](#) for information on alarm that trigger an alarm output.

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 6.9 Alarm Codes, Causes, and Possible Solutions

Digital Operator Display		Minor Fault Name
<i>AEr</i>	AEr	Communication Option Node ID Setting Error (CANopen)
Cause		Possible Solutions
Station number is set outside the possible setting range.		Set parameter F6-35 to the proper value if a CANopen option card is used.
Digital Operator Display		Minor Fault Name
<i>bb</i>	bb	Baseblock
Cause		Possible Solutions
External baseblock signal was entered via one of the multi-function input terminals (S3 to S8).		Check external sequence and baseblock signal input timing.
Digital Operator Display		Minor Fault Name
<i>boL</i>	boL	Braking Transistor Overload
Cause		Possible Solutions
The proper braking resistor has not been installed.		Select the optimal braking resistor.
Digital Operator Display		Minor Fault Name
<i>bUS</i>	bUS	Option Communication Error
Cause		Possible Solutions
Connection is broken or master controller stopped communicating.		<ul style="list-style-type: none"> Check for faulty wiring. Correct the wiring. Check for disconnected cables and short circuits. Repair as needed.
Option card is damaged.		If there are no problems with the wiring and the fault continues to occur, replace the option card.
The option card is not properly connected to the drive.		<ul style="list-style-type: none"> The connector pins on the option card are not properly lined up with the connector pins on the drive. Reinstall the option card.
A data error occurred due to noise.		<ul style="list-style-type: none"> Check options available to minimize the effects of noise. Take steps to counteract noise in the control circuit wiring, main circuit lines and ground wiring. Try to reduce noise on the controller side. Use surge absorbers on magnetic contactors or other equipment causing the disturbance. Use recommended cables or some other type of shielded line. Ground the shield to the controller side or on the input power side. All wiring for comm. devices should be separated from drive input power lines. Install an EMC noise filter to the drive input power.
Digital Operator Display		Minor Fault Name
<i>CALL</i>	CALL	Serial Communication Stand By
Cause		Possible Solutions
Communications wiring is faulty, there is a short circuit, or something is not connected properly.		<ul style="list-style-type: none"> Check for wiring errors. Correct the wiring. Check for disconnected cables and short circuits. Repair as needed.
Programming error on the master side.		Check communications at start-up and correct programming errors.
Communications circuitry is damaged.		<ul style="list-style-type: none"> Perform a self-diagnostics check. If the problem continues, replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
Termination resistor setting is incorrect.		A termination resistor must be installed at both ends of a communication line. Slave drives must have the internal termination resistor switch set correctly. Place DIP switch S2 to the ON position.

Digital Operator Display		Minor Fault Name
<i>CE</i>	CE	MEMOBUS/Modbus Communication Error Control data was not received correctly for two seconds.
Cause		Possible Solutions
A data error occurred due to noise.		<ul style="list-style-type: none"> Check options available to minimize the effects of noise. Take steps to counteract noise in the control circuit wiring, main circuit lines, and ground wiring. Reduce noise on the controller side. Use surge absorbers for the magnetic contactors or other components that may be causing the disturbance. Use only recommended shielded line. Ground the shield on the controller side or on the drive input power side. Separate all wiring for comm. devices from drive input power lines. Install an EMC noise filter to the drive input power supply.
Communication protocol is incompatible.		<ul style="list-style-type: none"> Check the H5 parameter settings as well as the protocol setting in the controller. Ensure settings are compatible.
The CE detection time (H5-09) is set shorter than the time required for a communication cycle to take place.		<ul style="list-style-type: none"> Check the PLC. Change the software settings in the PLC. Set a longer CE detection time (H5-09).
Incompatible PLC software settings or there is a hardware problem.		<ul style="list-style-type: none"> Check the PLC. Remove the cause of the error on the controller side.
Communications cable is disconnected or damaged.		<ul style="list-style-type: none"> Check the connector to make sure the cable has a signal. Replace the communications cable.
Digital Operator Display		Minor Fault Name
<i>CrST</i>	CrST	Cannot Reset
Cause		Possible Solutions
A fault reset command was entered while the Up/Down command was still present.		<ul style="list-style-type: none"> Ensure that a Up/Down command cannot be entered from the external terminals or option card during fault reset. Turn off the Up/Down command.
Digital Operator Display		Minor Fault Name
<i>dEv</i>	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.
Cause		Possible Solutions
Load is too heavy		Reduce the load.
Accel/decel ramp is too short.		Shorten the acceleration and deceleration ramps set to the C1 parameters. (i.e., increase the accel/decel time)
The load is locked up.		Check the machine.
Parameter settings are inappropriate.		Check the settings of parameters F1-10 and F1-11.
The motor brake is not applied.		Check if the brake really operates on a brake control command from the drive.
Digital Operator Display		Minor Fault Name
<i>EF</i>	EF	Up/Down Command Error Both forward run and reverse run closed simultaneously for over 0.5 s.
Cause		Possible Solutions
Sequence error		Check the forward and reverse command sequence and correct the problem. Note: When minor fault EF detected, motor ramps to stop.
Digital Operator Display		Minor Fault Name
<i>EF0</i>	EF0	Option Card External Fault An external fault condition is present.
Cause		Possible Solutions
An external fault was received from the PLC with F6-03 = 3 (causing the drive to continue running when an external fault occurs).		<ul style="list-style-type: none"> Remove the cause of the external fault. Remove the external fault input from the PLC.
There is a problem with the PLC program.		Check the PLC program and correct problems.
Digital Operator Display		Minor Fault Name
<i>EF3</i>	EF3	External fault (input terminal S3) External fault at multi-function input terminal S3.
<i>EF4</i>	EF4	External fault (input terminal S4) External fault at multi-function input terminal S4.
<i>EF5</i>	EF5	External fault (input terminal S5) External fault at multi-function input terminal S5.
<i>EF6</i>	EF6	External fault (input terminal S6) External fault at multi-function input terminal S6.
<i>EF7</i>	EF7	External fault (input terminal S7) External fault at multi-function input terminal S7.
<i>EF8</i>	EF8	External fault (input terminal S8) External fault at multi-function input terminal S8.
Cause		Possible Solutions
An external device has tripped an alarm function.		Remove the cause of the external fault and reset the multi-function input value.
Wiring is incorrect.		<ul style="list-style-type: none"> Ensure the signal lines have been connected properly to the terminals assigned for external fault detection (H1-□□ = 20 to 2F). Reconnect the signal line.
Multi-function contact inputs are set incorrectly.		<ul style="list-style-type: none"> Check if the unused terminals have been set for H1-□□ = 20 to 2F (External Fault). Change the terminal settings.

6.4 Alarm Detection

Digital Operator Display		Minor Fault Name
Hbb	Hbb	Safe Disable
Cause		Possible Solutions
Both Safe Disable Inputs H1 and H2 are open.		<ul style="list-style-type: none"> Check signal status at the input terminals H1 and H2. Check the Sink/Source Selection for the digital inputs. If the Safe Disable function is not utilized, check if the terminals H1-HC, and H2-HC are linked.
Internally, both Safe Disable channels are broken.		Replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
Digital Operator Display		Minor Fault Name
HbbF	HbbF	Safe Disable Circuit Fault
Cause		Possible Solutions
The signals to the Safe Disable inputs are wrong or the wiring is incorrect.		Check signal status at the input terminals H1 and H2. If the Safe Disable function is not utilized, the terminals H1-HC, and H2-HC must be linked.
One of the Safe Disable channels is faulty.		Replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
Digital Operator Display		Minor Fault Name
HcA	HCA	High Current Alarm
Cause		Possible Solutions
Load is too heavy.		Either reduce the load for applications with repetitive operation (repetitive stops and starts, etc.), or replace the drive.
Accel/decel ramp is too short.		Calculate the amount of torque required for the desired acceleration and/or deceleration ramp relative to the inertia moment of the load. If the drive is not capable of producing that much torque in time, try the following setting changes: <ul style="list-style-type: none"> Lengthen the acceleration and/or deceleration ramp (i.e., increase the accel/decel time). Use a larger capacity drive.
A special-purpose motor is being used, or the drive is attempting to run a motor greater than the maximum allowable capacity.		<ul style="list-style-type: none"> Check the motor capacity. Use a motor appropriate for the drive. Ensure the motor is within the allowable capacity range.
The current level increased due to a momentary power loss or while attempting to perform a fault restart.		The alarm will appear only briefly. There is no need to take action to prevent the alarm from occurring in such instances.
Digital Operator Display		Minor Fault Name
Lf-1	LT-1	Cooling Fan Maintenance Time
Cause		Possible Solutions
The cooling fan has reached 90% of its expected performance life.		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. Replace the cooling fan and reset the Maintenance Monitor by setting o4-03 to 0.
Digital Operator Display		Minor Fault Name
Lf-2	LT-2	Capacitor Maintenance Time
Cause		Possible Solutions
The main circuit and control circuit capacitors have reached 90% of their expected performance life.		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. Replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
Digital Operator Display		Minor Fault Name
Lf-3	LT-3	Soft Charge Bypass Relay Maintenance Time
Cause		Possible Solutions
The DC bus soft charge relay has reached 90% of their expected performance life.		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. Replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
Digital Operator Display		Minor Fault Name
Lf-4	LT-4	IGBT Maintenance Time (90%)
Cause		Possible Solutions
IGBTs have reached 50% of their expected performance life.		IGBTs have reached 90% of their expected performance life. Note: An alarm output (H2-□□ = 10) will only be triggered if H2-□□ = 2F. Check the load, carrier frequency, and output speed.
Digital Operator Display		Minor Fault Name
oH	oH	Heatsink Overheat
Cause		Possible Solutions
Surrounding temperature is too high		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). <ul style="list-style-type: none"> Check the surrounding temperature. Improve the air circulation within the enclosure panel. Install a fan or air conditioner to cool surrounding area. Remove anything near drive that may cause extra heat.
Internal cooling fan has stopped.		<ul style="list-style-type: none"> Replace the cooling fan. Refer to Cooling Fan Replacement on page 263. After replacing the drive, reset the cooling fan maintenance parameter to (o4-03 = "0").

Airflow around the drive is restricted.		<ul style="list-style-type: none"> Provide proper installation space around the drive as indicated in the manual. <i>Refer to Installation Orientation and Spacing on page 38.</i> Allow for the specified space and ensure that there is sufficient circulation around the control panel. Check for dust or foreign materials clogging cooling fan. Clear debris caught in the fan that restricts air circulation.
Digital Operator Display		Minor Fault Name
$oL3$	oL3	Overtorque Detection 1
Cause		Possible Solutions
Inappropriate parameter settings.		Check parameters L6-02 and L6-03.
There is a fault on the machine side (e.g., the machine is locked up).		<ul style="list-style-type: none"> Check the status of the machine. Remove the cause of the fault.
Digital Operator Display		Minor Fault Name
$oL4$	oL4	Overtorque Detection 2
Cause		Possible Solutions
Parameter settings are not appropriate.		Check parameters L6-05 and L6-06.
There is a fault on the machine side (e.g., the machine is locked up).		<ul style="list-style-type: none"> Check the status of the machine being used. Remove the cause of the fault.
Digital Operator Display		Minor Fault Name
oS	oS	Overspeed (for Control Mode with Encoder)
Cause		Possible Solutions
Inappropriate parameter settings.		Check the setting for the overspeed detection level and the overspeed detection time (F1-08 and F1-09).
Digital Operator Display		Minor Fault Name
ov	ov	DC Bus Overvoltage
Cause		Possible Solutions
Surge voltage present in the drive input power.		<ul style="list-style-type: none"> Install a DC reactor or an AC reactor. Voltage surge can result from a thyristor convertor and a phase advancing capacitor operating on the same drive input power system.
The motor is short-circuited.		<ul style="list-style-type: none"> Check the motor power cable, relay terminals and motor terminal box for short circuits. Correct grounding shorts and turn the power back on.
Ground current has over-charged the main circuit capacitors via the drive input power.		
Noise interference causes the drive to operate incorrectly.		<ul style="list-style-type: none"> Review possible solutions for handling noise interference. Review section on handling noise interference and check control circuit lines, main circuit lines and ground wiring. If the magnetic contactor is identified as a source of noise, install a surge protector to the MC coil.
Encoder cable is disconnected.		Reconnect the cable.
Encoder cable wiring is wrong.		Correct the wiring.
Noise interference along encoder wiring.		Separate encoder wiring from the source of the noise (often output wiring from the drive).
Digital Operator Display		Minor Fault Name
$PASS$	PASS	MEMOBUS/Modbus Self Test Successful
Cause		Possible Solutions
MEMOBUS/Modbus test has finished normally.		This verifies that the test was successful.
Digital Operator Display		Minor Fault Name
PGo	PGo	Encoder Disconnected (for Control Mode with Encoder)
Cause		Possible Solutions
Encoder cable is disconnected.		Reconnect the cable.
Encoder cable wiring is wrong.		Correct the wiring.
Encoder does not have enough power.		Make sure the correct power supply is properly connected to the encoder.
Motor brake is not released.		Ensure the brake releases properly
Digital Operator Display		Minor Fault Name
$PGoH$	PGoH	Encoder Disconnected (detected when using an encoder)
Cause		Possible Solutions
Encoder cable is disconnected.		Reconnect the cable.
Digital Operator Display		Minor Fault Name
SE	SE	MEMOBUS/Modbus Self Test Failed
Cause		Possible Solutions
A digital input set to 67H (MEMOBUS/Modbus test) was closed while the drive was running.		Stop the drive and run the test again.

6.4 Alarm Detection

Digital Operator Display		Minor Fault Name
FrPc	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).
Cause		Possible Solutions
IGBTs have reached 90% of their expected performance life.		Replace the drive.
Digital Operator Display		Minor Fault Name
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.
Cause		Possible Solutions
Inappropriate parameter settings.		Check parameters L6-02 and L6-03.
Load has dropped or decreased significantly.		Check for broken parts in the transmission system.
Digital Operator Display		Minor Fault Name
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.
Cause		Possible Solutions
Inappropriate parameter settings.		Check parameters L6-05 and L6-06.
The load has dropped or decreased significantly.		Check for broken parts in the transmission system.
Digital Operator Display		Minor Fault Name
Uu	Uv	Undervoltage
		One of the following conditions was true when the drive was stopped and a Up/Down command was entered: <ul style="list-style-type: none"> 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.
Cause		Possible Solutions
Phase loss in the drive input power.		Check for wiring errors in the main circuit drive input power. Correct the wiring.
Loose wiring in the drive input power terminals.		<ul style="list-style-type: none"> Ensure the terminals have been properly tightened. Apply the tightening torque to the terminals as specified. <i>Refer to Wire Gauges and Tightening Torque on page 59</i>
There is a problem with the drive input power voltage.		<ul style="list-style-type: none"> Check the voltage. Lower the voltage of the drive input power so that it is within the limits listed in the specifications.
Drive internal circuitry is worn.		<ul style="list-style-type: none"> Check the maintenance time for the capacitors (U4-05). Replace the drive if U4-05 exceeds 90%. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
The drive input power transformer is too small and voltage drops when the power is switched on.		<ul style="list-style-type: none"> Check for an alarm when the magnetic contactor, line breaker, and leakage breaker are closed. Check the capacity of the drive input power transformer.
Air inside the drive is too hot.		<ul style="list-style-type: none"> Check the temperature inside the drive.
The CHARGE light is broken or disconnected.		Replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
Digital Operator Display		Minor Fault Name
UoF	voF	Output Voltage Detection Error
		There is a problem with the output voltage.
Cause		Possible Solutions
Hardware is damaged.		Replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.

6.5 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 oPE Codes, Causes, and Possible Solutions on page 245* for the appropriate action. When an oPE appears on the operator display, press the ENTER button to view U1-18 and see the parameter that is causing the oPE error (U1-18).

Table 6.10 oPE Codes, Causes, and Possible Solutions

Digital Operator Display		Error Name
	oPE01	Drive Capacity Setting Fault
Cause		Possible Solutions
The drive model selection (o2-04) and the actual capacity of the drive are not the same.		Correct the value set to o2-04.
Digital Operator Display		Error Name
	oPE02	Parameter Range Setting Error
Cause		Possible Solutions
Parameters were set outside the possible setting range.		Set poPE04arameters to the proper values.
Note: When multiple errors occur at the same time, other errors are given precedence over oPE02.		
Digital Operator Display		Error Name
	oPE03	Multi-function Digital Input Selection Error
Cause		Possible Solutions
<ul style="list-style-type: none"> The same function is assigned to two multi-function inputs. Excludes "Not used" and "External Fault." 		<ul style="list-style-type: none"> Ensure all multi-function inputs are assigned to different functions. Re-enter the multi-function settings to ensure this does not occur.
Emergency Stop N.O. and Emergency Stop N.C. (15 vs. 17) were selected at the same time		Check for contradictory settings assigned to the multi-function input terminals at the same time. Correct setting errors.
Digital Operator Display		Error Name
	oPE04	Terminal Board Mismatch Error
Cause		Possible Solutions
The drive, control board, or terminal board has been replaced and the parameter settings between the control board and the terminal board no longer match.		To load the parameter settings to the drive that are stored in the terminal board, set A1-03 to 5550. Initialize parameters after drive replacement by setting A1-03 to 2220.
Digital Operator Display		Error Name
	oPE05	Reference Source Selection Error
Cause		Possible Solutions
Speed reference is assigned to an option card (b1-01 = 3) but an input option card is not connected to the drive.		Reconnect the input option card to the drive.
The Up/Down command is assigned to an option card (b1-02 = 3) but an input option card is not connected to the drive.		
Although the digital card input is set for BCD special for a 5 digit input (F3-01 = 6), the data length is set for 8 bit or 12 bit (F3-03 = 0, 1).		Set the input data for 16 bit (F3-03 = 2).
Digital Operator Display		Error Name
	oPE06	Control Mode Selection Error
Cause		Possible Solutions
A control mode has been selected that requires a PG option card to be installed, but no option card is installed (A1-02 = 3 or 7).		<ul style="list-style-type: none"> Connect a PG option card. Correct the value set to A1-02.
Digital Operator Display		Error Name
	oPE07	Multi-function Analog Input Selection Error
Cause		Possible Solutions
At least two analog input terminals are set to the same function (i.e., two of these parameters has the same setting: H3-02 or H3-10).		Change the settings to H3-02 and H3-10 so that functions no longer conflict. Note: Both 0 (speed reference bias) and F (not used) can be set to H3-02 and H3-10 at the same time.

6.5 Operator Programming Errors

Digital Operator Display		Error Name
oPE08	oPE08	Parameter Selection Error
		A function has been set that cannot be used in the motor control method selected.
Cause		Possible Solutions
Attempted to use a function that is not valid for the selected control mode.		Check the motor control method and the functions available.
In Open Loop Vector Control, n2-02 is greater than n2-03		Correct parameter settings so that n2-02 is less than n2-03.
b1-14 (Phase Order Selection) is set to 1 (Switch phase order) when in using a PG option card.		Correct the parameter settings.
Note: Use U1-18 to find which parameters are set outside the specified setting range. Other errors are given precedence over oPE08 when multiple errors occur at the same time.		
Digital Operator Display		Error Name
oPE10	oPE10	V/f Pattern Setting Error
		The following setting errors have occurred where: <ul style="list-style-type: none"> 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.
Cause		Possible Solutions
—		Correct the settings for E1-04, E1-06, E1-07, E1-09, and E1-11.
Digital Operator Display		Error Name
oPE16	oPE16	Energy Savings Constants Error
		Possible Solutions
Cause		Possible Solutions
Energy saving coefficients are out of the allowable range.		Check and correct the motor data in E5 parameters.
Digital Operator Display		Error Name
oPE18	oPE18	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).
Cause		Possible Solutions
S3-29 and S3-30 are set to the same value, meaning that the input from load cell with load condition 1 (S3-29) is set to the same value as load condition 2 (S3-30).		Correct the values set to S3-29 and S3-30.
Digital Operator Display		Error Name
oPE20	oPE20	PG-F3 Setting Error
		The encoder signal frequency is too high.
Cause		Possible Solutions
With the entered encoder resolution (F1-01), maximum output frequency (E1-04) and motor pole number (E5-04) the calculation encoder signal frequency exceeds 50 kHz (with PG-F3 option) or 20 kHz (with PG-E3 option).		<ul style="list-style-type: none"> Set F1-01 to the correct encoder resolution. Reduce the drive's maximum output frequency set to E1-04 so that the encoder signal frequency at maximum speed is lower than 50 kHz.

6.6 Auto-Tuning Fault Detection

Auto-Tuning faults are shown below. When the following faults are detected, the fault is displayed on the digital operator and the motor coasts to a stop. Auto-Tuning faults do not trigger an multi-function terminal set for fault or alarm output.

An End□ error indicates that although Auto-Tuning has completely successful, there is some discrepancy in the calculations the drive made. If an End□ error occurs, check for what might be causing the error using the table below, and perform Auto-Tuning again once the problem has been taken care of. If there appears to be no problem despite the End□ error being displayed, go ahead and start the application.

◆ Auto-Tuning Codes, Causes, and Possible Solutions

Table 6.11 Auto-Tuning Codes, Causes, and Possible Solutions

Digital Operator Display		Error Name
E_{nd1}	End1	Excessive V/f Setting (detected only during Rotational Auto-Tuning, and displayed after Auto-Tuning is complete)
Cause		Possible Solutions
The torque reference exceeded 20% during Auto-Tuning.		<ul style="list-style-type: none"> • Before Auto-Tuning the drive, verify the information written on the motor nameplate and enter that data to T1-03 through T1-05. • Enter proper information to parameters T1-03 to T1-05 and repeat Auto-Tuning.
The results from Auto-Tuning the no-load current exceeded 80%.		
Digital Operator Display		Error Name
E_{nd2}	End2	Motor Iron-Core Saturation Coefficient (detected only during Rotational Auto-Tuning and displayed after Auto-Tuning is complete)
Cause		Possible Solutions
Motor data entered during Auto-Tuning was incorrect.		<ul style="list-style-type: none"> • Make sure the data entered to the T1 parameters match the information written on the motor nameplate. • Restart Auto-Tuning and enter the correct information.
Results from Auto-Tuning are outside the parameter setting range, assigning the iron-core saturation coefficient (E2-07, E2-08) a temporary value.		Check and correct faulty motor wiring.
Digital Operator Display		Error Name
E_{nd3}	End3	Rated Current Setting Alarm (displayed after Auto-Tuning is complete)
Cause		Possible Solutions
The correct current rating printed on the nameplate was not entered into T1-04.		<ul style="list-style-type: none"> • Check the setting of parameter T1-04. • Check the motor data and repeat Auto-Tuning.
Digital Operator Display		Error Name
E_{nd4}	End4	Adjusted Slip Calculation Error
Cause		Possible Solutions
The slip that was calculated is outside the allowable range.		<ul style="list-style-type: none"> • Make sure the data entered for Auto-Tuning is correct. • Execute Rotational Auto-Tuning instead. If not possible, try Stationary Auto-Tuning 2.
Digital Operator Display		Error Name
E_{nd5}	End5	Resistance Tuning Error
Cause		Possible Solutions
The resistance value that was calculated is outside the allowable range.		<ul style="list-style-type: none"> • Double check the data that was entered for the Auto-Tuning process. • Check the motor and motor cable connection for faults.
Digital Operator Display		Error Name
E_{nd6}	End6	Leakage Inductance Alarm
Cause		Possible Solutions
The leakage inductance value that was calculated is outside the allowable range.		Double check the data that was entered for the Auto-Tuning process.
Digital Operator Display		Error Name
E_{nd7}	End7	No-Load Current Alarm
Cause		Possible Solutions
The entered no-load current value was outside the allowable range.		Check and correct faulty motor wiring.
Auto-Tuning results were less than 5% of the motor rated current.		Double check the data that was entered for the Auto-Tuning process.
Digital Operator Display		Error Name
E_{nd8}	End8	Rescue Operation Speed Warning
Cause		Possible Solutions
High frequency injection calculations for the battery power supply were below 10 Hz.		For Rescue Operation, either switch to a larger battery (at least 280 Vdc for a 200 V class drive, 560 Vdc for the 400 V class) or switch to an absolute encoder and the PG-F3 option card.

6.6 Auto-Tuning Fault Detection

Digital Operator Display		Error Name
<i>End9</i>	End9	Rescue Operation Rotor Pole Position Search Warning
Cause		Possible Solutions
While operating from the backup battery, pole diversion exceeded 40 degrees.		For Rescue Operation, either switch to a larger battery (at least 280 Vdc for a 200 V class drive, 560 Vdc for the 400 V class) or switch to an absolute encoder and the PG-F3 option card.
Digital Operator Display		Error Name
<i>End10</i>	End10	Rescue Operation Rotor Polarity Detection Warning
Cause		Possible Solutions
While operating from the backup battery, the Id value between poles was less than 5%.		For Rescue Operation, either switch to a larger battery (at least 280 Vdc for a 200 V class drive, 560 Vdc for the 400 V class) or switch to an absolute encoder and the PG-F3 option card.
Digital Operator Display		Error Name
<i>Er-01</i>	Er-01	Motor Data Error
Cause		Possible Solutions
Motor data or data entered during Auto-Tuning was incorrect.		<ul style="list-style-type: none"> Check that the motor data entered to T1 parameters matches motor nameplate input before Auto-Tuning. Start Auto-Tuning over again and enter the correct information.
Motor output power and motor-rated current settings (T1-02 and T1-04) do not match.		<ul style="list-style-type: none"> Check the drive and motor capacities. Correct the settings of parameters T1-02 and T1-04.
Motor rated current and detected no-load current are not consistent with another.		<ul style="list-style-type: none"> Check the motor rated current and no-load current. Correct the settings of parameters T1-04 and E2-03.
Base frequency and motor rated speed (T1-05 and T1-07) do not match.		<ul style="list-style-type: none"> Set T1-05 and T1-07 to the correct value. Check if the correct pole number was entered to T1-06.
Digital Operator Display		Error Name
<i>Er-02</i>	Er-02	Alarm
Cause		Possible Solutions
An alarm was triggered during Auto-Tuning.		Exit the Auto-Tuning menu, check the alarm code, remove the alarm cause, and repeat Auto-Tuning.
Digital Operator Display		Error Name
<i>Er-03</i>	Er-03	STOP Key Pressed
Cause		Possible Solutions
Auto-Tuning canceled by pressing STOP button.		Auto-Tuning did not complete properly and will have to be performed again.
Digital Operator Display		Error Name
<i>Er-04</i>	Er-04	Line-to-Line Resistance Error
Cause		Possible Solutions
Motor data entered during Auto-Tuning was incorrect.		<ul style="list-style-type: none"> Make sure the data entered to the T1 parameters match the information written on the motor nameplate. Restart Auto-Tuning and enter the correct information.
Results from Auto-Tuning are outside the parameter setting range or the tuning process took too long.		Check and correct faulty motor wiring.
Motor cable or cable connection faulty.		
Digital Operator Display		Error Name
<i>Er-05</i>	Er-05	No-Load Current Error
Cause		Possible Solutions
Motor data entered during Auto-Tuning was incorrect.		<ul style="list-style-type: none"> Make sure the data entered to the T1 parameters match the information written on the motor nameplate. Restart Auto-Tuning and enter the correct information.
Results from Auto-Tuning are outside the parameter setting range or the tuning process took too long.		<ul style="list-style-type: none"> Check and correct faulty motor wiring. Perform Rotational Auto-Tuning. Remember that the rope must be fully removed from the motor and the brake must be released to perform Rotational Auto-Tuning.
The load during Rotational Auto-tuning was too high.		<ul style="list-style-type: none"> Disconnect the motor from machine and restart Auto-Tuning. If motor and load cannot be uncoupled make sure the load is lower than 30%. If a mechanical brake is installed, make sure it is fully lifted during tuning.
Digital Operator Display		Error Name
<i>Er-08</i>	Er-08	Rated Slip Error
Cause		Possible Solutions
Motor data entered during Auto-Tuning was incorrect.		<ul style="list-style-type: none"> Make sure the data entered to the T1 parameters match the information written on the motor nameplate. Restart Auto-Tuning and enter the correct information.
Drive-calculated values outside parameter setting range or the tuning process took too long.		<ul style="list-style-type: none"> Check and correct faulty motor wiring. Perform Rotational Auto-Tuning. Remember that the rope must be fully removed from the motor and the brake must be released to perform Rotational Auto-Tuning.
The load during rotational Auto-tuning was too high.		<ul style="list-style-type: none"> Disconnect the motor from machine and restart Auto-Tuning. If motor and load cannot be uncoupled make sure the load is lower than 30%. If a mechanical brake is installed, make sure it is fully lifted during tuning.
Digital Operator Display		Error Name
<i>Er-09</i>	Er-09	Acceleration Error
Cause		Possible Solutions
The motor did not accelerate for the specified acceleration ramp.		Lengthen the acceleration ramp (C1-01).
Torque limit when motoring is too low (L7-01 and L7-02).		<ul style="list-style-type: none"> Check the settings of parameters L7-01 and L7-02. Increase the setting of L7-01 and L7-02.

The load during Rotational Auto-Tuning was too high.	<ul style="list-style-type: none"> Disconnect the motor from machine and restart Auto-Tuning. If motor and load cannot be uncoupled make sure the load is lower than 30%. If a mechanical brake is installed, make sure it is fully lifted during tuning.
Digital Operator Display	Error Name
Er-10	Er-10
Cause	Possible Solutions
The encoder signal lines are not properly connected to the drive.	Check and correct wiring to the PG encoder.
Motor and PG direction are opposite.	Check the motor speed monitor U1-05 while turning the motor manually in forward direction. If the sign displayed is negative, change the setting of parameter F1-05.
The load pulled the motor in the opposite direction of the speed reference and the torque exceeded 100%.	Uncouple the motor from the load and repeat Auto-Tuning.
Digital Operator Display	Error Name
Er-11	Er-11
Cause	Possible Solutions
Torque reference is too high.	<ul style="list-style-type: none"> Lengthen the acceleration ramp set to C1-01 (i.e., increase the acceleration time.) Disconnect the machine from the motor, if possible.
Digital Operator Display	Error Name
Er-12	Er-12
Cause	Possible Solutions
One of the motor phases is missing: (U/T1, V/T2, W/T3).	Check motor wiring and correct any problems.
Current exceeded the current rating of the drive.	<ul style="list-style-type: none"> Check the motor wiring for a short between motor lines. Make sure the motor contactor is closed during tuning. Replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
The current is too low.	
Attempted Auto-Tuning without motor connected to the drive.	Connect the motor and perform Auto-Tuning.
Current detection signal error.	Replace the drive. For instructions on replacing the drive, contact Yaskawa or your nearest sales representative.
Digital Operator Display	Error Name
Er-13	Er-13
Cause	Possible Solutions
Drive was unable to complete tuning for leakage inductance within 300 seconds.	<ul style="list-style-type: none"> Check all wiring and correct any mistakes. Double check the motor rated current value that was entered to T1-04 for Auto-Tuning. Check the motor rated current value written on the motor nameplate and enter the correct value.
Digital Operator Display	Error Name
Er-18	Er-18
Cause	Possible Solutions
The induced voltage constant exceeds the allowable setting range.	Double check the data that was entered to the T2-□□ parameters, and perform Auto-Tuning again.
Digital Operator Display	Error Name
Er-19	Er-19
Cause	Possible Solutions
The induced voltage constant inductance values set to E5-08 or E5-09 exceed the allowable range.	Double check the data that was entered to the T2-□□ parameters, and perform Auto-Tuning again.
Digital Operator Display	Error Name
Er-20	Er-20
Cause	Possible Solutions
Stator resistance tuning attempted to set a value to E5-06 that is outside the allowable setting range.	Double check the data that was entered to the T2-□□ parameters, and perform Auto-Tuning again.
Digital Operator Display	Error Name
Er-21	Er-21
Cause	Possible Solutions
Motor was coasting when Auto-Tuning was performed.	Make sure the motor has stopped completely. Repeat Auto-Tuning.
Either the motor or the encoder on the motor is not properly wired.	Check the wiring for the motor and the encoder. Repeat Auto-Tuning.
The direction for the encoder is set incorrectly, or the number of pulses set for the encoder is wrong.	Check the direction and number of pulses set for the encoder. Repeat Auto-Tuning.
Encoder is damaged.	Check the signal output from the encoder attached to the motor. Replace the encoder if damaged.

6.6 Auto-Tuning Fault Detection

Digital Operator Display		Error Name
Er-22	Er-22	Initial Rotor Pole Search Error
Cause		Possible Solutions
Parameters set by Initial Rotor Pole Search Tuning were outside the acceptable range.		Switch to an absolute encoder and to the PG-F3 option card.
During normal operation, pole diversion exceeded 20 degrees.		
Digital Operator Display		Error Name
Er-23	Er-23	Non-rotating Encoder Offset Tuning Warning
Cause		Possible Solutions
Pole diversion exceeded 15 degrees three times.		Remove the ropes and conduct Rotational Auto-Tuning for Encoder Offset (T2-01 = 3).
Parameters set by Encoder Offset Tuning were outside the acceptable range.		

6.7 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 6.12 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 a 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 6.12 Copy Function Task and Error Displays

Digital Operator Display		Task
<i>CoPY</i>	CoPy	Writing Parameter Settings (flashing)
Cause		Possible Solutions
Parameters are being written to the drive.		Not an error.
Digital Operator Display		Task
<i>CPEr</i>	CPEr	Control Mode Mismatch
Cause		Possible Solutions
Control mode of the parameters to be loaded onto the drive and the control mode already set to the drive don't match.		Check the control mode for the parameters that are to be loaded onto the drive and the control mode set to the drive those parameters will be written to. Set the same control mode using parameter A1-02 and try again.
Digital Operator Display		Task
<i>CPyE</i>	CPyE	Error Writing Data
Cause		Possible Solutions
Failed writing parameters.		Try writing parameters again.
Digital Operator Display		Task
<i>CSEr</i>	CSEr	Copy Unit Error
Cause		Possible Solutions
Hardware fault		Replace the operator or the USB Copy Unit.
Digital Operator Display		Task
<i>dFpS</i>	dFPS	Drive Model Mismatch
Cause		Possible Solutions
The drive from which the parameter were copied and the drive you are attempting to write to are not the same model. <ul style="list-style-type: none"> • The drive the parameters were copied from is a different model drive. • The drive you attempting to write to is a different model. 		Check the model number of the drive that the parameters were copied from and the model of the drive you are attempting to write those parameters to. Make sure the drive from which the parameter are copied and the drive to be written to have the same model numbers and software versions.
Digital Operator Display		Task
<i>End</i>	End	Task Complete
Cause		Possible Solutions
Finished reading, writing, or verifying parameters.		Not an error.
Digital Operator Display		Task
<i>iFEr</i>	iFEr	Communication Error
Cause		Possible Solutions
A communication error occurred between the drive and the operator or the USB copy unit.		Check the cable connection.
A non-compatible cable is being used to connect the USB Copy Unit and the drive.		Use the cable originally packaged with the USB Copy Unit.
Digital Operator Display		Task
<i>ndAT</i>	ndAT	Model, Voltage Class, Capacity Mismatch
Cause		Possible Solutions
The drive the parameters were copied from and the drive you are attempting to write to have different electrical specifications, a different capacity, is set to a different control mode, or is a different model number.		Make sure model numbers and specifications are the same for both drives.
The device being used to write the parameters is blank and does not have any parameters saved on it.		Making sure all connections are correct, and copy the parameter settings onto the USB Copy Unit or the operator.

6.7 Copy Function Related Displays

Digital Operator Display		Task
<i>rdEr</i>	rdEr	Error Reading Data
Cause		Possible Solutions
Failed while attempting to read parameter settings from the drive.		Press and hold the READ key on the USB Copy Unit for at least one second to have the unit read parameters from the drive.
Digital Operator Display		Task
<i>rEAd</i>	rEAd	Reading Parameter Settings (flashing)
Cause		Possible Solutions
Displayed while the parameter settings are being read onto the USB Copy Unit.		Not an error.
Digital Operator Display		Task
<i>vAEr</i>	vAEr	Voltage Class, Capacity Mismatch
Cause		Possible Solutions
The drive the parameters were copied from and the drive you performing the Verify mode on have different electrical specifications or are a different capacity.		Make sure electrical specifications and capacities are the same for both drives.
Digital Operator Display		Task
<i>vFyE</i>	vFyE	Parameter settings in the drive and those saved to the copy function are not the same
Cause		Possible Solutions
Indicates that parameter settings that have been Read and loaded onto the Copy Unit or Digital Operator are different.		To have parameters be the same, either write the parameters save on the USB Copy Unit or LCD digital operator onto the drive, or Read the parameter settings on the drive onto the USB Copy Unit.
Digital Operator Display		Task
<i>vrFy</i>	vrFy	Comparing Parameter Settings (flashing)
Cause		Possible Solutions
The Verify mode has confirmed that parameters settings on the drive and parameters read to the copy device are identical.		Not an error.

6.8 Diagnosing and Resetting Faults

When a fault occurs and the drive stops, follow the instructions below to remove whatever conditions triggered the fault, then restart the drive.

◆ Fault Occurs Simultaneously with Power Loss

WARNING! 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.

1. Turn on the drive input power.
2. Use monitor parameters U2-□□ to display data on the operating status of the drive just before the fault occurred.
3. Remove the cause of the fault and reset.

Note:

1. To find out what faults were triggered, check the fault history in U2-02. Information on drive status when the fault occurred such as the output speed, current, and voltage can be found in U2-03 through U2-20. [Refer to Viewing Fault Trace Data After Fault on page 253](#) for information on how to view fault data.
2. When the fault continues to be displayed after cycling power, remove the cause of the fault and reset.

◆ If the Drive Still has Power After a Fault Occurs

1. Look at the digital operator for information on the fault that occurred.
2. [Refer to Fault Displays, Causes, and Possible Solutions on page 229](#)
3. Reset the fault. [Refer to Fault Reset Methods on page 254](#).

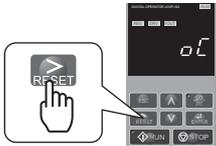
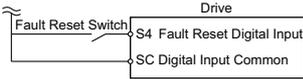
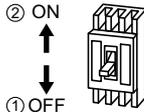
◆ Viewing Fault Trace Data After Fault

	Step		Display/Result
1.	Turn on the drive input power. The first screen displays.	→	
2.	Press until the monitor screen is displayed.	→	
3.	Press to display the parameter setting screen.	→	
4.	Press and until U2-02 (Fault History) is displayed.	→	
5.	Press to view the most recent fault (oC in this example).	→	
6.	Press to go back to the U2-02 display.	→	
7.	Press to view drive status information when fault occurred. Parameters U2-03 through U2-20 help determine the cause of a fault. Parameters to be monitored differ depending on the control mode.	→	

6.8 Diagnosing and Resetting Faults

◆ 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  on the digital operator.	
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. The Up/Down command must first be removed before a fault situation can be cleared.



Periodic Inspection & Maintenance

This chapter describes the periodic inspection and maintenance of the drive to ensure that it receives the proper care to maintain overall performance.

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7.1 Section Safety

DANGER

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 any 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.

The internal capacitor remains charged even after the power supply is turned off.

Failure to comply can result in serious electric shock.

WARNING

Ensuring Safety during Auto-Tuning

When using a PM motor for the first time, or when replacing the drive or PM motor, always make sure that motor parameters have been set properly and the speed detection function accurately prior to operation.

Using a PM motor requires that the encoder offset be set correctly in addition to entering motor data to corresponding parameters. If the motor, encoder, or drive is ever replaced, be sure to perform Encoder Offset Auto-Tuning.

Insufficient torque can cause the elevator car to move in the direction of the load, or cause the motor to behave erratically (reverse operation, stand still, sudden accelerations, etc.).

For more information, refer to the instruction manual included with the motor.

Ensuring Safety with PM Motors

Even when the power has been shut off for a drive running a motor, voltage continues to be generated at the motor terminals while the motor coasts to stop.

Failure to comply may result in injury from electrical shock.

Applications where the machine can still rotate even though the drive has fully stopped should have a magnetic contactor installed to the output side of the drive.

Failure to comply may result in injury from electrical shock.

Do not allow an external force to rotate the motor beyond the maximum allowable speed, also when the drive has been shut off.

Failure to comply may result in injury from electrical shock.

Whenever performing maintenance, inspection, or wiring on the motors, make sure to open the magnetic contactor on the output side and make sure the motor has come to a complete stop. Next wait for time specified in this manual before beginning to work on the motor.

Failure to comply may result in injury from electrical shock.

When closing the magnetic contactor while the motor is coasting, make sure the power to the drive is turned on and the drive output has completely stopped.

Failure to comply may result in injury from electrical shock.

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 motor contactor.

Failure to comply may result in injury from electrical shock.

Never attempt to change any wiring or remove any connectors while power is flowing through the motor.

⚠ WARNING

Failure to comply may result in injury from electrical shock.

Electrical Shock Hazard

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.

Always ground the motor-side grounding terminal.

Improper equipment grounding could result in death or serious injury by contacting the motor case.

Wiring to the motor (U, V, W) should never come into contact with the external case of the drive.

Failure to comply could result in death or serious injury.

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.

Do not allow unqualified personnel to use 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.

Switch off the power supply and lock the switching device before wiring terminals.

Failure to comply would result in serious injury or death.

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.

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.

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.

⚠ CAUTION**Preventing Burns**

Never touch the heatsink on the drive, as it can reach high temperatures. When replacing the cooling fan, wait at least 15 minutes after power to the drive has been shut off before touching the fan to ensure that it has cooled off enough.

Failure to comply could result in burns.

NOTICE

Ensuring Safety with PM Motors

When using a PM motor, never open or close the magnetic contactor while the motor is running.

Failure to comply could result in the drive damage.

Equipment Hazard

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.

Follow cooling fan replacement instructions. The cooling fan cannot operate properly when it is installed incorrectly and could seriously damage the drive.

Follow the instructions in this manual to replace the cooling fan, making sure that the label is on top before inserting the cooling fan into the drive. To ensure maximum useful product life, replace both cooling fans when performing maintenance.

Never connect or disconnect the motor from the drive while the drive is outputting voltage.

Improper equipment sequencing could result in damage to the drive.

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.

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.

Check all the wiring 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.

Make sure wiring to motor terminals U, V, and W connect the corresponding U/T1, V/T2, and W/T3 output terminals on the drive.

Wiring to the wrong terminals will reverse the phase order, causing the motor to operate in reverse. This could cause the elevator car to fall when attempting to go up.

Never use a magnet contactor on the input side of the drive to frequently start and stop the motor.

Failure to comply could result in damage to the drive.

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.

7.2 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 7.1 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 7.1 General Recommended Daily Inspection Checklist

Inspection Category	Inspection Points	Corrective Action	Checked
Motor	<ul style="list-style-type: none"> • Inspect for abnormal oscillation or noise coming from the motor. 	<ul style="list-style-type: none"> • Check the load coupling. • Measure motor vibration. • Tighten all loose components. 	
Cooling	<ul style="list-style-type: none"> • Inspect for abnormal heat generated from the drive or motor and visible discoloration. 	<ul style="list-style-type: none"> • Check for excessive load. • Loose connections • Check for dirty heatsink or motor. • Ambient temperature 	
	<ul style="list-style-type: none"> • Inspect drive cooling fan operation. 	<ul style="list-style-type: none"> • Check for clogged or dirty fan. • Check fan operation drive parameter. 	
Environment	<ul style="list-style-type: none"> • Verify the drive environment complies with the specifications listed in <i>Installation Environment on page 37</i>. 	<ul style="list-style-type: none"> • Eliminate the source of contaminants or correct poor environment. 	
Load	<ul style="list-style-type: none"> • The drive output current should not be higher than the motor or drive rating for an extended period of time. 	<ul style="list-style-type: none"> • Check for excessive load. • Check the motor parameter settings of the drive. 	
Power Supply Voltage	<ul style="list-style-type: none"> • Check main power supply and control voltages. 	<ul style="list-style-type: none"> • Correct the voltage or power supply to within nameplate specifications. • Verify all main circuit phases. 	

◆ Recommended Periodic Inspection

Table 7.2 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 7.2 Periodic Inspection Checklist

Inspection Area	Inspection Points	Corrective Action	Checked
Main Circuit Periodic Inspection			
General	<ul style="list-style-type: none"> Inspect equipment for discoloration from overheating or deterioration. Inspect for damaged or deformed parts. 	<ul style="list-style-type: none"> Replace damaged components as required. The drive has few serviceable parts and may require complete drive replacement. 	
	<ul style="list-style-type: none"> Inspect for dirt, foreign particles, or dust collection on components. 	<ul style="list-style-type: none"> Inspect enclosure door seal if used. Use dry air to clear away foreign matter. Use a pressure of 39.2×10^4 to 58.8×10^4 Pa (4 - 6 kg·cm²). Replace components if cleaning is not possible. 	
Conductors and Wiring	<ul style="list-style-type: none"> Inspect wiring and connections for discoloration, damage, or heat stress. Inspect wire insulation and shielding for wear. 	<ul style="list-style-type: none"> Repair or replace damaged wiring. 	
Terminals	<ul style="list-style-type: none"> Inspect terminals for stripped, damaged, or loose connections. 	<ul style="list-style-type: none"> Tighten loose screws and replace damaged screws or terminals. 	
Relays and Contactors	<ul style="list-style-type: none"> Inspect contactors and relays for excessive noise during operation. Inspect coils for signs of overheating such as melted or cracked insulation. 	<ul style="list-style-type: none"> Check coil voltage for over or under voltage conditions. Replace damaged removable relays contactors or circuit board. 	
Braking Resistors	<ul style="list-style-type: none"> Inspect for discoloration of heat stress on or around resistors. 	<ul style="list-style-type: none"> Minor discoloration may be acceptable. If discoloration exists check for loose connections. 	
Electrolytic Capacitor	<ul style="list-style-type: none"> Inspect for leaking, discoloration, or cracks. Check if the cap has come off, for any swelling, or if the sides have burst open. 	<ul style="list-style-type: none"> The drive has few serviceable parts and may require complete drive replacement. 	
Diode, IGBT (Power Transistor)	<ul style="list-style-type: none"> Inspect for dust or other foreign material collected on the surface. 	<ul style="list-style-type: none"> Use dry air to clear away foreign matter. Use a pressure of 39.2×10^4 to 58.8×10^4 Pa (4 - 6 kg·cm²). 	
Motor Periodic Inspection			
Operation Check	<ul style="list-style-type: none"> Check for increased vibration or abnormal noise. 	<ul style="list-style-type: none"> Stop the motor and contact qualified maintenance personnel as required. 	
Control Circuit Periodic Inspection			
General	<ul style="list-style-type: none"> Inspect terminals for stripped, damaged, or loose connections. Make sure all terminals have been properly tightened. 	<ul style="list-style-type: none"> 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. 	
Circuit Boards	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Fix any loose connections. If an antistatic cloth or vacuum plunger can't be used, replace the board. Do not use any solvents to clean the board. Use dry air to clear away foreign matter. Use a pressure of 39.2×10^4 to 58.8×10^4 Pa (4 - 6 kg·cm²). The drive has few serviceable parts and may require complete drive replacement. 	
Cooling System Periodic Inspection			
Cooling Fan	<ul style="list-style-type: none"> Check for abnormal oscillation or unusual noise. Check for damaged or missing fan blades. 	<ul style="list-style-type: none"> Replace as required. <i>Refer to Drive Cooling Fan on page 263</i> for information on cleaning or replacing the fan. 	
Heatsink	<ul style="list-style-type: none"> Inspect for dust or other foreign material collected on the surface. 	<ul style="list-style-type: none"> Use dry air to clear away foreign matter. Use a pressure of 39.2×10^4 to 58.8×10^4 Pa (4 - 6 kg·cm²). 	
Air Duct	<ul style="list-style-type: none"> Inspect air intake and exhaust openings. They must be free from obstruction and properly installed. 	<ul style="list-style-type: none"> Visually inspect the area. Clear obstructions and clean air duct as required. 	
Display Periodic Inspection			
Digital Operator	<ul style="list-style-type: none"> Make sure data appears on the operator properly. Inspect for dust or other foreign material that may have collected on surrounding components. 	<ul style="list-style-type: none"> Contact your Yaskawa representative if there is any trouble with the display or keypad. Clean the digital operator. 	

7.3 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
- Electrolytic Capacitors
- Inrush Prevention Circuit
- IGBTs

For replacement parts, contact the distributor where the drive was purchased or contact Yaskawa directly.

◆ Replacement Parts

The drive cooling fans can easily be replaced if necessary. Only use Yaskawa replacement parts for the appropriate drive model and revision.

Refer to Cooling Fan Replacement on page 263 for cooling fans replacement instructions.

■ 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 260 for more details.

Table 7.3 Performance Life Monitors Used for Component Replacement

Parameter	Component	Contents
U4-03	Cooling Fan	Displays the cumulative 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 cumulative fan operation time as a percentage of the specified maintenance period.
U4-05	DC Bus Capacitors	Displays the cumulative 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 or the IGBT's reach 90% of their expect performance life. Additionally the digital operator will display an alarm like shown in *Table 7.4* to indicate the specific components that may need maintenance.

Table 7.4 Maintenance Alarms

Alarm Display	Function	Corrective Action
LT-1 <1>	LT-1	The cooling fans have reached 90% of their designated life time. Replace the cooling fan.
LT-2 <2>	LT-2	The DC bus capacitors have reached 90% of their designated life time. Replace the drive.
LT-3 <2>	LT-3	The DC bus charge circuit has reached 90% of its designated life time. Replace the drive.
LT-4 <2>	LT-4	The IGBT's have reached 90% of their designated life time. Check the load, carrier frequency, and output speed.
TrPC <2>	TrPC	The IGBT's have reached 90% of their designated life time. 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).

7.3 Periodic Maintenance

■ Related Drive Parameters

Parameters o4-03, o4-05, o4-07, and o4-09 can be used to reset a Maintenance Monitor back to zero after a specific component has been replaced. *Refer to Parameter Table on page 302* 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.*

7.4 Drive Cooling Fan

NOTICE: Follow cooling fan replacement instructions. The cooling fan cannot operate properly when it is installed incorrectly and could seriously damage the drive. Follow the instructions in this manual to replace the cooling fan, making sure that the label is on top before inserting the cooling fan into the drive. To ensure maximum useful product life, replace both cooling fans when performing maintenance.

Contact your Yaskawa representative or the nearest Yaskawa sales office to order replacement cooling fans as required.

For drives with multiple cooling fans, replace all the fans when performing maintenance to ensure maximum product performance life.

◆ Number of Cooling Fan

Three-Phase 200 V Class		Three-Phase 400 V Class	
Model CIMR-L□	Cooling Fan	Model CIMR-L□	Cooling Fan
2A0018	1	4A0009	1
2A0025	2	4A0015	2
2A0033	2	4A0018	2
2A0047	2	4A0024	2
2A0060	2	4A0031	2
2A0075	2	4A0039	2
2A0085	2	4A0045	2
2A0115	2	4A0060	2
2A0145	2	4A0075	2
2A0180	2	4A0091	2
2A0145	2	4A0112	2
2A0180	2	4A0150	2
–	–	4A0112	2
–	–	4A0150	2

◆ Cooling Fan Replacement

The cooling fan is installed on the top of the drive or in the fan unit. It can easily be replaced.

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.

CAUTION! Burn Hazard. Do not touch a hot drive heatsink. Failure to comply could result in minor or moderate injury. Shut off the power to the drive when replacing the cooling fan. To prevent burns, wait at least 15 minutes and ensure the heatsink has cooled down.

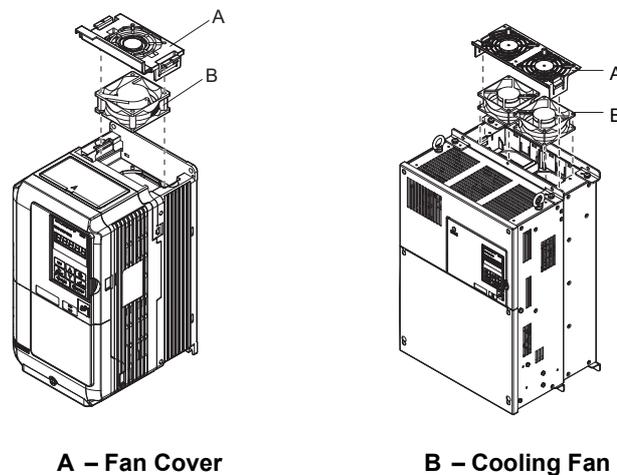


Figure 7.1 Cooling Fan Replacement

■ 2A0018 to 2A0075 and 4A0009 to 4A0039

Removing the Cooling Fan

1. Depress the right and left sides of the fan cover hooks and pull upward. Remove the fan cover from the top of the drive.

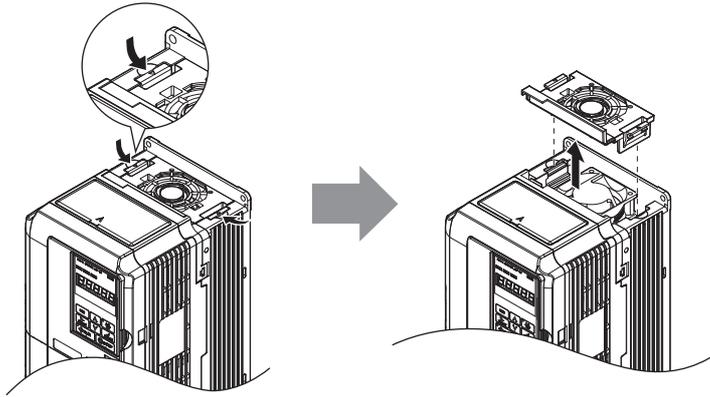


Figure 7.2 Removing the Fan Cover: 2A0018 to 2A0075, 4A0009 to 4A0039

2. Remove the cooling fan cartridge. Disconnect the pluggable connector and remove the fan.

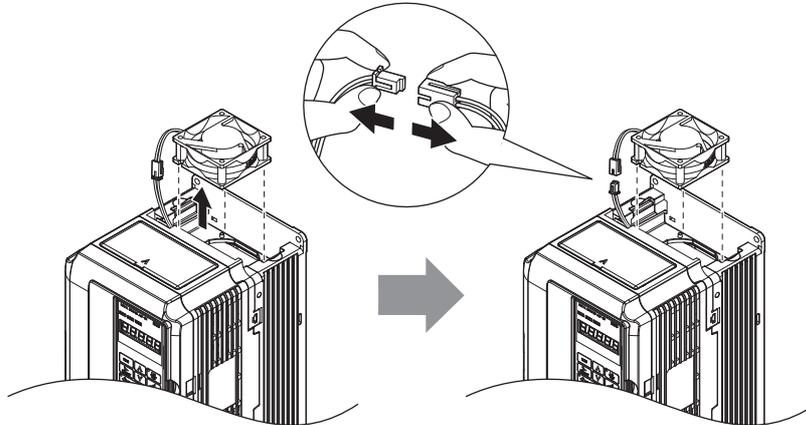


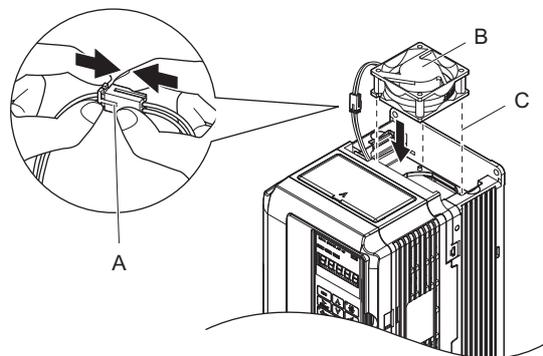
Figure 7.3 Removing the Cooling Fan: 2A0018 to 2A0075, 4A0009 to 4A0039

Installing the Cooling Fan

NOTICE: Prevent Equipment Damage. Follow cooling fan replacement instructions. Improper fan replacement could result in damage to equipment. When installing the replacement fan into the drive, make sure the fan is facing upwards. To ensure maximum useful product life, replace all fans when performing maintenance.

Reverse the procedure described above to reinstall the cooling fan.

1. Install the replacement fan into the drive, ensuring the alignment pins line up as shown in the figure below.



A – Push the connectors together so no space remains between them.

B – Label facing up

C – Make sure the alignment pins line up properly.

Figure 7.4 Installing the Cooling Fan: 2A0018 to 2A0075, 4A0009 to 4A0039

2. Make sure the power lines for the fan are properly connected, then place the cable back into the recess of the drive.

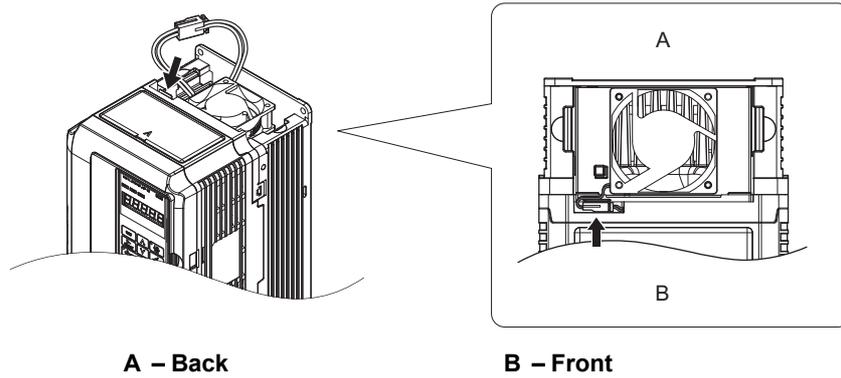


Figure 7.5 Cooling Fan Power Supply Connectors: 2A0018 to 2A0075, 4A0009 to 4A0039

3. While pressing in on the hooks on the left and right sides of the fan cover, guide the fan cover until it clicks back into place.

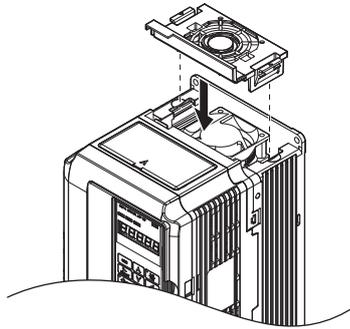


Figure 7.6 Reattach the Fan Cover: 2A0018 to 2A0075, 4A0009 to 4A0039

4. Turn the power supply back on and reset the cooling fan operation time for the Maintenance Monitor by setting o4-03 to 0.

■ 2A0085, 2A0115 and 4A0045, 4A0060

Removing the Cooling Fan

1. While pressing in on the hooks located on the left and right sides of the fan cover, free the fan cover leading by lifting the back end first.

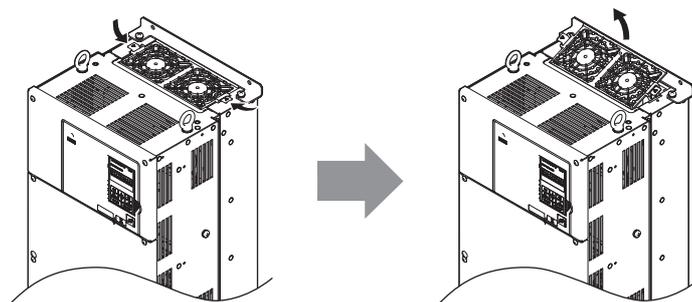


Figure 7.7 Removing the Cooling Fan Cover: 2A0085, 2A0115, 4A0045, 4A0060

7.4 Drive Cooling Fan

2. Lift the fan cover out leading with the back end. Unplug the replay connector and free the fan cover from the drive.

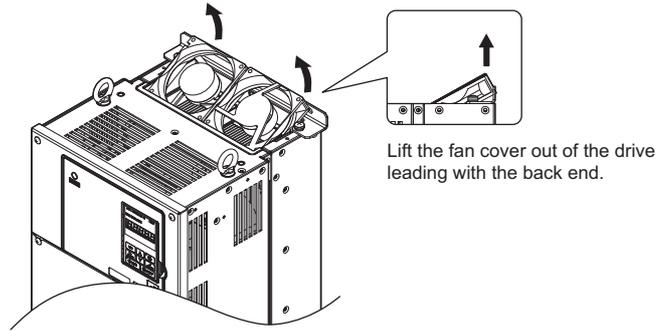


Figure 7.8 Removing the Cooling Fan: 2A0085, 2A0115, 4A0045, 4A0060

Installing the Cooling Fan

NOTICE: Prevent Equipment Damage. Follow cooling fan replacement instructions. Improper fan replacement could result in damage to equipment. When installing the replacement fan into the drive, make sure the fan is facing upwards. To ensure maximum useful product life, replace all fans when performing maintenance.

1. Make sure the power lines for the fan are properly connected.
2. Place the power supply connectors and cable back into the recess of the drive.

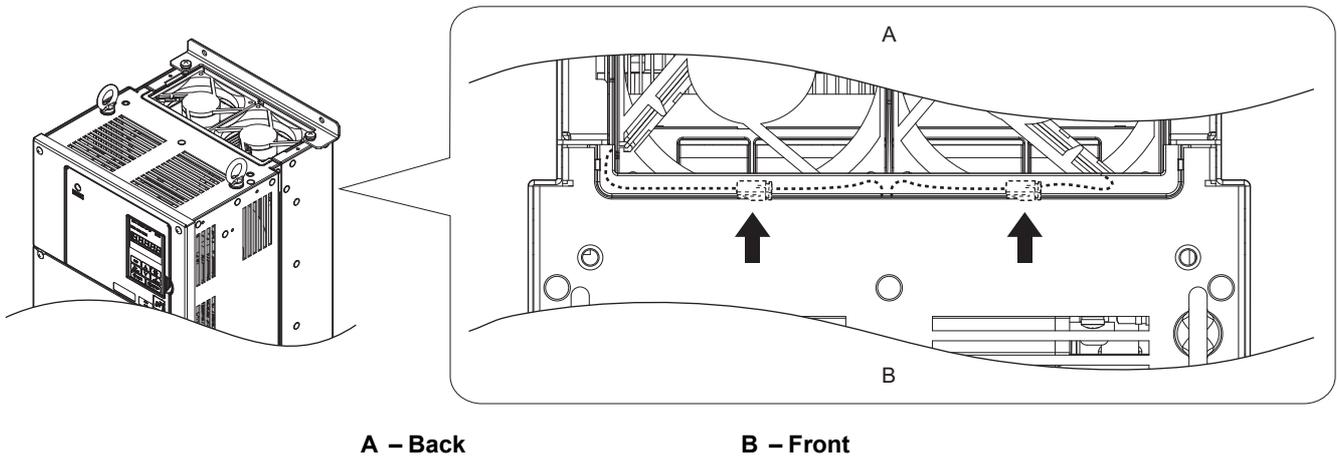


Figure 7.9 Cooling Fan Power Supply Connectors: 2A0085, 2A0115, 4A0045, 4A0060

3. Install the replacement fan into the drive.

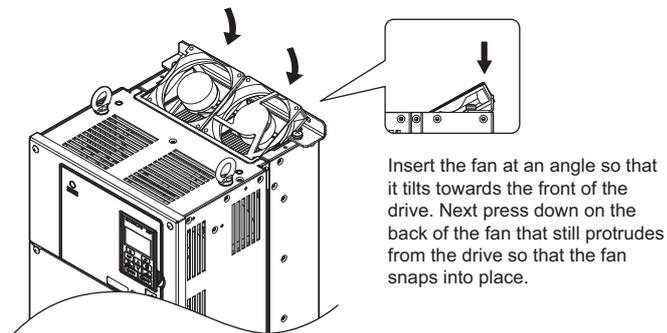


Figure 7.10 Installing the Cooling Fan: 2A0085, 2A0115, 4A0045, 4A0060

- Angle the fan cover so the back end tilts up. Slide the cover into the small opening towards the front of the drive, and then guide the entire fan cover into place.

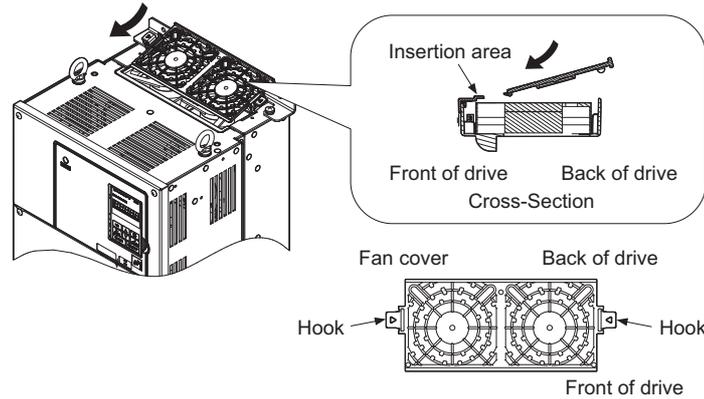


Figure 7.11 Reattach the Fan Cover: 2A0085, 2A0115, 4A0045, 4A0060

- While pressing in on the hooks on the left and right sides of the fan cover, guide the fan cover until it clicks back into place.

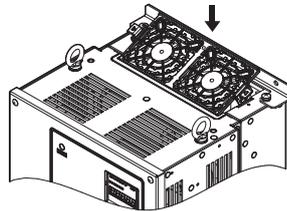


Figure 7.12 Reattach the Fan Cover: 2A0085, 2A0115, 4A0045, 4A0060

- Turn the power supply back on and reset the cooling fan operation time for the Maintenance Monitor by setting o4-03 to 0.

■ 4A0075 to 4A0091

Removing the Cooling Fan

- While pressing in on the hooks located on the left and right sides of the fan cover, free the fan cover leading by lifting the back end first.

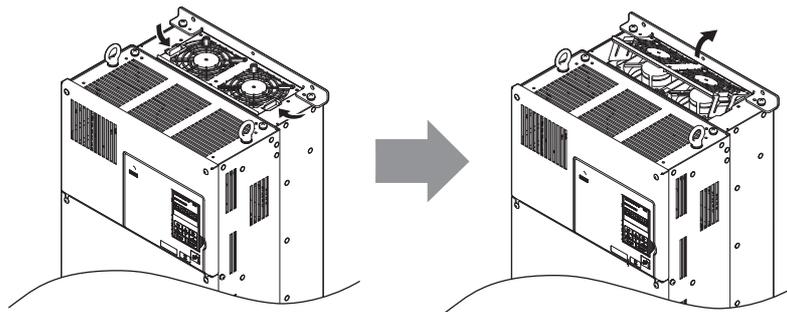


Figure 7.13 Removing the Cooling Fan Cover: 4A0075, 4A0091

7.4 Drive Cooling Fan

2. Lift the cooling fan directly up on the fan as shown below. Unplug the relay connector and free the fan from the drive.

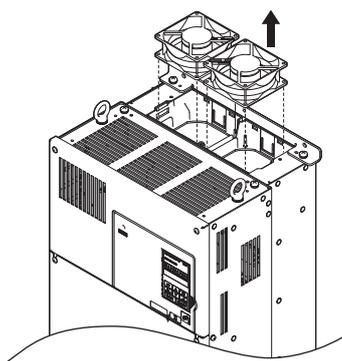


Figure 7.14 Removing the Cooling Fan: 4A0075, 4A0091

Installing the Cooling Fan

NOTICE: Prevent Equipment Damage. Follow cooling fan replacement instructions. Improper fan replacement could result in damage to equipment. When installing the replacement fan into the drive, make sure the fan is facing upwards. To ensure maximum useful product life, replace all fans when performing maintenance.

Reverse the procedure described above to reinstall the cooling fan.

1. Install the replacement fan into the drive, ensuring the alignment pins line up as shown in the figure below.

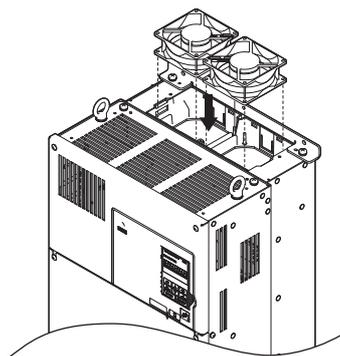
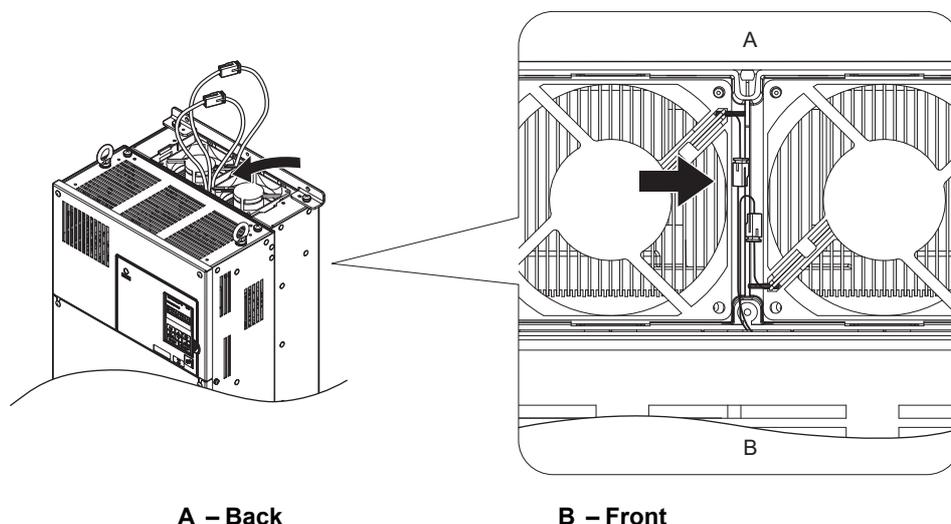


Figure 7.15 Installing the Cooling Fan: 4A0075, 4A0091

2. Make sure the power lines for the fan are properly connected, then place the power supply connectors and cable back into the recess of the drive.



A – Back

B – Front

Figure 7.16 Cooling Fan Power Supply Connectors: 4A0075, 4A0091

3. Angle the fan cover as shown and insert the connector tabs into the corresponding holes on the drive.

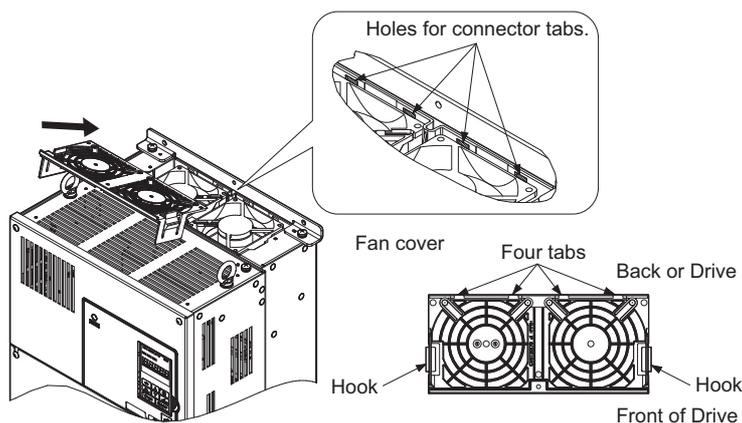


Figure 7.17 Reattach the Fan Cover: 4A0075, 4A0091

4. While pressing in on the hooks on the left and right sides of the fan cover, guide the fan cover until it clicks back into place.

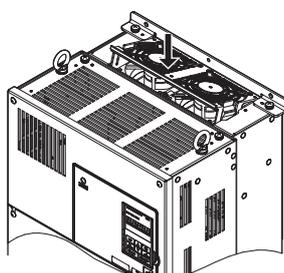


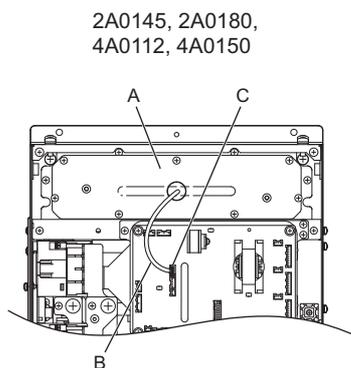
Figure 7.18 Reattach the Fan Cover: 4A0075, 4A0091

5. Turn the power supply back on and reset the cooling fan operation time for the Maintenance Monitor by setting o4-03 to 0.

■ 2A0145, 0180, 4A0112, 4A0150

Removing and Disassembling the Cooling Fan Unit

1. Remove the terminal cover and front cover.
2. Remove the fan connector (CN6).



A – Fan Unit

C – Fan Connector (CN6)

B – Fan Relay Cable

Figure 7.19 Cooling Fan Replacement: Fan Unit and Connectors

3. Remove the screws holding the fan unit in place and slide the fan unit out of the drive.

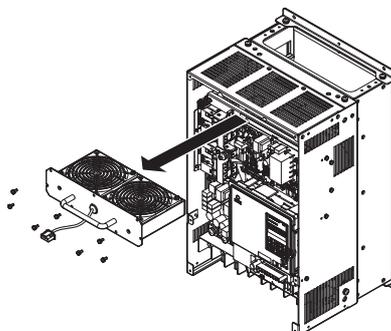
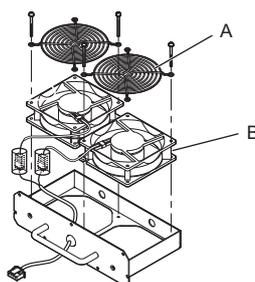


Figure 7.20 Removing the Fan Unit: 2A0145, 2A0180, 4A0112, 4A0150

4. Remove the fan guard and replace the cooling fans.

2A0145, 2A0180,
4A0112, 4A0150



A – Fan Guard

B – Cooling Fan

Figure 7.21 Fan Unit Disassembly: 2A0145, 2A0180, 4A0112, 4A0150

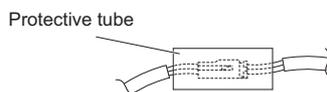
Installing the Cooling Fan

NOTICE: Prevent Equipment Damage. Follow cooling fan replacement instructions. Improper fan replacement could result in damage to equipment. When installing the replacement fan into the drive, make sure the fan is facing upwards. To ensure maximum useful product life, replace all fans when performing maintenance.

Follow the directions below to prevent damage to the fan cable connector and make sure the fan cable does not get pinched between parts when reassembling the fan unit.

2A0145, 2A0180, 4A0112, and 4A0150

1. Position the protective tube so that the fan connector sits in the center of the protective tube.



2. Place the fan connector covered by the tube as shown in the drawings below.

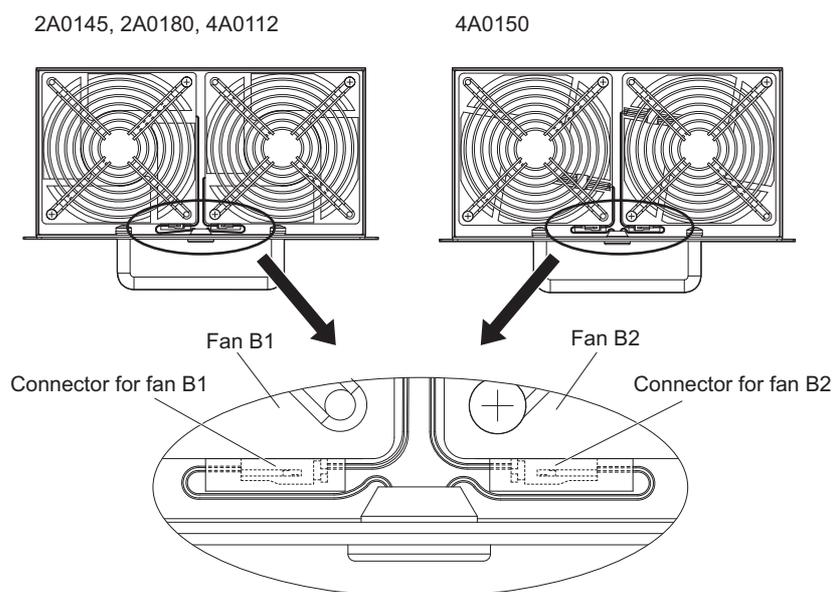


Figure 7.22 Cooling Fan Wiring for Models 2A0145, 2A0180, 4A0112 and 4A0150

3. Make sure that the protective tube does not stick out beyond the fan guard.
4. Double check the relay connector to ensure that it is properly connected.

Installing the Cooling Fan Unit

1. Reverse the procedure described above to reinstall the cooling fan unit.

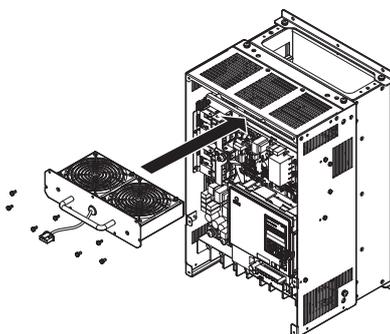


Figure 7.23 Installing the Cooling Fan Unit: 2A0145, 2A0180, 4A0112, 4A0150

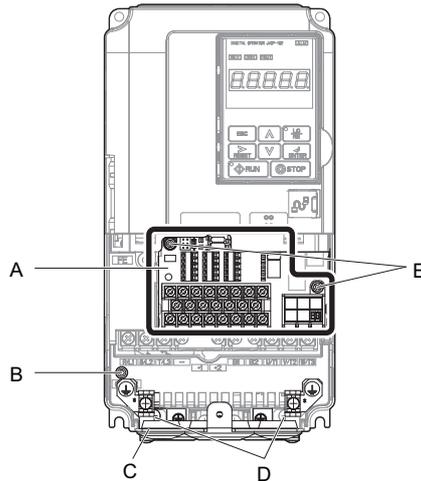
2. Reattach the covers and digital operator.
3. Turn the power supply back on and reset the cooling fan operation time for the Maintenance Monitor by setting 04-03 to 0.

7.5 Drive Replacement

◆ About the Control Terminal Board

The drive has a removable I/O terminal block that allows drive replacement without disconnecting control circuit wires. The control terminal board contains on-board memory that stores all drive parameter settings. When replacing a drive, disconnect the control terminal board from the damaged drive then reconnect it to the replacement drive. Once the new drive is powered up, the parameters stored in the terminal board are transferred into the new drive so that 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 7.24 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, then 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.

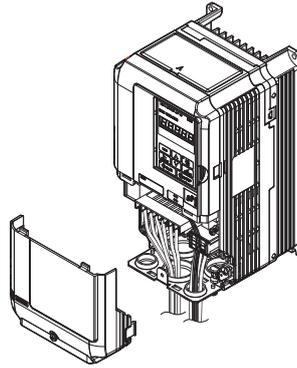


Figure 7.25 Drive Replacement: Removing the Terminal Cover

2. Loosen the screws holding the terminal board in place. Take out the screw securing the bottom cover and remove the bottom cover from the drive.

Note: Drives set up for compliance with IP00 do not have a bottom cover.

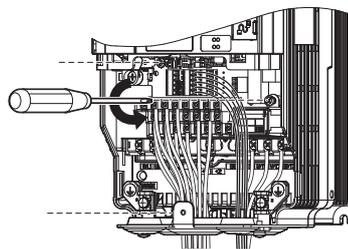


Figure 7.26 Drive Replacement: Removing the Control Terminal Board

3. Slide the terminal board as illustrated by the arrows, and remove it from the drive along with the bottom cover.

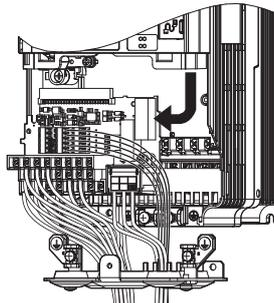
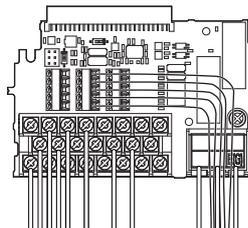


Figure 7.27 Drive Replacement: Remove the Control Terminal Board



**Figure 7.28 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. Once the main circuit has been wired, connect the terminal block to the drive as shown in [Figure 7.29](#). Use the installation screw to fasten the terminal block into place.

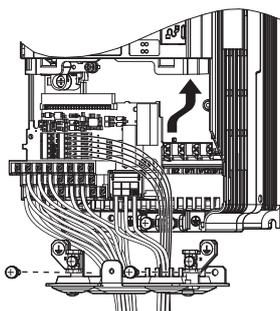


Figure 7.29 Drive Replacement: Installing the Control Terminal Board

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 the control terminal board has been replaced, parameter o2-04 needs to be reset. For instructions, see [Defaults by Drive Model Selection \(o2-04\) on page 338](#). Should an oPE04 error occur, load the parameter settings that have been saved on the terminal board onto the new drive by setting parameter A1-03 to 5550. Reset timers used for the Maintenance Monitor function by setting parameters o4-01 through o4-12 back to 0, and parameter o4-13 to 1.



Peripheral Devices & Options

This chapter explains the installation of peripheral devices and options available for the drive.

8.1 SECTION SAFETY	276
8.2 DRIVE OPTIONS AND PERIPHERAL DEVICES	278
8.3 CONNECTING PERIPHERAL DEVICES	280
8.4 OPTION CARD INSTALLATION	281
8.5 INSTALLING PERIPHERAL DEVICES	283

8.1 Section Safety

DANGER

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 any 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.

The internal capacitor remains charged even after the power supply is turned off.

Failure to comply can result in serious electric shock.

WARNING

Electrical Shock Hazard

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 remove covers or touch circuit boards while the power is on.

Failure to comply could result in death or serious injury.

Do not allow unqualified personnel to use 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.

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.

Always ground the motor-side grounding terminal.

Improper equipment grounding could result in death or serious injury by contacting the motor case.

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.

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.

Confirm an actual motor overload condition is not present prior to increasing the thermal oL trip detection setting. Check local electrical codes before making adjustments to motor thermal overload settings.

Failure to comply can result in fire.

NOTICE**Equipment Hazard**

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.

Never connect or disconnect the motor from the drive while the drive is outputting voltage.

Improper equipment sequencing could result in damage to the drive.

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.

Do not carelessly connect parts or devices to the drives braking transistor terminals.

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

Carefully review instruction manual TOBPC72060000 when connecting a braking option to the drive.

Never use a magnet contactor on the input side of the drive frequently to start and stop the motor.

Failure to comply could result in damage to the drive.

Do not connect magnetic contactors to the output motor circuits without proper sequencing.

Improper sequencing of output motor circuits could result in damage to the drive.

Use a magnetic contactor (MC) to ensure that power to the drive can be completely shut off when necessary.

The MC should be wired so that it opens when a fault output terminal is triggered.

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 interrupter.

8.2 Drive Options and Peripheral Devices

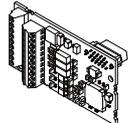
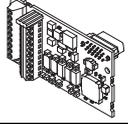
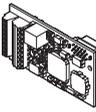
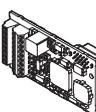
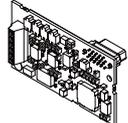
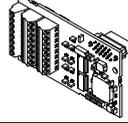
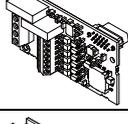
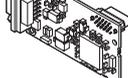
The following table of peripheral devices lists the names of the various accessories and options available for Yaskawa drives. Contact Yaskawa or your Yaskawa agent to order these peripheral devices.

- **Peripheral Device Selection:** Refer to the Yaskawa catalog for selection and part numbers.
- **Peripheral Device Installation:** Refer to the corresponding option manual for installation instructions.

Table 8.1 Available Peripheral Devices

Option	Model Number	Description
Power Options		
	DC Reactor	UZDA Series
	AC Reactor	UZBA Series
	Braking Resistor Unit	LKEB Series
	Braking Unit	CDBR Series
	Molded Case Circuit Breaker	NF Series
	Electric Leakage Circuit Breaker (ELCB)	NV, EG, or SG Series
	Magnetic Contactor (Input)	SC Series
	Surge Protector	200 V class: DCR2-□A 400 V class: RFN3AL-504KD
	Zero Phase Reactor	F6045GB, F11080GB
	Fuse	200 V class: CR2LS or CR2L Series, FWX Series 400 V class: CR6L Series, FWH Series
	Input Noise Filter	LNFB, LNFD, FN Series
	Output Noise Filter	LF-310 Series
—	Isolator	DGP□□□
Reference Setting / Monitor Options		
—	Frequency Meter / Ammeter	DCF-6A
—	Frequency Meter Potentiometer (20 kΩ)	RH000850
—	Output Voltage Meter	SDF-12NH
—	Frequency Setting Potentiometer (2 kΩ)	RH000739
—	Control Dial for Frequency Setting Potentiometer	CM-3S
—	Meter Plate	NPJT41561-1

8.2 Drive Options and Peripheral Devices

Option	Model Number	Description
Interface Options		
	LCD Operator JVOP-180	Digital operator with 8 languages, clear text LCD display, and copy function; max. cable length for remote usage: 3 m
	Remote Operator Cable WV001/WV003	Extension cable (1 m or 3 m) to connect the digital operator for remote operation RJ-45, 8 pin straight through, UTP CAT5e cable
	USB Copy Unit JVOP-181	Allows the user to copy and verify parameter settings between drives. Can also be used as an adapter to connect the drive to the USB port on a PC.
Attachment		
—	NEMA 1 Kit EZZ020787	Parts to make the drive conform to NEMA Type 1 enclosure requirements
	Installation Support Set A EZZ020642A	For installing the digital operator keypad on the outside of an enclosure panel that houses the drive. Uses screws to secure the operator.
	Installation Support Set B EZZ020642B	For installing the digital operator keypad on the outside of an enclosure panel that houses the drive. Uses nuts to secure the operator for installations where screws are not practical.
Others		
	24 V Power Supply PS-A10L, PS-A10H	Provides power to the control circuit and option boards in the event of power loss. Allows the user to still monitor drive settings and fault information even if the main circuit has no power.
—	DriveWizard Plus (Under development)	— PC tool for drive setup and parameter management
Communication Options		
	Complementary Signal Encoder PG-B3	For speed feedback input by connecting a motor encoder Input: 3 track (can be used with one or two tracks), for HTL encoder connection, 50 kHz max Output: 3 track, open collector Encoder power supply: 12 V, max current 200 mA
	Line Driver Encoder PG-X3	For speed feedback input by connecting a motor encoder Input: 3 track (can be used with one or two tracks), line driver, 300 kHz max Output: 3 track, line driver Encoder power supply: 5 V or 12 V, max current 200 mA
	EnDat Encoder PG-F3	Encoder type: EnDat 2.1/01, EnDat 2.2/01 (HEIDENHAIN) Maximum input frequency: 50 kHz Pulse monitor: Matches RS-422 level Output voltage: 5 V±5%, 8 V±10% Maximum output current: 200 mA Wiring length: 20 m max. for the encoder, 30 m max. for the pulse monitor
	ERN1387 Encoder PG-E3	Encoder type: ERN1387 (HEIDENHAIN) Maximum input frequency: 50 kHz Pulse monitor: Matches RS-422 level Output voltage: 5 V±5% Maximum output current: 200 mA Wiring length: 20 m max. for the encoder, 30 m max. for the pulse monitor
	Analog Monitor AO-A3	Provides extra multi-function analog output terminals. Output channels: 2 Output voltage: -10 to 10 V, 11 bit (signed)
	Digital Input DI-A3	Used to set the speed reference by digital inputs Input channels: 18 (including SET signal and SIGN signal) Input signal type: BCD 16 bit (4 digit), 12 bit (3 digit), 8 bit (2 digit) Input signal: 24 Vdc, 8 mA
	Digital Output DO-A3	Provides extra insulated multi-function digital outputs. Photocoupler relays: 6 (48 V, up to 50 mA) Contact relays: 2 (250 Vac/up to 1 A, 30 Vdc/up to 1 A)
	CANopen SI-S3	Connects to a CANopen network

8.3 Connecting Peripheral Devices

Figure 8.1 illustrates how to configure the drive and motor to operate with various peripheral devices.

- For more detailed instructions on how to install each device shown below, refer to the specific manual for that device.

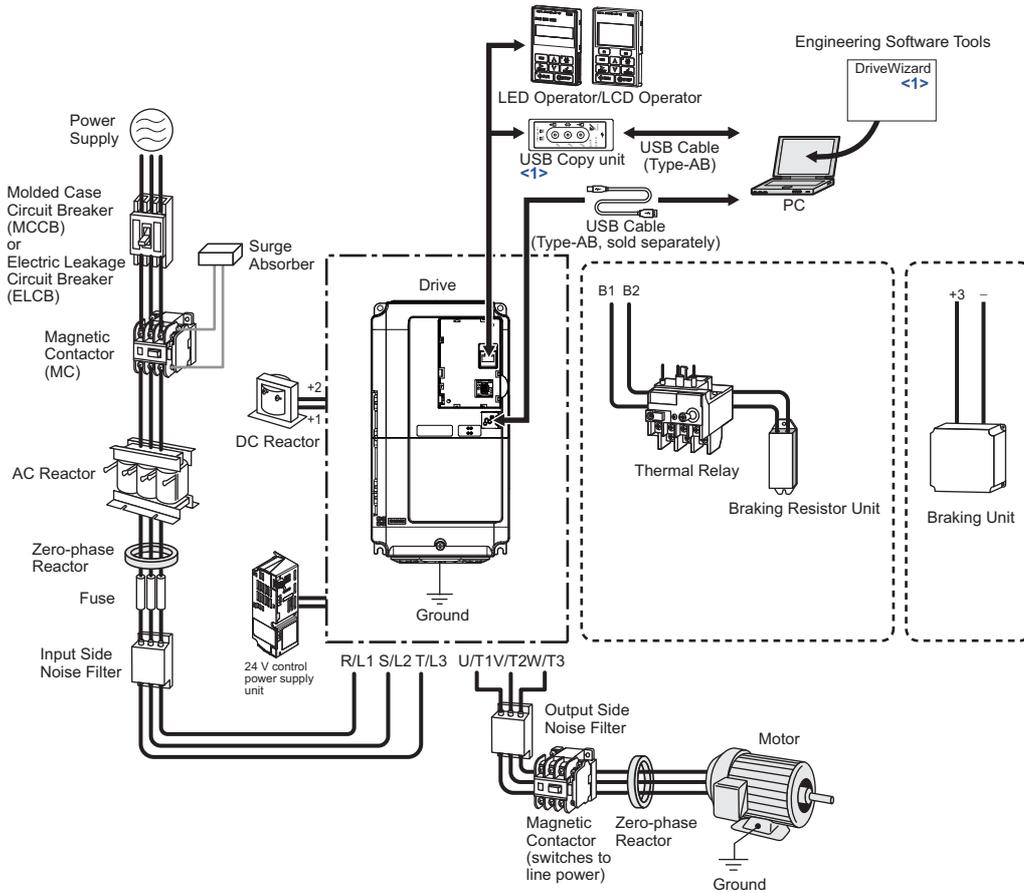


Figure 8.1 Connecting Peripheral Devices

- <1> To obtain the driver and software of USB Copy Unit, CopyUnitManager and DriveWizardPlus, access these sites:
 China: <http://www.yaskawa.com.cn>
 Japan: <http://www.e-mechatronics.com>
 Europe: <http://www.yaskawa.eu.com>
 Other areas: contact a Yaskawa representative.

Note: Note that if the drive is set to trigger a fault output whenever the fault restart function is activated (L5-02 = 1), then a sequence to interrupt power when a fault occurs will result in shutting off the power to the drive as the drive attempts to restart itself. The default setting for L5-02 is 0 (fault output active during restart attempt).

8.4 Option Card Installation

This section provides instructions on installing the option cards listed in [Table 8.1](#).

◆ Installing Option Cards

[Table 8.2](#) below lists the number of option cards that can be connected to the drive and the drive ports for connecting those option cards.

Table 8.2 Option Card Installation

Option Card	Port/Connector	Number of Cards Possible
SI-S3, DI-A3 <1>	CN5-A	1
PG-B3, PG-X3	CN5-B, C	2 <2>
DO-A3, AO-A3	CN5-A, B, C	1
PG-F3, PG-E3	CN5-C	1

<1> If installed to CN5-B or CN5-C, DI-A3 cannot be used to set the speed reference, but the input status can still be viewed using U1-17.
 <2> If only one encoder option card is connected to the drive, use the CN5-C connector. If two encoder option cards are connected, use both CN5-B and CN5-C.

◆ Installation Procedure

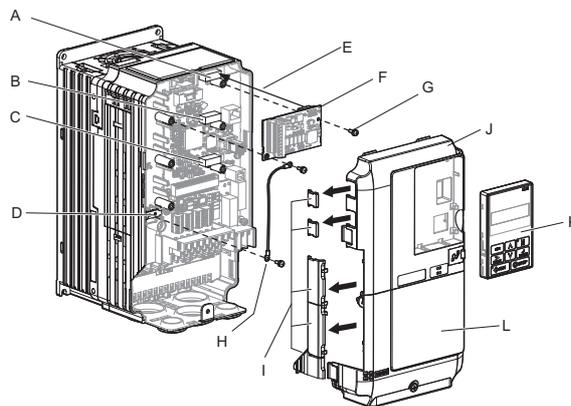
WARNING! Electrical Shock Hazard. Do not allow unqualified personnel to perform work on the drive. Failure to comply could result in death or serious injury. Maintenance, inspection, and replacement of parts must be performed only by authorized personnel familiar with installation, adjustment and maintenance of AC drives and Option Cards.

NOTICE: Damage to Equipment. Observe proper electrostatic discharge procedures (ESD) when handling the option card, 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.

Use the procedure described below when installing option cards to the drive.

1. Shut off power to the drive, wait the appropriate amount of time for voltage to dissipate, then remove the operator and front cover. Refer to [Digital Operator and Front Cover on page 57](#)
2. Insert the CN5 connector on the option card into the matching CN5 connector on the drive, then fasten it into place using one of the screws included with the option card.



- | | |
|-----------------------------------|---|
| A – Connector CN5-C | G – Mounting screw |
| B – Connector CN5-B | H – Lead line |
| C – Connector CN5-A | I – Use wire cutters to create an opening for cable lines |
| D – Drive grounding terminal (FE) | J – Front cover |
| E – Insert connector CN5 here | K – Digital operator |
| F – Option card | L – Terminal cover |

Figure 8.2 Installing an Option Card

8.4 Option Card Installation

3. Connect one of the lead lines using one of the screws to the ground terminal.

Some option cards come with several different lead lines for connecting the card to the drive. Select the lead line with the most appropriate length.

Note: There are only two screw holes on the drive for ground terminals. If three option cards are connected, two of the lead lines will need to share the same ground terminal.

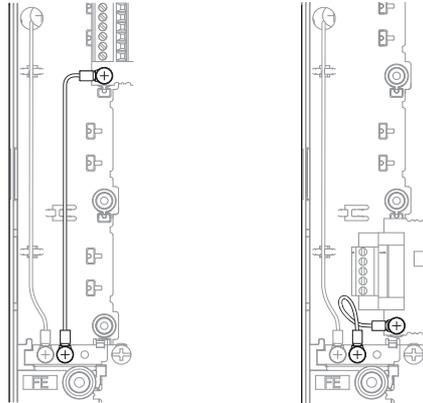


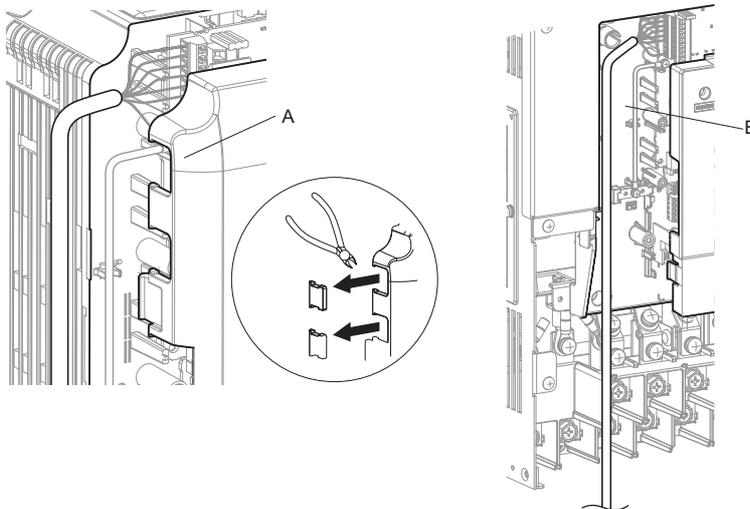
Figure 8.3 Connecting the Ground Terminal

4. Wire the option card to the terminal block on the option card.

For wiring instructions, refer to the manual delivered with the option card.

When installing option cards to drive models CIMR-L□2A0018 through 0033 and to models CIMR-L□4A0009 through 0018, the cables connected to the option might need to be routed through the front cover to the outside. In this case, cut out the perforated openings on the left side of the front cover. Make sure no sharp edges are left that may damage the cable.

Models CIMR-L□2A0047 through 2A0180 and 4A0024 through 0150 have enough space to keep all wiring inside the unit.



A – Cable through hole
(CIMR-L□2A0018 to 0033, 4A0009 to 0018)

B – Space for wiring
(CIMR-L□2A0047 to 0180, 4A0024 to 0150)

Figure 8.4 Wiring Space

5. Place the front cover and digital operator back onto the drive.

Note: 1. Leave enough space when wiring so that the front cover can be easily reattached. Make sure no wires get caught between the front cover and the drive.

2. Any exposed wiring will void the wall-mount enclosure rating.

8.5 Installing Peripheral Devices

This section describes the proper steps and precautions to take when installing or connecting various peripheral devices to the drive.

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.

◆ Braking Options

A braking resistor or an external braking transistor combined with a braking resistor must be installed in order to dissipate the energy fed back to the drive during regenerative operation.

NOTICE: Do not allow unqualified personnel to use the product. Failure to comply could result in damage to the drive or braking circuit. Carefully review the braking resistor instruction manual when connecting a braking resistor option to the drive.

Note: The braking circuit must be sized properly in order to dissipate the regenerative energy from the elevator system. The drive is likely to trip with DC bus over voltage if the resistor value is too large. Connecting a too small braking resistor can damage the drive or braking transistor. Consult with you sales representative for proper braking option selection.

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

NOTICE: Connect braking resistors to the drive as shown in the I/O wiring examples. Improperly wiring braking circuits could result in damage to the drive or equipment.

■ Installing Braking Resistors

Always use braking resistors that are equipped with a thermal overload relay contact, and utilize this contact to switch off the drive in case of braking resistor overheating. When connecting the braking resistors to the drive internal braking transistor, make sure the braking transistor will not be overloaded with the required duty cycle and the selected resistance value.

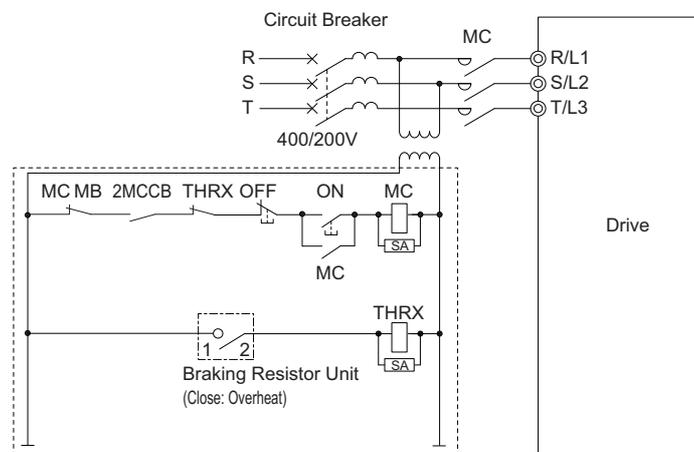


Figure 8.5 Power Supply Interrupt for Overheat Protection (Example)

■ Installing a Braking Unit: CDBR Type

When using a CDBR braking unit or any other external braking transistor or a regenerative converter, disable the internal braking transistor protection function by setting parameter L8-55 = 0.

To install a CDBR type braking unit, connect the drive's B1 terminal (CIMR-L□2A0018A through 0115 and CIMR-L□4A0009 through 0060) or +3 terminal (units CIMR-L□2A0145, 2A0180 and CIMR-L□4A0075 to 4A0150) to the positive terminal on the braking unit. Next wire the negative terminals on the drive and braking unit together. Terminal +2 is not used.

Connect the braking resistor to the CDBR's terminals +0 and -0.

Wire the thermal trip contacts of the CDBR and the braking resistor in series, and connect this signal to a drive digital input. Use this input to trigger a fault in the drive in case a CDBR or braking resistor overload occurs.

8.5 Installing Peripheral Devices

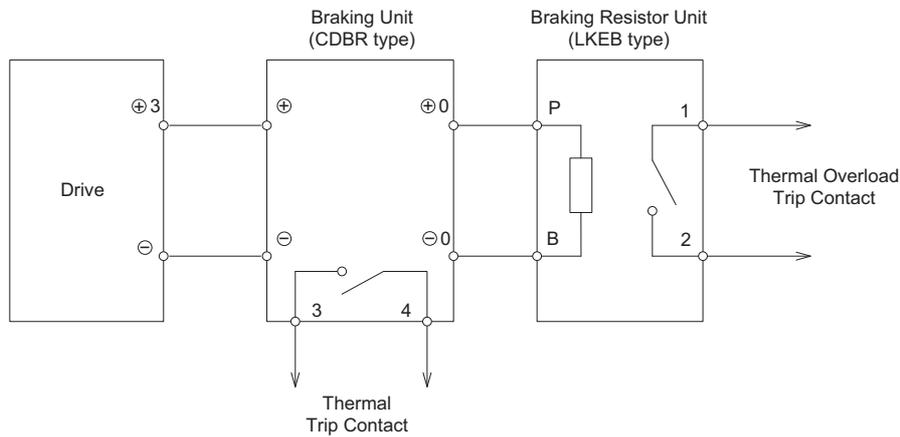


Figure 8.6 Connecting a Braking Unit (CDBR type) and Braking Resistor Unit (CIMR-L□2A0145 to 2A0180 and L□4A0075 to 4A0150)

■ Using Braking Units in Parallel

When multiple braking units are used, they must be installed with a master-slave configuration with a single braking unit acting as the master. **Figure 8.7** illustrates how to wire braking units in parallel.

Wire the thermal overload contacts of all CDBRs and all braking resistors in series, then connect this signal to a drive digital input. Set up the input to trigger a fault in the drive in case of overload in any of the CDBRs or braking resistors.

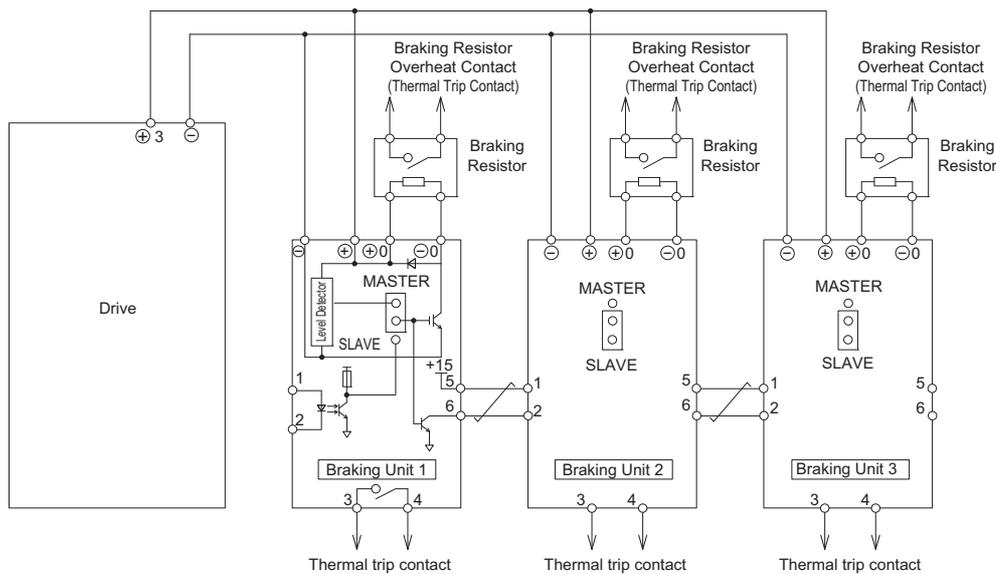


Figure 8.7 Connecting Braking Units in Parallel

◆ Installing a Molded Case Circuit Breaker (MCCB)

Install a MCCB for line protection between the power supply and the main circuit power supply input terminals R/L1, S/L2, and T/L3. This protects the main circuit and devices wired to the main circuit while also providing overload protection.

Consider the following when selecting and installing a MCCB:

- The capacity of the MCCB should be 1.5 to 2 times the rated output current of the drive. Use a MCCB with an operation characteristics so that the MCCB does not trip faster than the drive overload protection works (shuts off the drive after 1 min. operation at 150% of the drive rated current).
- If several drives are connected to one MCCB, use a sequence that shuts the power OFF when an error occurs in one drive by using magnetic contactor (MC) as shown in the following figure.

◆ Connecting an AC or DC Reactor

■ Reactor Placement

When connecting to a large capacity power supply transformer (greater than 600 kVA), or when switching a phase advance capacitor, large peak current can flow through the input power supply circuit and damage converter components in L1000A. To prevent this, install a DC reactor or AC reactor to the input side of the drive. This will additionally help to improve the power factor. If a DC drive or some other type of thyristor converter is running from the same power system as L1000A, then a DC or AC reactor should be installed, regardless of the power supply conditions shown in [Figure 8.9](#).

Note: A DC reactor is built in to the drive models 2A0085 to 2A0180 and 4A0045 to 4A0150.

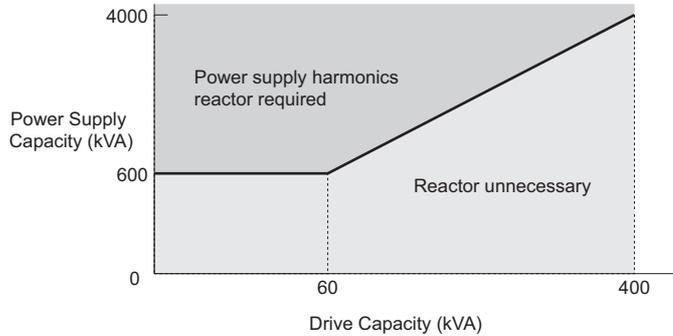


Figure 8.9 Installing a Reactor

■ Connecting an AC Reactor

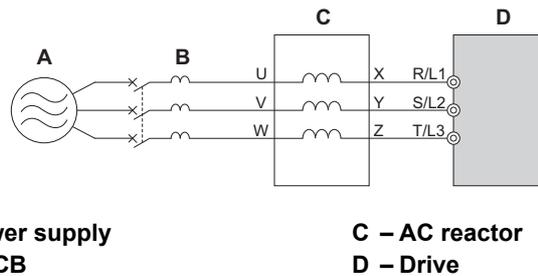


Figure 8.10 Connecting an AC Reactor

■ Connecting a DC Reactor

A DC reactor can be installed to drive models CIMR-L□2A0018 to 0075 and 4A0009 to 0039. When installing a DC reactor, ensure the jumper between terminals +1 and +2 (terminals are jumpered for shipment) is removed. The jumper must be installed if no DC reactor is used. Refer to [Figure 8.11](#) for an example of DC reactor wiring.

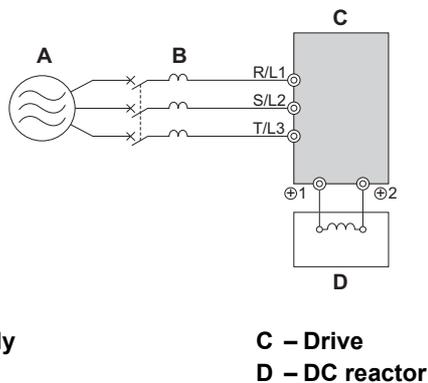


Figure 8.11 Connecting a DC Reactor

8.5 Installing Peripheral Devices

Preventing Induced Noise

Use a noise filter on the output side or use shielded cables. Lay the cables at least 30 cm away from the signal line to prevent induced noise.

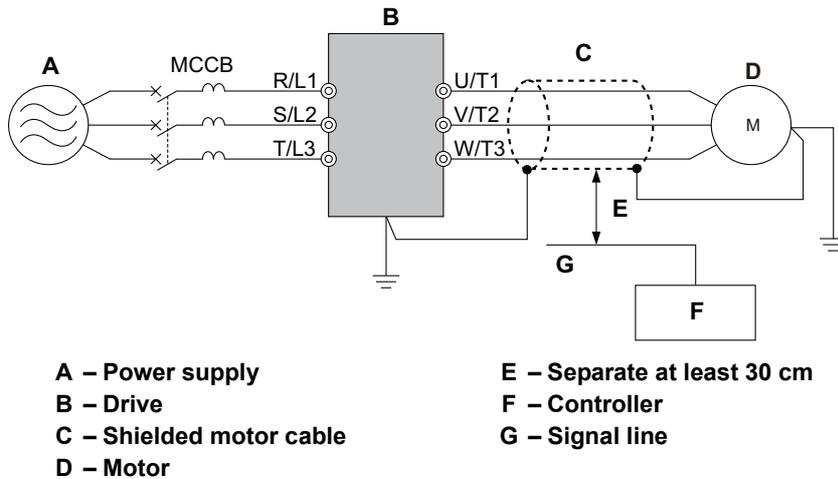


Figure 8.14 Preventing Induced Noise

Reducing Radiated and Radio Frequency Noise

The drive, input lines, and output lines generate radio frequency noise. Use noise filters on input and output sides and install the drive in a metal enclosure panel to reduce radio frequency noise.

Note: The cable running between the drive and motor should be as short as possible.

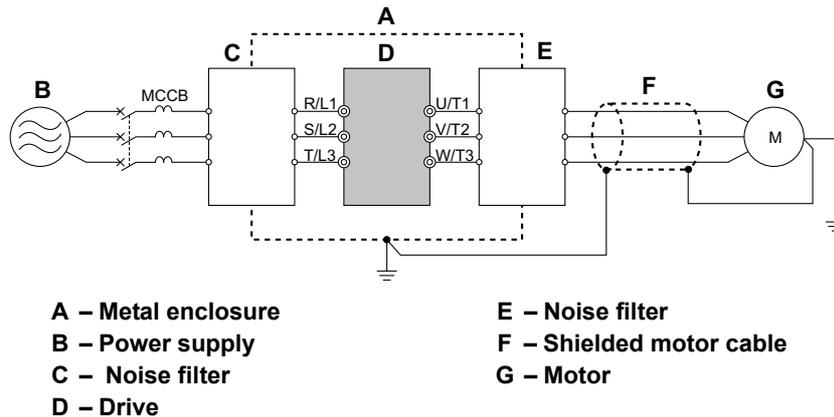


Figure 8.15 Reducing Radio Frequency Noise

◆ Fuse/Fuse Holder

Yaskawa recommends installing a fuse to the input side of the drive to prevent damage to the drive if a short circuit occurs.

Select the appropriate fuse from the table below.

Table 8.3 Input Fuses

Model CIMR-L□	Fuse Type		Fuse Holder		Fuse Type			
	Manufacturer: Fuji Electric						Manufacturer: Bussmann	
	Model	Fuse Ampere Rating	Model	Quantity	Model	Fuse Ampere Rating		
Three-Phase 200 V Class								
2A0018	CR2LS-100	100	CM-1A	1	FWH-90B	90		
2A0025	CR2L-125	125	CM-2A	1	FWH-100B	100		
2A0033	CR2L-150	150	CM-2A	1	FWH-200B	200		
2A0047	CR2L-175	175	CM-2A	1	FWH-200B	200		
2A0060	CR2L-225	225	–	–	FWH-200B	200		
2A0075	CR2L-260	260	–	–	FWH-300A	300		
2A0085	CR2L-300	300	–	–	FWH-300A	300		
2A0115	CR2L-350	350	–	–	FWH-350A	350		

Model CIMR-L□	Fuse Type		Fuse Holder		Fuse Type	
	Manufacturer: Fuji Electric				Manufacturer: Bussmann	
	Model	Fuse Ampere Rating	Model	Quantity	Model	Fuse Ampere Rating
2A0145	CR2L-400	400	–	–	FWH-400A	400
2A0180	CR2L-450	450	–	–	FWH-400A	400
Three-Phase 400 V Class						
4A0009	CR6L-50	50	CMS-4	3	FWH-90B	90
4A0015	CR6L-75	75	CMS-5	3	FWH-80B	80
4A0018	CR6L-75	75	CMS-5	3	FWH-100B	100
4A0024	CR6L-100	100	CMS-5	3	FWH-125B	125
4A0031	CR6L-150	150	CMS-5	3	FWH-200B	200
4A0039	CR6L-150	150	CMS-5	3	FWH-250A	250
4A0045	CR6L-200	200	–	–	FWH-250A	250
4A0060	CR6L-250	250	–	–	FWH-250A	250
4A0075	CR6L-250	250	–	–	FWH-250A	250
4A0091	CR6L-300	300	–	–	FWH-250A	250
4A0112	CR6L-350	350	–	–	FWH-350A	350
4A0150	CR6L-400	400	–	–	FWH-400A	400

◆ Attachment for External Heatsink

An optional external heatsink attachment allows the drive to be mounted inside an enclosure panel with the heatsink protruding outside the panel. Steps should be taken to ensure that there is enough air circulation around the heatsink.

Contact your Yaskawa sales representative or Yaskawa directly.

◆ EMC Filter Installation

This drive is tested according to European standards IEC61800-5-1 and complies with the EMC guidelines. [Refer to EMC Filter Installation on page 373](#) for details about EMC filter selection and installation.

◆ Installing a Motor Thermal Overload (oL) Relay on the Drive Output

It is generally not necessary to install a motor thermal overload relay when operating a single motor from a single AC drive. The L1000A has a UL recognized electronic motor overload protection built into the drive software. However, when utilizing a thermal overload relay, follow the guidelines below.

Note: The relay should shut off main power on the input side of the main circuit when triggered.

■ General Precautions when Using Thermal Overload Relays

The following application precautions should be considered when using motor thermal overload relays on the output of AC drives in order to prevent nuisance trips or overheat of the motor at low speeds:

1. Low speed motor operation
2. Motor cable length
3. Nuisance tripping resulting from high AC drive carrier frequency

Low Speed Operation and Motor Thermal oL Relays

Generally, thermal relays are applied on general-purpose motors. When general-purpose motors are driven by AC drives, the motor current is approximately 5% to 10% greater than if driven by a commercial power supply. In addition, the cooling capacity of a motor with a shaft-driven fan decreases when operating at low speeds. Even if the load current is within the motor rated value, motor overheating may occur. A thermal relay cannot effectively protect the motor due to the reduction of cooling at low speeds. For this reason, apply the UL recognized electronic thermal overload protection function built into the drive whenever possible.

UL recognized electronic thermal overload function of the drive: Speed-dependent heat characteristics are simulated using data from standard motors and force-ventilated motors. The motor is protected from overload using this function.

Long Motor Cables

When a high carrier frequency and long motor cables are used, nuisance tripping of the thermal relay may occur due to increased leakage current. To avoid this, reduce the carrier frequency or increase the tripping level of the thermal overload relay.

8.5 Installing Peripheral Devices

Nuisance Tripping Due to a High AC Drive Carrier Frequency

Current waveforms generated by high carrier frequency PWM drives tend to increase the temperature in overload relays. It may be necessary to increase the trip level setting when encountering nuisance triggering of the relay.

WARNING! *Fire Hazard. Confirm an actual motor overload condition is not present prior to increasing the thermal oL trip setting. Check local electrical codes before making adjustments to motor thermal overload settings.*



Appendix: A

Specifications

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A.3 THREE-PHASE 400 V CLASS DRIVES	294
A.4 DRIVE SPECIFICATIONS	295
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A.1 Section Safety

NOTICE

Equipment Hazard

For optimal performance life, make sure the maximum output current does not exceed 150% of the drive rated current.

Expected performance life estimates the number of drive starts at three million times. This assumes the carrier frequency is at its default setting (8 kHz for models CIMR-L□2A0018 to 2A0115, 4A0009 to 4A0091, and 5 kHz for models CIMR-L□2A0145, 2A0180, 4A0112, 4A0150) and a peak current of less than 150% of the drive rated current.

A.2 Three-Phase 200 V Class Drives

Table A.1 Power Ratings (Three-Phase 200 V Class)

Item		Specification									
CIMR-L□2A		0018	0025	0033	0047	0060	0075	0085	0115	0145	0180
Maximum Applicable Motor Capacity (kW) <1>		3.7	5.5	7.5	11	15	18.5	22	30	37	45
Input	Input Current (A) <2>	18.9	28	37	52	68	80	82	111	136	164
	Rated Voltage Rated Frequency	Three-phase 200 to 240 Vac 50/60 Hz/270 to 340 Vdc									
	Allowable Voltage Fluctuation	-15 to 10%									
	Allowable Frequency Fluctuation	±5%									
	Input Power (kVA)	9.5	14	18	27	36	44	37	51	62	75
Output	Rated Output Capacity (kVA) <3>	6.7	9.5	12.6	17.9	23	29	32	44	55	69
	Rated Output Current (A)	17.5 <4>	25 <4>	33 <4>	47 <4>	60 <4>	75 <4>	85 <4>	115 <4>	145 <4>	180 <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	
	Maximum Output Voltage (V)	Three-phase 200 to 240 V (proportional to input voltage)									
	Maximum output speed (Hz)	120 Hz (user-set)									

<1> The motor capacity (kW) refers to a Yaskawa 4-pole motor. The rated output current of the drive output amps should be equal to or greater than the motor rated 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 220 V.

<4> Carrier frequency can be set up the 8 kHz while keeping this current rating. Higher carrier frequency settings require derating.

<5> Carrier frequency can be set up the 5 kHz while keeping this current rating. Higher carrier frequency settings require derating.

A.3 Three-Phase 400 V Class Drives

Table A.2 Power Ratings (Three-Phase 400 V Class)

Item		Specification											
CIMR-L□4A		0009	0015	0018	0024	0031	0039	0045	0060	0075	0091	0112	0150
Maximum Applicable Motor Capacity (kW) <1>		3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75
Input	Input Current (A) <2>	10.4	15	20	29	39	44	43	58	71	86	105	142
	Rated Voltage Rated Frequency	Three-phase 380 to 480 Vac 50/60 Hz 510 to 680 Vdc											
	Allowable Voltage Fluctuation	-15 to 10%											
	Allowable Frequency Fluctuation	±5%											
	Input Power (kVA)	10.0	14.6	19.2	28.4	37.5	46.6	39.3	53.0	64.9	78.6	96.0	129.9
Output	Rated Output Capacity (kVA) <3>	7	11.3	13.7	18.3	24	30	34	48	57	69	85	114
	Rated Output Current (A)	9.2	14.8	18	24	31	39	45	60	75	91	112	150
	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 380 to 480 V (proportional to input voltage)											
	Maximum output speed (Hz)	120 Hz (user-adjustable)											

<1> The motor capacity (kW) refers to a Yaskawa 4-pole motor. The rated output current of the drive output amps should be equal to or greater than the motor rated 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> Rated motor capacity is calculated with a rated output voltage of 440 V.

<4> Carrier frequency can be set up the 8 kHz while keeping this current rating. Higher carrier frequency settings require derating.

<5> Carrier frequency can be set up the 5 kHz while keeping this current rating. Higher carrier frequency settings require derating.

A.4 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: <ul style="list-style-type: none"> • 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 120 Hz
	Frequency Accuracy (Temperature Fluctuation)	Digital input: within $\pm 0.01\%$ of the max output speed (-10 to +40°C) Analog input: within $\pm 0.1\%$ of the max output speed (25°C $\pm 10^\circ\text{C}$)
	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	-10 to 10 V, 0 to 10 V
	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: 1:1500
	Speed Control Accuracy <1>	OLV: $\pm 0.2\%$ (25°C $\pm 10^\circ\text{C}$), CLV: $\pm 0.02\%$ (25°C $\pm 10^\circ\text{C}$)
	Speed Response <1>	OLV: 10 Hz CLV, CLV/PM: 50 Hz
	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-L□2A0018 to 2A0115, 4A0009 to 4A0060 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 Restart, 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.	
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 <2>
	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
	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
	Heatsink Overheat Protection	Thermistor
	Stall Prevention	Stall Prevention is available during acceleration, and during run.
	Ground Protection	Electronic circuit protection <3>
DC Bus Charge LED	Remains lit until DC bus voltage falls below 50 V	
Environment	Area of Use	Indoors
	Ambient Temperature	-10 to 40°C (NEMA Type 1 enclosure), -10 to 50°C (IP00 enclosure)
	Humidity	95 RH% or less (no condensation)
	Storage Temperature	-20 to 60°C (short-term temperature during transportation)
	Altitude	Up to 1000 meters without derating, up to 3000m 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
Safety Standard	Two Safe Disable inputs and 1 EDM output according to EN61800-5-1, EN954-1/ISO13849 Cat. 3, IEC/EN61508 SIL2, Insulation coordination: class 1 Note: Time from input open to drive output stop is less than 1 ms	
Protection Design	IP00 enclosure, NEMA Type 1 enclosure <4>	

- <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> Overload protection may be triggered when operating with 150% of the rated output current if the output speed is less than 6 Hz.
<3> 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.
<4> Removing the top protective cover from a NEMA Type 1 enclosure drive voids the NEMA Type 1 protection but still keeps IP20 conformity. This is applicable to models CIMR-L□2A0018 to 2A0075 and 4A0009 to 4A0039.

A.5 Drive Watt Loss Data

Table A.3 Watt Loss 200 V Class Three-Phase Models

Model Number CIMR-L□	Carrier Frequency 8 kHz			
	Rated Amps (A)	Heatsink Loss (W)	Interior Unit Loss (W)	Total Loss (W)
2A0018	17.5	100.7	67.4	168.1
2A0025	25.0	194.4	92.3	286.6
2A0033	33.0	213.8	104.8	318.7
2A0047	47.0	280.2	129.9	410.2
2A0060	60.0	394.9	162.8	557.7
2A0075	75.0	459.8	220.9	680.7
2A0085	85.0	510.3	210.9	721.2
2A0115	115.0	662.4	250.0	912.4
2A0145	145.0 <I>	815.9	306.3	1122.2
2A0180	180.0 <I>	976.0	378.1	1354.1

<I> These values assume the carrier frequency is set to 5 kHz.

Table A.4 Watt Loss 400 V Class Three-Phase Models

Model Number CIMR-L□	Carrier Frequency 8 kHz			
	Rated Amps (A)	Heatsink Loss (W)	Interior Unit Loss (W)	Total Loss (W)
4A0009	9.2	68.5	61.0	129.5
4A0015	14.8	135.4	85.7	221.1
4A0018	18.0	149.9	97.0	246.9
4A0024	24.0	208.0	115.1	323.2
4A0031	31.0	262.6	140.8	403.4
4A0039	39.0	329.8	179.4	509.2
4A0045	45.0	348.5	169.6	518.1
4A0060	60.0	484.1	217.2	701.3
4A0075	75.0	563.4	254.0	817.4
4A0091	91.0	722.6	299.0	1021.7
4A0112	112.0 <I>	908.2	416.4	1324.6
4A0150	150.0 <I>	1340.3	580.1	1920.3

<I> These values assume the carrier frequency is set to 5 kHz.

A.6 Drive Derating Data

The drive can be operated at above the rated temperature, altitude, and default carrier frequency by derating the drive capacity.

◆ Carrier Frequency Derating

As the carrier frequency of the drive is increased above the factory default setting, the drive's rated output current must be derated according to [Figure A.1](#) to [Figure A.4](#).

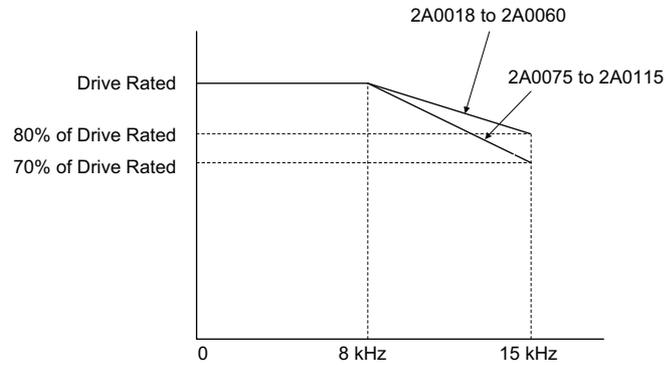


Figure A.1 Carrier Frequency Derating (CIMR-L□2A0018 to 2A0115)

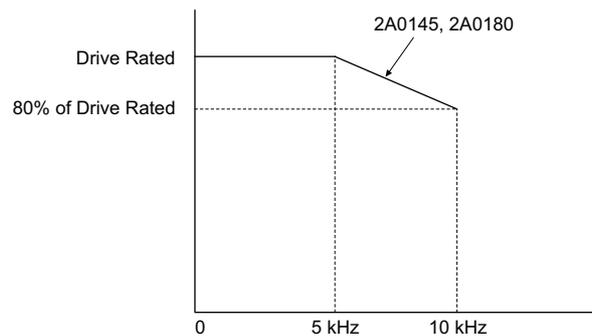


Figure A.2 Carrier Frequency Derating (CIMR-L□2A0145, 2A0180)

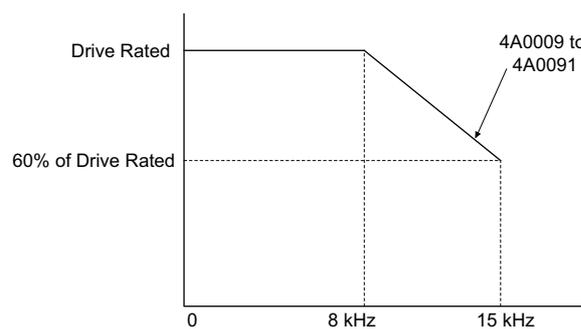


Figure A.3 Carrier Frequency Derating (CIMR-L□4A0009 to 4A0091)

A.6 Drive Derating Data

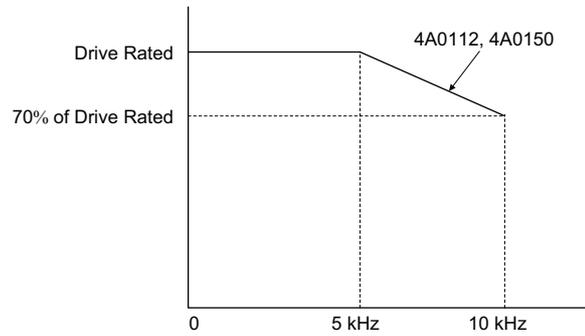


Figure A.4 Carrier Frequency Derating (CIMR-L□4A0112 to 4A0150)

◆ Temperature Derating

To ensure the maximum performance life, the drives output current must be derated like shown in *Figure A.5* when the drive is installed in areas with high ambient temperature. In order to ensure reliable drive overload protection, the parameters L8-12 and L8-35 must also be set according to the installation conditions.

■ Parameter Settings

No.	Name	Description	Range	Def.
L8-12	Ambient Temperature Setting	Adjust the drive overload (oL2) protection level when the drive is installed in an environment that exceeds its ambient temperature rating.	-10 to 50	40°C
L8-35	Installation Method Selection	0: IP00 Enclosure 2: NEMA Type 1 Enclosure	0 or 2	0

IP00 Enclosure

Drive operation between -10°C and 50°C allows 100% continuous current without derating.

NEMA Type 1 Enclosure

Drive operation between -10°C and 40°C allows 100% continuous current without derating. Operation between 40°C and 50°C requires output current derating.

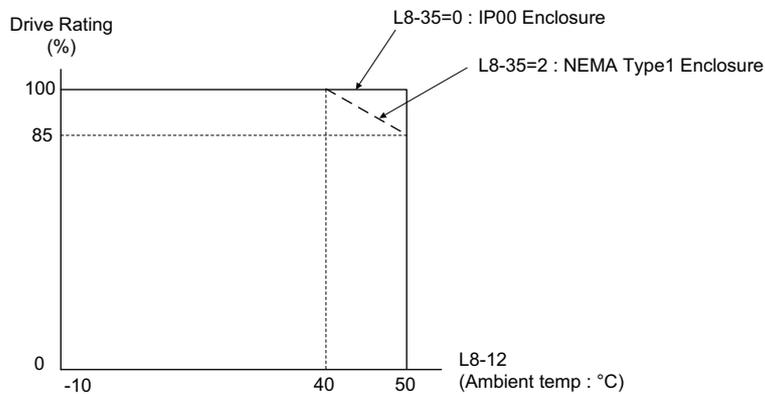


Figure A.5 Ambient Temperature and Installation Method Derating



Appendix: B

Parameter List

This appendix contains a full listing of all parameters and settings available in the drive.

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B.1 Understanding the Parameter Table

◆ Control Modes, Symbols, and Terms

The table below lists terms and symbols used in this section to indicate which parameters are available in which control modes.

Note: For detailed instructions on each control mode, *Refer to Control Mode Selection on page 30.*

Table B.1 Symbols and Icons Used in the Parameter Table

Symbol	Description
	Indicates the parameter is accessible in all control modes.
	Parameter is available when operating the drive with V/f Control.
	Parameter is available when operating the drive with Open Loop Vector.
	Parameter is available when operating the drive with Closed Loop Vector.
	Parameter is available when operating the drive with Closed Loop Vector for PM motors.
	Indicates this parameter can be changed during run.

Note: If a parameter is not available in a certain control mode, the symbol for that control mode is grayed out.

B.2 Parameter Groups

Parameter Group	Name	Page	Parameter Group	Name	Page
A1	Initialization	302	L2	Undervoltage Detection	319
A2	User Parameters	302	L3	Stall Prevention	319
b1	Operation Mode Selection	303	L4	Speed Detection	319
b2	Magnetic Flux Compensation	303	L5	Fault Restart	320
b4	Delay Timers	303	L6	Torque Detection	320
b6	Dwell Function	303	L7	Torque Limit	321
b7	Droop Control	304	L8	Drive Protection	321
b8	Energy Saving	304	n2	Speed Feedback Detection Control (AFR) Tuning	322
C1	Acceleration and Deceleration Ramps	304	n5	Inertia Compensation	322
C2	Jerk Settings	305	n6	Online Tuning	323
C3	Slip Compensation	305	n8	PM Motor Control Tuning	323
C4	Torque Compensation	305	n9	Current Detection Adjustments	323
C5	Speed Control Loop Settings	306	o1	Digital Operator Display Selection	324
C6	Carrier Frequency	306	o2	Digital Operator Keypad Functions	324
d1	Speed Reference	307	o3	Copy Function	325
d6	Field Forcing	308	o4	Maintenance Monitor Settings	325
E1	V/f Pattern	308	S1	Brake Sequence	326
E2	Motor Parameters	309	S2	Slip Compensation for Elevators	326
E5	PM Motor Settings	309	S3	Start/Stop Optimization	327
F1	Encoder/PG Feedback Settings	310	S4	Rescue Operation	328
F3	Digital Input Card (DI-A3)	311	S5	Short Floor Operation	328
F4	Analog Monitor Card (AO-A3)	311	S6	Error Detection	328
F5	Digital Output Card (DO-A3)	312	T1	Induction Motor Auto-Tuning	329
F6	Communication Option Card	312	T2	PM Motor Auto-Tuning	330
H1	Multi-Function Digital Inputs	313	U1	Operation Status Monitors	330
H2	Multi-Function Digital Outputs	314	U2	Fault Trace	332
H3	Multi-Function Analog Inputs	316	U3	Fault History	333
H4	Multi-Function Analog Outputs	317	U4	Maintenance Monitors	334
H5	MEMOBUS/Modbus Serial Communication	318	U6	Control Monitors	335
L1	Motor Protection	319			

B.3 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.

■ A1: Initialization Parameters

No.(Addr.)	Name	Description	Setting	Page
A1-00 (100H)  <I>	Language Selection	All Modes 0: English 1: Japanese 2: German 3: French 4: Italian 5: Spanish 6: Portuguese 7: Chinese	Default: <27> Min: 0 Max: 7	132
A1-01 (101H) 	Access Level Selection	All Modes 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	132
A1-02 (102H) <I>	Control Method Selection	All Modes 0: V/f Control 2: Open Loop Vector Control 3: Closed Loop Vector Control 7: Closed Loop Vector Control for PM Motors	Default: 0 Min: 0 Max: 7	132
A1-03 (103H)	Initialize Parameters	All Modes 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	133
A1-04 (104H)	Password	All Modes	Default: 0000 Min: 0000 Max: 9999	134
A1-05 (105H)	Password Setting	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.		

<I> Parameter setting value is not reset to the default value when the drive is initialized.

<27> Regional default settings

Setting 0: Asia except for China (Model code: CIMR-LT□A)

Setting 7: China (Model code: CIMR-LB□A)

■ A2: User Parameters

No.(Addr.)	Name	Description	Setting	Page
A2-01 to A2-32 (106 to 125H)	User Parameters 1 to 32	All Modes 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: o4-13	135
A2-33 (126H)	User Parameter Automatic Selection	All Modes 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	135

<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.(Addr.)	Name	Description	Setting	Page
b1-01 (180H)	Speed Reference Selection	All Modes 0: Digital operator 1: Analog input terminals 2: MEMOBUS/Modbus communications 3: Option card	Default: 0 Min: 0 Max: 3	136
b1-02 (181H)	Up/Down Command Selection	All Modes 0: Digital operator 1: Digital input terminals 2: MEMOBUS/Modbus communications 3: Option card	Default: 1 Min: 0 Max: 3	137
b1-03 (182H)	Stopping Method Selection	All Modes 0: Ramp to stop 1: Coast to stop	Default: 0 Min: 0 Max: 1	137
b1-06 (185H)	Digital Input Reading	All Modes 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	137
b1-08 (187H)	Up/Down Command Selection while in Programming Mode	All Modes 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	138
b1-14 (1C3H)	Phase Order Selection	All Modes 0: U-V-W 1: U-W-V	Default: 0 Min: 0 Max: 1	138

■ b2: Magnetic Flux Compensation

No.(Addr.)	Name	Description	Setting	Page
b2-08 (190H)	Magnetic Flux Compensation Value	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> Sets the magnetic flux compensation as a percentage of the no-load current value (E2-03).	Default: 0% Min: 0% Max: 1000%	138

■ b4: Delay Timers

No.(Addr.)	Name	Description	Setting	Page
b4-01 (1A3H)	Timer Function On-Delay Time	All Modes	Default: 0.0 s Min: 0.0 s Max: 3000.0 s	139
b4-02 (1A4H)	Timer Function Off-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	139

■ b6: Dwell Function

No.(Addr.)	Name	Description	Setting	Page
b6-01 (1B6H)	Dwell Speed at Start	All Modes 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%	139
b6-02 (1B7H)	Dwell Time at Start		Default: 0.0 s Min: 0.0 s Max: 10.0 s	139
b6-03 (1B8H)	Dwell Speed at Stop		Default: 0.0% Min: 0.0% Max: 100.0%	140
b6-04 (1B9H)	Dwell Time at Stop		Default: 0.0 s Min: 0.0 s Max: 10.0 s	140

B.3 Parameter Table

■ b7: Droop Control

No.(Addr.)	Name	Description	Setting	Page
b7-01 (1CAH) 	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%	140
b7-02 (1CBH) 	Droop Control Delay Time	 Used to adjust the responsiveness of Droop Control.	Default: 0.05 s Min: 0.03 s Max: 2.00 s	140

■ b8: Energy Saving

No.(Addr.)	Name	Description	Setting	Page
b8-01 (1CCH)	Energy Saving Control Selection	 0: Disabled 1: Enabled	Default: 0 Min: 0 Max: 1	140
b8-16 (1F8H)	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	141
b8-17 (1F9H)	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	141

◆ 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.(Addr.)	Name	Description	Setting	Page	
C1-01 (200H) 	Acceleration Ramp 1	 Sets the ramp to accelerate from 0 to maximum speed.	Default: 1.50 s Min: 0.00 s Max: 600.00 s	142	
C1-02 (201H) 	Deceleration Ramp 1	 Sets the ramp to decelerate from maximum speed to 0.		142	
C1-03 (202H) 	Acceleration Ramp 2	 Sets the ramp to accelerate from 0 to maximum speed.		142	
C1-04 (203H) 	Deceleration Ramp 2	 Sets the ramp to decelerate from maximum speed to 0.		142	
C1-05 (204H) 	Acceleration Ramp 3	 Sets the ramp to accelerate from 0 to maximum speed.		142	
C1-06 (205H) 	Deceleration Ramp 3	 Sets the ramp to decelerate from maximum speed to 0.		142	
C1-07 (206H) 	Acceleration Ramp 4	 Sets the ramp to accelerate from 0 to maximum speed.		142	
C1-08 (207H) 	Deceleration Ramp 4	 Sets the ramp to decelerate from maximum speed to 0.		142	
C1-09 (208H)	Emergency Stop Ramp	 Sets the ramp for the Emergency Stop function.		143	
C1-10 (209H)	Accel/Decel Setting Resolution	 0: 0.01 s unit 1: 0.1 s unit		Default: 0 Min: 0 Max: 1	143
C1-11 (20AH)	Accel/Decel Switching Speed	 Sets the speed to switch between accel/decel ramp settings.		Default: 0.0% Min: 0.0% Max: 100.0%	143

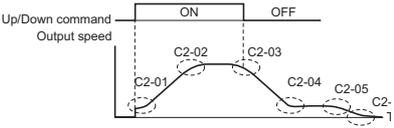
No.(Addr.)	Name	Description	Setting	Page
C1-15 (260H)	Inspection Deceleration Ramp	All Modes Sets the deceleration ramp used for inspection run.	Default: 0.00 s <6> <8> Min: 0.00 s Max: 2.00 s <6> <8>	143

<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 339](#)

<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.(Addr.)	Name	Description	Setting	Page	
C2-01 (20BH)	Jerk at Accel Start	All Modes	Default: 0.50 s <6> Min: 0.00 s Max: 10.00 s <6>	144	
C2-02 (20CH)	Jerk at Accel End	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>	144	
C2-03 (20DH)	Jerk at Decel Start		Default: 0.50 s <6> Min: 0.00 s Max: 10.00 s <6>	144	
C2-04 (20EH)	Jerk at Decel End		Default: 0.50 s <6> Min: 0.00 s Max: 10.00 s <6>	144	
C2-05 (25FH)	Jerk below Leveling Speed		All Modes 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>	144

<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 339](#)

■ C3: Slip Compensation

No.(Addr.)	Name	Description	Setting	Page
C3-01 (20FH) ◀ RUN	Slip Compensation Gain	V/f OLV CLV CLV/PM Sets the gain for the motor slip compensation function.	Default: 1.0 Min: 0.0 Max: 2.5	144
C3-02 (210H) ◀ RUN	Slip Compensation Primary Delay Time	V/f OLV CLV CLV/PM Adjusts the slip compensation function delay time.	Default: 2000 ms Min: 0 ms Max: 10000 ms	145
C3-03 (211H)	Slip Compensation Limit	V/f OLV CLV CLV/PM 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%	145
C3-04 (212H)	Slip Compensation Selection during Regeneration	V/f OLV CLV CLV/PM 0: Disabled. 1: Enabled above 6 Hz. 2: Enabled whenever slip compensation is possible.	Default: 0 Min: 0 Max: 2	145
C3-05 (213H)	Output Voltage Limit Operation Selection	V/f OLV CLV CLV/PM 0: Disabled. 1: Enabled. Automatically decreases motor flux when output voltage saturation is reached.	Default: <5> Min: 0 Max: 1	145

<5> Default setting is determined by the control mode (A1-02).

■ C4: Torque Compensation

No.(Addr.)	Name	Description	Setting	Page
C4-01 (215H) ◀ RUN	Torque Compensation Gain	V/f OLV CLV CLV/PM 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	146
C4-02 (216H) ◀ RUN	Torque Compensation Primary Delay Time	V/f OLV CLV CLV/PM Sets the torque compensation filter time.	Default: <5> Min: 0 ms Max: 60000 ms	146
C4-03 (217H)	Torque Compensation at Forward Start	V/f OLV CLV CLV/PM Sets torque compensation at forward start as a percentage of motor torque.	Default: 0.0% Min: 0.0% Max: 200.0%	146
C4-04 (218H)	Torque Compensation at Reverse Start	V/f OLV CLV CLV/PM Sets torque compensation at reverse start as a percentage of motor torque.	Default: 0.0% Min: -200.0% Max: 0.0%	147
C4-05 (219H)	Torque Compensation Time Constant	V/f OLV CLV CLV/PM 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	147

<5> Default setting is determined by the control mode (A1-02).

B.3 Parameter Table

■ C5: Speed Control Loop Settings

No.(Addr.)	Name	Description	Setting	Page
C5-01 (21BH) 	Speed Control Loop Proportional Gain 1	 Sets the proportional gain 1 of the speed control loop.	Default: <5> Min: 0.00 Max: 300.00	148
C5-02 (21CH) 	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	148
C5-03 (21DH) 	Speed Control Loop Proportional Gain 2	 Sets the proportional gain 2 of the speed control loop.	Default: <5> Min: 0.00 Max: 300.00	148
C5-04 (21EH) 	Speed Control Loop Integral Time 2	 Sets the integral time 2 of the speed control loop.	Default: <5> Min: 0.000 s Max: 10.000 s	148
C5-06 (220H)	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	148
C5-07 (221H)	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%	148
C5-08 (222H)	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%	149
C5-13 (272H) 	Speed Control Loop Proportional Gain 3	 Sets the proportional gain 3 of the speed control loop.	Default: <5> Min: 0.00 Max: 300.00	148
C5-14 (273H) 	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	148
C5-16 (271H)	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	149
C5-19 (274H) 	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	149
C5-20 (275H) 	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	149

<5> Default setting is determined by the control mode (A1-02).

■ C6: Carrier Frequency

No.(Addr.)	Name	Description	Setting	Page
C6-03 (225H)	Carrier Frequency	 Sets the carrier frequency.	Default: <4> Min: 1.0 kHz Max: 15.0 kHz	149
C6-06 (228H)	PWM Method	 Selects PWM modulation method. 0: 2-phase/3-phase conversion 1: 2-phase modulation 2: 3-phase modulation	Default: 2 Min: 0 Max: 2	150
C6-09 (22BH)	Carrier Frequency during Rotational Auto-Tuning	 0: Carrier Frequency = 5 kHz 1: Setting value for C6-03	Default: 0 Min: 0 Max: 1	150
C6-21 (245H)	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	150
C6-23 (25EH)	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	150

<4> Default setting value varies by the drive model (o2-04).

◆ d: Speed References

Speed Reference parameters are used to set the various speed reference values during operation.

■ d1: Speed Reference

No.(Addr.)	Name	Description	Setting	Page
d1-01 (280H) 	Speed Reference 1	<p>All Modes</p> <p>Sets the Speed reference for the drive when d1-18 is set to 0 or 3. Setting units are determined by parameter o1-03.</p>	Default: 0.00% <6> Min: 0.00% Max: 100.00% <6>	151
d1-02 (281H) 	Speed Reference 2			151
d1-03 (282H) 	Speed Reference 3			151
d1-04 (283H) 	Speed Reference 4			151
d1-05 (284H) 	Speed Reference 5			151
d1-06 (285H) 	Speed Reference 6			151
d1-07 (286H) 	Speed Reference 7			151
d1-08 (287H) 	Speed Reference 8			151
d1-18 (2C0H)	Speed Reference Selection Mode	<p>All Modes</p> <p>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.</p>	Default: 0 Min: 0 Max: 3	151
d1-19 (2C1H) 	Nominal Speed	<p>All Modes</p> <p>Sets the nominal speed reference when d1-18 = 1 or 2.</p>	Default: 100.00% <6> Min: 0.00% Max: 100.00% <6>	151
d1-20 (2C2H) 	Intermediate Speed 1	<p>All Modes</p> <p>Sets intermediate speed reference 1 when d1-18 = 1 or 2.</p>	Default: 0.00% <6> Min: 0.00% Max: 100.00% <6>	152
d1-21 (2C3H) 	Intermediate Speed 2	<p>All Modes</p> <p>Sets intermediate speed reference 2 when d1-18 = 1 or 2.</p>	Default: 0.00% <6> Min: 0.00% Max: 100.00% <6>	152
d1-22 (2C4H) 	Intermediate Speed 3	<p>All Modes</p> <p>Sets intermediate speed reference 3 when d1-18 = 1 or 3.</p>	Default: 0.00% <6> Min: 0.00% Max: 100.00% <6>	152
d1-23 (2C5H) 	Releveling Speed	<p>All Modes</p> <p>Sets speed reference for releveling when d1-18 = 1 or 2.</p>	Default: 0.00% <6> Min: 0.00% Max: 100.00% <6>	152
d1-24 (2C6H) 	Inspection Operation Speed	<p>All Modes</p> <p>Sets speed reference when inspection operation is enabled.</p>	Default: 50.00% <6> Min: 0.00% Max: 100.00% <6>	152
d1-25 (2C7H) 	Rescue Operation Speed	<p>All Modes</p> <p>Sets the speed reference during inspection operation.</p>	Default: 10.00% <6> Min: 0.00% Max: 100.00% <6>	152
d1-26 (2C8H) 	Leveling Speed	<p>All Modes</p> <p>Sets leveling speed reference when d1-18 = 1 or 2.</p>	Default: 8.00% <6> Min: 0.00% Max: 100.00% <6>	152

B.3 Parameter Table

No.(Addr.)	Name	Description	Setting	Page
d1-28 (2CAH)	Leveling Speed Detection Level	All Modes 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: 0.00% Min: 0.00% Max: 100.00%	152
d1-29 (2CBH)	Inspection Speed Detection Level	All Modes 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: 0.00% Min: d1-28 Max: 100.00%	153

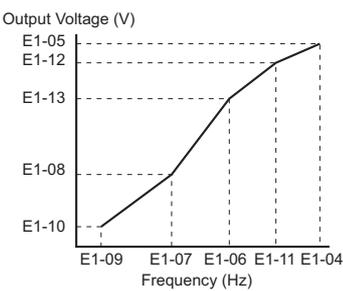
<6> Setting ranges and defaults vary by the setting units determined by parameter o1-03.
Refer to [Defaults and Setting Ranges by Display Unit Selection \(o1-03\) on page 339](#)

■ d6: Field Forcing

No.(Addr.)	Name	Description	Setting	Page
d6-03 (2A2H)	Field Forcing Selection	V/f OLV CLV CLV/PM 0: Disabled 1: Enabled	Default: 0 Min: 0 Max: 1	153
d6-06 (2A5H)	Field Forcing Limit	V/f OLV CLV CLV/PM 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%	153

◆ E: Motor Parameters

■ E1: V/f Pattern

No.(Addr.)	Name	Description	Setting	Page
E1-01 (300H)	Input Voltage Setting	All Modes This parameter must be set to the power supply voltage. WARNING! 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: 200 V <9> Min: 155 V Max: 255 V <9>	154
E1-03 (302H)	V/f Pattern Selection	V/f OLV CLV CLV/PM F: Custom V/f, E1-04 through E1-13 settings define the V/f pattern	Default: F Min: – Max: F	154
E1-04 (303H)	Maximum Output Frequency	<p>All Modes</p> <p>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 four frequencies are set according to these rules: $E1-09 \leq E1-07 < E1-06 \leq E1-11 \leq E1-04$ Note that if E1-11 = 0, then both E1-11 and E1-12 are disabled, and the above conditions do not apply.</p> 	Default: <5> Min: <33> Max: 120.0 Hz	154
E1-05 (304H)	Maximum Voltage		Default: 200.0 V <9> Min: 0.0 V Max: 255.0 V <9>	154
E1-06 (305H)	Base Frequency		Default: <5> Min: 0.0 Hz Max: 120.0 Hz	154
E1-07 (306H)	Middle Output Frequency		Default: <5> Min: 0.0 Hz Max: 120.0 Hz	154
E1-08 (307H)	Middle Output Frequency Voltage		Default: <2> <9> Min: 0.0 V Max: 255.0 V <9>	154
E1-09 (308H)	Minimum Output Frequency		Default: <5> Min: 0.0 Hz Max: 120.0 Hz	154
E1-10 (309H)	Minimum Output Frequency Voltage		Default: <2> <9> Min: 0.0 V Max: 255.0 V <9>	154
E1-11 (30AH) <11>	Middle Output Frequency 2		Default: 0.0 Hz Min: 0.0 Hz Max: 120.0 Hz	154
E1-12 (30BH) <11>	Middle Output Frequency Voltage 2		Default: 0.0 V <9> Min: 0.0 V Max: 255.0 V <9>	154
E1-13 (30CH)	Base Voltage		Default: 0.0 V <9> <13> Min: 0.0 V Max: 255.0 V <9>	154

<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. Double the value when using a 400 V class drive.

<11> Parameter is ignored when E1-11 and E1-12 are set to 0.0.

<13> Auto-Tuning will set E1-13 to the same value as E1-05.

<33> Setting range depends on the type of motor being used. CLV allows a setting range of 10.0 to 120.0 Hz, while CLV/PM allows a setting range of 4.0 to 120.0 Hz.

■ E2: Motor Parameters

No.(Addr.)	Name	Description	Setting	Page
E2-01 (30EH)	Motor Rated Current	<input type="checkbox"/> V/f <input type="checkbox"/> OLV <input type="checkbox"/> CLV <input checked="" type="checkbox"/> CLV/PM 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>	155
E2-02 (30FH)	Motor Rated Slip	<input type="checkbox"/> V/f <input type="checkbox"/> OLV <input type="checkbox"/> CLV <input checked="" type="checkbox"/> CLV/PM Sets the motor rated slip. Automatically set during Auto-Tuning.	Default: <4> Min: 0.00 Hz Max: 20.00 Hz	155
E2-03 (310H)	Motor No-Load Current	<input type="checkbox"/> V/f <input type="checkbox"/> OLV <input type="checkbox"/> CLV <input checked="" type="checkbox"/> CLV/PM Sets the no-load current for the motor. Automatically set during Auto-Tuning.	Default: <4> Min: 0 A Max: E2-01 <10>	155
E2-04 (311H)	Number of Motor Poles	<input type="checkbox"/> V/f <input type="checkbox"/> OLV <input type="checkbox"/> CLV <input checked="" type="checkbox"/> CLV/PM Sets the number of motor poles. Automatically set during Auto-Tuning.	Default: 4 Min: 2 Max: 48	156
E2-05 (312H)	Motor Line-to-Line Resistance	<input type="checkbox"/> V/f <input type="checkbox"/> OLV <input type="checkbox"/> CLV <input checked="" type="checkbox"/> CLV/PM Sets the phase-to-phase motor resistance. Automatically set during Auto-Tuning.	Default: <4> Min: 0.000 Ω Max: 65.000 Ω	156
E2-06 (313H)	Motor Leakage Inductance	<input type="checkbox"/> V/f <input type="checkbox"/> OLV <input type="checkbox"/> CLV <input checked="" type="checkbox"/> CLV/PM 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%	156
E2-07 (314H)	Motor Iron-Core Saturation Coefficient 1	<input type="checkbox"/> V/f <input type="checkbox"/> OLV <input type="checkbox"/> CLV <input checked="" type="checkbox"/> CLV/PM 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	156
E2-08 (315H)	Motor Iron-Core Saturation Coefficient 2	<input type="checkbox"/> V/f <input type="checkbox"/> OLV <input type="checkbox"/> CLV <input checked="" type="checkbox"/> CLV/PM 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	156
E2-09 (316H)	Motor Mechanical Loss	<input type="checkbox"/> V/f <input type="checkbox"/> OLV <input type="checkbox"/> CLV <input checked="" type="checkbox"/> CLV/PM Sets the motor mechanical loss as a percentage of motor rated power (kW).	Default: 0.0% Min: 0.0% Max: 10.0%	156
E2-10 (317H)	Motor Iron Loss for Torque Compensation	<input type="checkbox"/> V/f <input type="checkbox"/> OLV <input type="checkbox"/> CLV <input checked="" type="checkbox"/> CLV/PM Sets the motor iron loss.	Default: <4> Min: 0 W Max: 65535 W	157
E2-11 (318H)	Motor Rated Power	<input type="checkbox"/> V/f <input type="checkbox"/> OLV <input type="checkbox"/> CLV <input checked="" type="checkbox"/> CLV/PM 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	157

<4> Default setting value varies by the drive model (o2-04).

<10> Differs by drive capacity. Models CIMR-L□2A0018 to 0033 and CIMR-L□4A0009 to 0018 display values in 0.01 A units, while models CIMR-L□2A0047 to 0180 and CIMR-L□4A0024 to 0150 display values in 0.1 A units.

■ E5: PM Motor Settings

No.(Addr.)	Name	Description	Setting	Page
E5-02 (32AH) <1>	Motor Rated Power	<input type="checkbox"/> V/f <input type="checkbox"/> OLV <input type="checkbox"/> CLV <input checked="" type="checkbox"/> CLV/PM Sets the rated capacity of the motor.	Default: <4> Min: 0.10 kW Max: 650.00 kW	158
E5-03 (32BH) <1>	Motor Rated Current	<input type="checkbox"/> V/f <input type="checkbox"/> OLV <input type="checkbox"/> CLV <input checked="" type="checkbox"/> CLV/PM Sets the motor rated current.	Default: <4> Min: 10% of drive rated current Max: 200% of drive rated current <10>	158
E5-04 (32CH) <1>	Motor Poles	<input type="checkbox"/> V/f <input type="checkbox"/> OLV <input type="checkbox"/> CLV <input checked="" type="checkbox"/> CLV/PM Sets the number of motor poles.	Default: 12 Min: 2 Max: 48	158
E5-05 (32DH) <1>	Motor Stator Resistance (Single Phase)	<input type="checkbox"/> V/f <input type="checkbox"/> OLV <input type="checkbox"/> CLV <input checked="" type="checkbox"/> CLV/PM Sets the stator resistance (1 phase value).	Default: <4> Min: 0.000 Ω Max: 65.000 Ω	158
E5-06 (32EH) <1>	Motor d-Axis Inductance	<input type="checkbox"/> V/f <input type="checkbox"/> OLV <input type="checkbox"/> CLV <input checked="" type="checkbox"/> CLV/PM Sets the d-axis inductance.	Default: <4> Min: 0.00 mH Max: 600.00 mH	158
E5-07 (32FH) <1>	Motor q-Axis Inductance	<input type="checkbox"/> V/f <input type="checkbox"/> OLV <input type="checkbox"/> CLV <input checked="" type="checkbox"/> CLV/PM Sets the q-axis inductance.	Default: <4> Min: 0.00 mH Max: 600.00 mH	158
E5-09 (331H) <1>	Motor Induction Voltage Constant 1	<input type="checkbox"/> V/f <input type="checkbox"/> OLV <input type="checkbox"/> CLV <input checked="" type="checkbox"/> CLV/PM 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)	159

B.3 Parameter Table

No.(Addr.)	Name	Description	Setting	Page
E5-11 (333H)	Encoder Offset	<div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> V/f OLV CLV CLV/PM </div> 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	159
E5-24 (353H)	Motor Induction Voltage Constant 2	<div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> V/f OLV CLV CLV/PM </div> Sets the induced phase-to-phase rms voltage in units of 0.1 mV/(r/min) [mechanical angle]. When setting this parameter, E5-24 should be set to 0.0.	Default: 0.0 mV/(r/min) Min: 0.0 mV/(r/min) Max: 6500.0 mV/(r/min)	159

<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> Differs by drive capacity. Models CIMR-L□2A0018 to 0033 and CIMR-L□4A0009 to 0018 display values in 0.01 A units, while models CIMR-L□2A0047 to 0180 and CIMR-L□4A0024 to 0150 display values in 0.1 A units.

◆ 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.(Addr.)	Name	Description	Setting	Page
F1-01 (380H)	Encoder 1 Resolution	<div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> V/f OLV CLV CLV/PM </div> Sets the encoder resolution (number of pulses per revolution)	Default: <5> Min: 1 ppr Max: 60000 ppr <34>	160
F1-02 (381H)	Operation Selection at PG Open Circuit (PGo)	<div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> V/f OLV CLV CLV/PM </div> 0: Ramp to stop. Decelerate to stop using the deceleration ramp in C1-02. 1: Coast to stop. 2: Emergency Stop. Decelerate to stop using the deceleration ramp in C1-09. 3: Alarm only.	Default: 1 Min: 0 Max: 3	160
F1-03 (382H)	Operation Selection at Overspeed (oS)	<div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> V/f OLV CLV CLV/PM </div> 0: Ramp to stop. Decelerate to stop using the deceleration ramp in C1-02. 1: Coast to stop. 2: Emergency Stop. Decelerate to stop using the deceleration ramp in C1-09. 3: Alarm only.	Default: 1 Min: 0 Max: 3	160
F1-04 (383H)	Operation Selection at Deviation	<div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> V/f OLV CLV CLV/PM </div> 0: Ramp to stop. Decelerate to stop using the deceleration ramp in C1-02. 1: Coast to stop. 2: Emergency Stop. Decelerate to stop using the deceleration ramp in C1-09. 3: Alarm only.	Default: <5> Min: 0 Max: 3	160
F1-05 (384H)	Encoder 1 Rotation Direction Selection	<div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> V/f OLV CLV CLV/PM </div> 0: A phase leads B in up direction 1: B phase leads A in up direction	Default: <5> Min: 0 Max: 1	161
F1-06 (385H)	PG 1 Pulse Monitor Output Division Ratio	<div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> V/f OLV CLV CLV/PM </div> 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	161
F1-08 (387H)	Overspeed Detection Level	<div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> V/f OLV CLV CLV/PM </div> Sets the overspeed detection level as a percentage of the maximum output frequency.	Default: 115% Min: 0% Max: 120%	160
F1-09 (388H)	Overspeed Detection Delay Time	<div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> V/f OLV CLV CLV/PM </div> 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	160
F1-10 (389H)	Excessive Speed Deviation Detection Level	<div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> V/f OLV CLV CLV/PM </div> Sets the speed deviation detection level as a percentage of the maximum output frequency.	Default: 10% Min: 0% Max: 50%	160
F1-11 (38AH)	Excessive Speed Deviation Detection Delay Time	<div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> V/f OLV CLV CLV/PM </div> 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	160
F1-14 (38DH)	PG Open-Circuit Detection Time	<div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> V/f OLV CLV CLV/PM </div> Sets the time required to trigger a PG Open fault (PGo).	Default: 2.0 s Min: 0.0 s Max: 10.0 s	160
F1-18 (3ADH)	dv3 Detection Selection	<div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> V/f OLV CLV CLV/PM </div> 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	161
F1-19 (3AEH)	dv4 Detection Selection	<div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> V/f OLV CLV CLV/PM </div> 0: Disabled n: Number of pulses that the A and B pulse are reversed that triggers dv4 detection.	Default: 128 Min: 0 Max: 5000	161
F1-20 (3B4H)	PG Option Card Disconnect Detection 1	<div style="display: flex; justify-content: space-around; margin-bottom: 5px;"> V/f OLV CLV CLV/PM </div> 0: Disabled 1: Enabled	Default: 1 Min: 0 Max: 1	161

No.(Addr.)	Name	Description	Setting	Page
F1-29 (3BFH)	dEv Detection Condition Selection	<p>V/f OLV CLV CLV/PM</p> <p>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</p>	Default: 2 Min: 0 Max: 2	162
F1-51 (3D3H)	PGoH Detection Level	<p>V/f OLV CLV CLV/PM</p> <p>Sets the level for detecting PG Hardware Fault (PGoH). Available when F1-20 = 1</p>	Default: 80% Min: 1% Max: 100%	162
F1-63 (2DFH)	PG-E3 R Track Selection	<p>V/f OLV CLV CLV/PM</p> <p>0: Disabled 1: Enabled</p>	Default: 0 Min: 0 Max: 1	162

<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.

■ F3: Digital Input Card (DI-A3)

No.(Addr.)	Name	Description	Setting	Page
F3-01 (390H)	DI-A3 Option Card Input Selection	<p>All Modes</p> <p>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 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.</p>	Default: 0 Min: 0 Max: 7	162
F3-03 (3B9H)	DI-A3 Option Card Data Length Selection	<p>All Modes</p> <p>0: 8 bit 1: 12 bit 2: 16 bit</p>	Default: 2 Min: 0 Max: 2	163

■ F4: Analog Monitor Card (AO-A3)

No.(Addr.)	Name	Description	Setting	Page
F4-01 (391H)	Terminal V1 Function Selection	<p>All Modes</p> <p>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.</p>	Default: 102 Min: 000 Max: 999	163
F4-02 (392H)	Terminal V1 Gain	<p>All Modes</p> <p>Sets the gain for voltage output via terminal V1.</p>	Default: 100.0% Min: -999.9% Max: 999.9%	163
F4-03 (393H)	Terminal V2 Function Selection	<p>All Modes</p> <p>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.</p>	Default: 103 Min: 000 Max: 999	163
F4-04 (394H)	Terminal V2 Gain	<p>All Modes</p> <p>Sets the gain for voltage output via terminal V2.</p>	Default: 50.0% Min: -999.9% Max: 999.9%	163
F4-05 (395H)	Terminal V1 Bias	<p>All Modes</p> <p>Sets the amount of bias added to the voltage output via terminal V1.</p>	Default: 0.0% Min: -999.9% Max: 999.9%	163
F4-06 (396H)	Terminal V2 Bias	<p>All Modes</p> <p>Sets the amount of bias added to the voltage output via terminal V2.</p>	Default: 0.0% Min: -999.9% Max: 999.9%	163
F4-07 (397H)	Terminal V1 Signal Level Selection	<p>All Modes</p>	Default: 1 Min: 0 Max: 1	163
F4-08 (398H)	Terminal V2 Signal Level Selection	<p>0: 0 to 10 V 1: -10 to 10 V</p>	Default: 1 Min: 0 Max: 1	163

B.3 Parameter Table

■ F5: Digital Output Card (DO-A3)

No.(Addr.)	Name	Description	Setting	Page
F5-01 (399H)	Terminal P1-PC Output Selection	<p>All Modes</p> <p>Sets the function for contact output terminals M1-M2, M3-M4, and photocoupler output terminals P1 through P6.</p>	Default: 0 Min: 0 Max: 161	164
F5-02 (39AH)	Terminal P2-PC Output Selection		Default: 1 Min: 0 Max: 161	164
F5-03 (39BH)	Terminal P3-PC Output Selection		Default: 2 Min: 0 Max: 161	164
F5-04 (39CH)	Terminal P4-PC Output Selection		Default: 4 Min: 0 Max: 161	164
F5-05 (39DH)	Terminal P5-PC Output Selection		Default: 6 Min: 0 Max: 161	164
F5-06 (39EH)	Terminal P6-PC Output Selection		Default: 37 Min: 0 Max: 161	164
F5-07 (39FH)	Terminal M1-M2 Output Selection		Default: F Min: 0 Max: 161	164
F5-08 (3A0H)	Terminal M3-M4 Output Selection		Default: F Min: 0 Max: 161	164
F5-09 (3A1H)	DO-A3 Output Mode Selection		<p>All Modes</p> <p>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.</p>	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.(Addr.)	Name	Description	Setting	Page
F6-01 (3A2H)	Operation Selection after Communications Error	<p>All Modes</p> <p>0: Ramp to stop. Decelerate to stop using the deceleration ramp in C1-02. 1: Coast to stop. 2: Emergency Stop. Decelerate to stop using the deceleration ramp in C1-09. 3: Alarm only.</p>	Default: 1 Min: 0 Max: 3	164
F6-02 (3A3H)	External Fault from Communication Option Detection Selection	<p>All Modes</p> <p>0: Always detected 1: Detection during run only</p>	Default: 0 Min: 0 Max: 1	164
F6-03 (3A4H)	External Fault from Communication Option Operation Selection	<p>All Modes</p> <p>0: Ramp to stop. Decelerate to stop using the deceleration ramp in C1-02. 1: Coast to stop. 2: Emergency Stop. Decelerate to stop using the deceleration ramp in C1-09. 3: Alarm only.</p>	Default: 1 Min: 0 Max: 3	165
F6-04 (3A5H)	bUS Error Detection Time	<p>All Modes</p> <p>Sets the delay time for error detection if a bus error occurs.</p>	Default: 2.0 s Min: 0.0 s Max: 5.0 s	–
F6-06 (3A7H)	Torque Limit Selection from Communications Option	<p>V/f OLV CLV CLV/PM</p> <p>0: Disabled. Torque limit from option card disabled. 1: Enabled. Torque limit from option card enabled.</p>	Default: 0 Min: 0 Max: 1	165
F6-08 (36AH) <I>	Reset Communication Parameter	<p>All Modes</p> <p>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.</p>	Default: 0 Min: 0 Max: 1	165
F6-35 (3D0H)	CANopen Node ID	<p>All Modes</p> <p>Sets the node address.</p>	Default: 0 Min: 0 Max: 126	–
F6-36 (3D1H)	CANopen Communication Speed	<p>All Modes</p> <p>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</p>	Default: 6 Min: 0 Max: 8	–

<I> Parameter setting value is not reset to the default value when the drive is initialized.

◆ H: Terminal Functions

H parameters assign functions to the multi-function input and output terminals.

■ H1: Multi-Function Digital Inputs

No.(Addr.)	Name	Description	Setting	Page
H1-03 (400H)	Terminal S3 Function Selection	<p>All Modes</p> <p>Assigns a function to the multi-function digital inputs. Refer to page 313 to page 314 for a description of setting values. Note: Unused terminals should be set to F.</p>	Default: <19> Min: 3 Max: 79	166
H1-04 (401H)	Terminal S4 Function Selection		Default: <19> Min: 3 Max: 79	166
H1-05 (402H)	Terminal S5 Function Selection		Default: <19> Min: 3 Max: 79	166
H1-06 (403H)	Terminal S6 Function Selection		Default: <19> Min: 3 Max: 79	166
H1-07 (404H)	Terminal S7 Function Selection		Default: <19> Min: 3 Max: 79	166
H1-08 (405H)	Terminal S8 Function Selection		Default: F Min: 3 Max: 79	166

<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, 13, 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	Page
3	Multi-Step Speed Reference 1	<p>All Modes</p> <p>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.</p>	166
4	Multi-Step Speed Reference 2		166
5	Multi-Step Speed Reference 3		166
7	Accel/decel Ramp Selection 1	<p>All Modes</p> <p>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).</p>	166
8	Baseblock Command (N.O.)	<p>All Modes</p> <p>Closed: No drive output</p>	166
9	Baseblock Command (N.C.)	<p>All Modes</p> <p>Open: No drive output</p>	166
F	Not Used (Through Mode)	<p>All Modes</p> <p>Select this setting when using the terminal in a 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.</p>	166
14	Fault Reset	<p>All Modes</p> <p>Closed: Resets faults if the cause is cleared and the Up/Down command is removed.</p>	167
15	Emergency Stop (N.O.)	<p>All Modes</p> <p>Closed: Decelerates to stop at the Emergency Stop ramp set to C1-09.</p>	167
17	Emergency Stop (N.C.)	<p>All Modes</p> <p>Open: Decelerates to stop at the Emergency Stop ramp set to C1-09.</p>	167
18	Timer Function Input	<p>All Modes</p> <p>Triggers the timer set up by parameters b4-01 and b4-02. Must be set in conjunction with the timer function output (H2-□□ = 12).</p>	167
1A	Accel/decel Ramp Selection 2	<p>All Modes</p> <p>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.</p>	167

B.3 Parameter Table

H1 Multi-Function Digital Input Settings			
H1-□□ Setting	Function	Description	Page
20 to 2F	External Fault	<p>All Modes</p> <p>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, Emergency Stop 29: N.C., Always detected, Emergency Stop 2A: N.O., During run, Emergency Stop 2B: N.C., During run, Emergency 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)</p>	167
50	Nominal Speed	<p>All Modes</p> <p>Closed: Activates the nominal speed (d1-19).</p>	168
51	Intermediate Speed	<p>All Modes</p> <p>Closed: Activates the Intermediate Speed (d1-20).</p>	168
52	Releveling Speed	<p>All Modes</p> <p>Closed: Activates the Releveling Speed (d1-23).</p>	168
53	Leveling Speed	<p>All Modes</p> <p>Closed: Activates the Leveling Speed (d1-26).</p>	168
54	Inspection Operation	<p>All Modes</p> <p>Closed: Activates Inspection operation using the speed set in d1-24.</p>	168
55	Rescue Operation	<p>All Modes</p> <p>Closed: Activates rescue operation.</p>	168
56	Motor Contactor Feedback	<p>All Modes</p> <p>Used for motor contactor supervision and fault detection.</p>	168
57	High Speed Limit (Up)	<p>All Modes</p> <p>Closed: Uses the leveling speed as the maximum speed when going up.</p>	168
58	High Speed Limit (Down)	<p>All Modes</p> <p>Closed: Uses the leveling speed as the maximum speed when going down.</p>	168
67	Communications Test Mode	<p>All Modes</p> <p>Tests the MEMOBUS/Modbus RS-485/422 interface. Displays "PASS" if the test completes successfully.</p>	169
79	Brake Feedback	<p>All Modes</p> <p>Used for brake supervision and detection of incorrect operation.</p>	169

■ H2: Multi-Function Digital Outputs

No.(Addr.)	Name	Description	Setting	Page
H2-01 (40BH)	Terminals M1-M2 Function Selection (relay)	<p>All Modes</p> <p>Refer to H2 Multi-Function Digital Output Settings on page 315 for a description of setting values.</p>	Default: 50 Min: 0 Max: 161	169
H2-02 (40CH)	Terminals M3-M4 Function Selection (relay)		Default: 51 Min: 0 Max: 161	169
H2-03 (40DH)	Terminals M5-M6 Function Selection (relay)		Default: 6 Min: 0 Max: 161	169
H2-04 (40EH)	Terminal P1-C1 Function Selection (photocoupler)		Default: 37 Min: 0 Max: 161	169
H2-05 (40FH)	Terminal P2-C2 Function Selection (photocoupler)		Default: F Min: 0 Max: 161	169

H2 Multi-Function Digital Output Settings			
H2-□□ Setting	Function	Description	Page
0	During Run	All Modes Closed: An Up/Down command is active or voltage is output.	169
1	Zero Speed	All Modes Open: Output speed is above the minimum output speed set in E1-09. Closed: Output speed is below the minimum output speed set in E1-09.	169
2	Speed Agree 1	All Modes Closed: Output speed equals the speed reference (plus or minus the hysteresis set to L4-02).	170
3	User-set Speed Agree 1	All Modes Closed: Output speed and speed reference equal L4-01 (plus or minus the hysteresis set to L4-02).	170
4	Speed Detection 1	All Modes Closed: Output speed is less than or equal to the value in L4-01 with hysteresis determined by L4-02.	170
5	Speed Detection 2	All Modes Closed: Output speed is greater than or equal to the value in L4-01 with hysteresis determined by L4-02.	171
6	Drive Ready	All Modes Closed: Power up is complete and the drive is ready to accept an Up/Down command.	171
7	DC Bus Undervoltage	All Modes Closed: DC bus voltage is below the Uv trip level set in L2-05.	171
8	During Baseblock (N.O.)	All Modes Closed: Drive has entered the baseblock state (no output voltage).	172
9	Speed Reference Source	All Modes Open: The speed reference is supplied by an external reference (set in b1-01). Closed: Digital operator supplies the speed reference.	172
A	Up/Down Command Source	All Modes Open: The Up/Down command is supplied by an external reference (set in b1-02). Closed: Digital operator supplies the Up/Down command.	172
B	Torque Detection 1	All Modes Closed: An overtorque or undertorque situation has been detected.	172
E	Fault	All Modes Closed: Fault occurred.	172
F	Not used (Through Mode)	All Modes Set this value when using the terminal in the pass-through mode.	172
10	Minor Fault	All Modes Closed: An alarm has been triggered, or the IGBTs have reached 90% of their expected life span.	172
11	Fault Reset Command Active	All Modes Closed: A command has been entered to clear a fault via the input terminals or from the serial network.	172
12	Timer Output	All Modes Closed: Timer output.	172
13	Speed Agree 2	All Modes Closed: When drive output frequency equals the speed reference \pm L4-04.	173
14	User-set Speed Agree 2	All Modes Closed: When the drive output speed is equal to the value in L4-03 \pm L4-04.	173
15	Speed Detection 3	All Modes Closed: When the drive output speed is less than or equal to the value in L4-03 \pm L4-04.	173
16	Speed Detection 4	All Modes Closed: When the output speed is greater than or equal to the value in L4-03 \pm L4-04.	174
18	Torque Detection 2	All Modes Closed: Overtorque or undertorque has been detected.	172
1A	During Down Direction	All Modes Closed: Drive is running in the down direction.	174
1B	During Baseblock 2 (N.C.)	All Modes Open: Drive has entered the baseblock state (no output voltage).	175

B.3 Parameter Table

H2 Multi-Function Digital Output Settings			
H2-□□ Setting	Function	Description	Page
1D	During Regeneration	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> Closed: Motor is operated in regenerative mode.	175
1E	Restart Enabled	<div style="display: flex; justify-content: space-around; align-items: center;"> All Modes </div> Closed: An automatic restart is performed	175
1F	Motor Overload Alarm (oL1)	<div style="display: flex; justify-content: space-around; align-items: center;"> All Modes </div> Closed: oL1 is at 90% of its trip point or greater. An oH3 situation also triggers this alarm.	175
20	Drive Overheat Pre-alarm (oH)	<div style="display: flex; justify-content: space-around; align-items: center;"> All Modes </div> Closed: Heatsink temperature exceeds the parameter L8-02 value.	175
2F	Maintenance Period	<div style="display: flex; justify-content: space-around; align-items: center;"> All Modes </div> Closed: Cooling fan, electrolytic capacitors, IGBTs, or the soft charge bypass relay may require maintenance.	175
30	During Torque Limit	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> Closed: When the torque limit has been reached.	175
33	Within Position Lock Bandwidth	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> Closed: Position deviation is within the Position Lock Bandwidth.	175
37	During Frequency Output	<div style="display: flex; justify-content: space-around; align-items: center;"> All Modes </div> Open: Either the drive has stopped or baseblock, DC Injection Braking, or Initial Excitation is being performed. Closed: Drive is running the motor (not in a baseblock state and DC Injection is not being performed).	175
50	Brake Control	<div style="display: flex; justify-content: space-around; align-items: center;"> All Modes </div> Close: Release brake Open: Apply brake	176
51	Output Contactor Control	<div style="display: flex; justify-content: space-around; align-items: center;"> All Modes </div> Closed: Close output contactor	176
52	Door Zone Reached	<div style="display: flex; justify-content: space-around; align-items: center;"> All Modes </div> Closed: Indicates that the door zone has been reached.	176
53	Not Zero Speed	<div style="display: flex; justify-content: space-around; align-items: center;"> All Modes </div> Closed: Speed is greater than the zero speed level set to S1-01 Open: Operating at zero speed level	176
54	Light Load Direction	<div style="display: flex; justify-content: space-around; align-items: center;"> All Modes </div> Closed: Light load direction is up Open: Light load direction is down	176
55	Light Load Direction Detection Status	<div style="display: flex; justify-content: space-around; align-items: center;"> All Modes </div> Closed: Ready for Light Load Direction Search Open: Light Load Detection in progress	176
56	Cooling Fan Status	<div style="display: flex; justify-content: space-around; align-items: center;"> All Modes </div> Closed: Cooling fan is operating	176
57	Input Phase Loss	<div style="display: flex; justify-content: space-around; align-items: center;"> All Modes </div> Closed: Input phase loss has occurred Open: Normal operation (no phase loss detected)	176
58	Safe Disable Status	<div style="display: flex; justify-content: space-around; align-items: center;"> All Modes </div> 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)	176
61	Motor Pole Search Status	<div style="display: flex; justify-content: space-around; align-items: center;"> All Modes </div> Closed: Motor pole search successful	176
100 to 161	Function 0 to 61 with Inverse Output	<div style="display: flex; justify-content: space-around; align-items: center;"> All Modes </div> Inverts the output switching of the multi-function output functions. Sets the last two digits of I□□ to reverse the output signal of that specific function.	177

■ H3: Multi-Function Analog Inputs

No.(Addr.)	Name	Description	Setting	Page
H3-01 (410H)	Terminal A1 Signal Level Selection	<div style="display: flex; justify-content: space-around; align-items: center;"> All Modes </div> 0: 0 to 10 V 1: -10 to 10 V	Default: 0 Min: 0 Max: 1	177
H3-02 (434H)	Terminal A1 Function Selection	<div style="display: flex; justify-content: space-around; align-items: center;"> All Modes </div> Sets the function of terminal A1.	Default: 0 Min: 0 Max: 1F	177

No.(Addr.)	Name	Description	Setting	Page
H3-03 (411H) 	Terminal A1 Gain Setting	All Modes 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%	177
H3-04 (412H) 	Terminal A1 Bias Setting	All Modes 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%	177
H3-09 (417H)	Terminal A2 Signal Level Selection	All Modes 0: 0 to 10 V 1: -10 to 10 V	Default: 0 Min: 0 Max: 0	178
H3-10 (418H)	Terminal A2 Function Selection	All Modes Sets the function of terminal A2.	Default: 0 Min: 0 Max: 1F	178
H3-11 (419H) 	Terminal A2 Gain Setting	All Modes 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%	179
H3-12 (41AH) 	Terminal A2 Bias Setting	All Modes 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%	179
H3-13 (41BH)	Analog Input Filter Time Constant	All Modes 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	179
H3-16 (2F0H)	Offset for Terminal A1	All Modes Applies an offset to analog input A1. Can be used for zero adjustment of the analog input.	Default: 0 Min: -500 Max: 500	179
H3-17 (2F1H)	Offset for Terminal A2	All Modes Applies an offset to analog input A2. Can be used for zero adjustment of the analog input.	Default: 0 Min: -500 Max: 500	179

H3 Multi-Function Analog Input Settings			
H3-□□ Setting	Function	Description	Page
0	Speed Reference Bias (value added to input signal when multiple analog terminals supply the speed reference)	All Modes 10 V = E1-04 (maximum output frequency)	179
2	Auxiliary Speed Reference 1 (used as a second speed reference)	All Modes 10 V = E1-04 (maximum output frequency)	179
3	Auxiliary Speed Reference 2 (used as third speed reference)	All Modes 10 V = E1-04 (maximum output frequency)	180
14	Torque Compensation (load cell input)	V/f OLV CLV CLV/PM 10 V = Motor rated torque	180
1F	Not used (Through Mode)	All Modes Sets this value when using the terminal in the pass-through mode.	180

■ H4: Analog Outputs

No.(Addr.)	Name	Description	Setting	Page
H4-01 (41DH)	Terminal FM Monitor Selection	All Modes 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	180
H4-02 (41EH) 	Terminal FM Gain	All Modes 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%	180
H4-03 (41FH) 	Terminal FM Bias	All Modes Sets the bias value added to the terminal FM output signal.	Default: 0.0% Min: -999.9% Max: 999.9%	180
H4-04 (420H)	Terminal AM Monitor Selection	All Modes 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	180
H4-05 (421H) 	Terminal AM Gain	All Modes 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%	180

B.3 Parameter Table

No.(Addr.)	Name	Description	Setting	Page
H4-06 (422H) 	Terminal AM Bias	All Modes Sets the bias value added to the terminal AM output signal.	Default: 0.0% Min: -999.9% Max: 999.9%	180
H4-07 (423H)	Terminal FM Signal Level Selection	All Modes 0: 0 to 10 V 1: -10 to 10 V	Default: 0 Min: 0 Max: 1	181
H4-08 (424H)	Terminal AM Signal Level Selection	All Modes 0: 0 to 10 V 1: -10 to 10 V	Default: 0 Min: 0 Max: 1	181

■ H5: MEMOBUS/Modbus Serial Communication

No.(Addr.)	Name	Description	Setting	Page
H5-01 (425H) <14>	Drive Node Address	All Modes 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	346
H5-02 (426H)	Communication Speed Selection	All Modes 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	346
H5-03 (427H)	Communication Parity Selection	All Modes 0: No parity 1: Even parity 2: Odd parity Cycle power for the setting to take effect.	Default: 0 Min: 0 Max: 2	346
H5-04 (428H)	Stopping Method After Communication Error (CE)	All Modes 0: Ramp to stop 1: Coast to stop 2: Emergency Stop 3: Alarm only	Default: 3 Min: 0 Max: 3	346
H5-05 (429H)	Communication Fault Detection Selection	All Modes 0: Disabled 1: Enabled. If communication is lost for more than two seconds, a CE fault will occur.	Default: 1 Min: 0 Max: 1	347
H5-06 (42AH)	Drive Transmit Wait Time	All Modes Sets the wait time between receiving and sending data.	Default: 5 ms Min: 5 ms Max: 65 ms	347
H5-07 (42BH)	RTS Control Selection	All Modes 0: Disabled. RTS is always on. 1: Enabled. RTS turns on only when sending.	Default: 1 Min: 0 Max: 1	347
H5-09 (435H)	CE Detection Time	All Modes 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	347
H5-10 (436H)	Unit Selection for MEMOBUS/Modbus Register 0025H	All Modes 0: 0.1 V units 1: 1 V units	Default: 0 Min: 0 Max: 1	347
H5-11 (43CH)	Communications ENTER Function Selection	All Modes 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	348

<14> If this parameter is set to 0, the drive will be unable to respond to MEMOBUS/Modbus commands.

◆ L: Protection Functions

L parameters are used to set up drive and motor protection functions, such as: undervoltage detection, Stall Prevention, speed detection, fault restarts, overtorque detection, torque limits, and other types of hardware protection.

■ L1: Motor Protection

No. (Addr.)	Name	Description	Setting	Page
L1-01 (480H)	Motor Overload Protection Selection	All Modes 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	182
L1-02 (481H)	Motor Overload Protection Time	All Modes Sets the motor thermal overload protection (oL1) time.	Default: 1.0 min Min: 0.1 min Max: 5.0 min	184
L1-13 (46DH)	Continuous Electrothermal Operation Selection	All Modes 0: Disabled 1: Enabled	Default: 1 Min: 0 Max: 1	184

<5> Default setting is determined by the control mode (A1-02).

■ L2: Undervoltage Detection

No. (Addr.)	Name	Description	Setting	Page
L2-05 (489H)	Undervoltage Detection Level (Uv)	All Modes Sets the DC bus undervoltage trip level.	Default: <9> <15> Min: 150 Vdc Max: 210 Vdc <9>	184

<9> Values shown here are for 200 V class drives. Double the value when using a 400 V class drive.

<15> Default setting value is dependent on the setting for the input voltage (E1-01).

■ L3: Stall Prevention

No. (Addr.)	Name	Description	Setting	Page
L3-01 (48FH)	Stall Prevention Selection during Acceleration	V/f OLV CLV CLV/PM 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	185
L3-02 (490H)	Stall Prevention Level during Acceleration	V/f OLV CLV CLV/PM Used when L3-01 = 1 or 2. 100% is equal to the drive rated current.	Default: <16> Min: 0% Max: 150% <16>	186
L3-05 (493H)	Stall Prevention Selection during Run	V/f OLV CLV CLV/PM 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	186
L3-06 (494H)	Stall Prevention Level during Run	V/f OLV CLV CLV/PM 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>	186

<16> The setting value is dependent on the setting for the carrier frequency reduction (L8-38).

■ L4: Speed Detection

No. (Addr.)	Name	Description	Setting	Page
L4-01 (499H)	Speed Agreement Detection Level	All Modes	Default: 0.0% Min: 0.0% Max: 100.0%	186
L4-02 (49AH)	Speed Agreement Detection Width	L4-01 sets the speed detection level for digital output functions H2-□□ = 2, 3, 4, 5. L4-02 sets the hysteresis or allowable margin for speed detection.	Default: 4.0% Min: 0.0% Max: 40.0%	186
L4-03 (49BH)	Speed Agreement Detection Level (+/-)	All Modes	Default: 0.0% Min: -100.0% Max: 100.0%	187
L4-04 (49CH)	Speed Agreement Detection Width (+/-)	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: 4.0% Min: 0.0% Max: 40.0%	187
L4-05 (49DH)	Speed Reference Loss Detection Selection	All Modes 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	187

B.3 Parameter Table

No. (Addr.)	Name	Description	Setting	Page
L4-06 (4C2H)	Speed Reference at Reference Loss	All Modes 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%	187
L4-13 (4F6H)	Door Zone Level	All Modes 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%	187

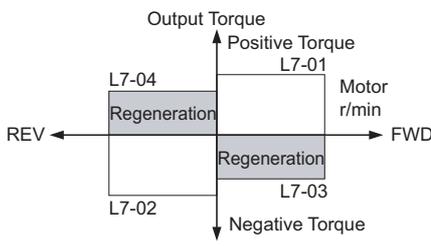
■ L5: Fault Restart

No. (Addr.)	Name	Description	Setting	Page
L5-01 (49EH)	Number of Auto Restart Attempts	All Modes Sets the number of times the drive may attempt to restart after the following faults occur: GF, LF, oC, ov, PF, rr, oL1, oL2, oL3, oL4, UL3, UL4.	Default: 0 Min: 0 Max: 10	188
L5-02 (49FH)	Fault Output Operation during Auto Restart	All Modes 0: Fault output not active. 1: Fault output active during restart attempt.	Default: 0 Min: 0 Max: 1	189
L5-04 (46CH)	Fault Reset Interval Time	All Modes Sets the amount of time to wait between performing fault restarts.	Default: 10.0 s Min: 0.5 s Max: 600.0 s	189
L5-06 (522H)	Under Voltage Fault Restart Selection	All Modes 0: Same as L5-01 condition 1: Always automatically reset UV1	Default: 0 Min: 0 Max: 1	189

■ L6: Torque Detection

No. (Addr.)	Name	Description	Setting	Page
L6-01 (4A1H)	Torque Detection Selection 1	All Modes 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	190
L6-02 (4A2H)	Torque Detection Level 1	All Modes Sets the overtorque and undertorque detection level.	Default: 150% Min: 0% Max: 300%	190
L6-03 (4A3H)	Torque Detection Time 1	All Modes 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	190
L6-04 (4A4H)	Torque Detection Selection 2	All Modes 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	190
L6-05 (4A5H)	Torque Detection Level 2	All Modes Sets the overtorque and undertorque detection level.	Default: 150% Min: 0% Max: 300%	190
L6-06 (4A6H)	Torque Detection Time 2	All Modes 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	190

■ L7: Torque Limit

No. (Addr.)	Name	Description	Setting	Page
L7-01 (4A7H)	Forward Torque Limit	<p>V/f OLV CLV CLV/PM</p> <p>Sets the torque limit value as a percentage of the motor rated torque. Four individual quadrants can be set.</p> 	Default: 200% Min: 0% Max: 300%	191
L7-02 (4A8H)	Reverse Torque Limit		Default: 200% Min: 0% Max: 300%	191
L7-03 (4A9H)	Forward Regenerative Torque Limit		Default: 200% Min: 0% Max: 300%	191
L7-04 (4AAH)	Reverse Regenerative Torque Limit		Default: 200% Min: 0% Max: 300%	191

■ L8: Drive Protection

No. (Addr.)	Name	Description	Setting	Page
L8-02 (4AEH)	Overheat Alarm Level	<p>All Modes</p> <p>An overheat alarm will occur if the heatsink temperature exceeds the level set in L8-02.</p>	Default: <4> Min: 50°C Max: 150°C	191
L8-03 (4AFH)	Overheat Pre-Alarm Operation Selection	<p>All Modes</p> <p>0: Ramp to stop. A fault is triggered. 1: Coast to stop. A fault is triggered. 2: Emergency Stop. Decelerate to stop using the deceleration ramp in C1-09. A fault is triggered. 3: Continue operation. An alarm is triggered.</p>	Default: 3 Min: 0 Max: 3	192
L8-05 (4B1H)	Input Phase Loss Protection Selection	<p>All Modes</p> <p>Selects the detection of input current phase loss, power supply voltage imbalance, or main circuit electrolytic capacitor deterioration.</p> <p>0: Disabled 1: Enabled always 2: Enabled during operation 3: Enabled during constant speed</p>	Default: 1 Min: 0 Max: 3	192
L8-06 (4B2H)	Input Phase Loss Detection Level	<p>All Modes</p> <p>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.</p> <p>Detection Level = 100% = Voltage class × √2 (determines standards for setting values)</p>	Default: <4> Min: 0.0% Max: 50.0%	192
L8-07 (4B3H)	Output Phase Loss Protection Selection	<p>All Modes</p> <p>0: Disabled 1: Enabled (triggered by a single phase loss) 2: Enabled (triggered when two phases are lost)</p>	Default: 0 Min: 0 Max: 2	193
L8-09 (4B5H)	Output Ground Fault Detection Selection	<p>All Modes</p> <p>0: Disabled 1: Enabled</p>	Default: 1 Min: 0 Max: 1	193
L8-10 (4B6H)	Heatsink Cooling Fan Operation Selection	<p>All Modes</p> <p>0: During run only. Fan operates only during run and for L8-11 seconds after stop. 1: Fan always on. Cooling fan operates whenever the drive is powered up. 2: Temperature controlled operation.</p>	Default: 0 Min: 0 Max: 2	193
L8-11 (4B7H)	Heatsink Cooling Fan Off Delay Time	<p>All Modes</p> <p>Sets a delay time to shut off the cooling fan after the Up/Down command is removed when L8-10 = 0.</p>	Default: 60 s Min: 0 s Max: 300 s	193
L8-12 (4B8H)	Ambient Temperature Setting	<p>All Modes</p> <p>Enter the ambient temperature. This value adjusts the oL2 detection level.</p>	Default: 40°C Min: -10°C Max: 50°C	194
L8-15 (4BBH)	oL2 (drive overload) Characteristics Selection at Low Speeds	<p>All Modes</p> <p>0: No oL2 level reduction below 6 Hz. 1: oL2 level is reduced linearly below 6 Hz. It is halved at 0 Hz.</p>	Default: 1 Min: 0 Max: 1	194
L8-27 (4DDH)	Overcurrent Detection Gain	<p>V/f OLV CLV CLV/PM</p> <p>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.</p>	Default: 300.0% Min: 0.0% Max: 300.0%	194
L8-29 (4DFH)	Current Unbalance Detection (LF2)	<p>V/f OLV CLV CLV/PM</p> <p>0: Disabled 1: Enabled</p>	Default: 1 Min: 0 Max: 1	194

B.3 Parameter Table

No. (Addr.)	Name	Description	Setting	Page
L8-35 (4ECH) </>	Installation Selection	All Modes 0: IP20 enclosure drive 2: NEMA Type 1 enclosure	Default: <4> Min: 0 Max: 2	195
L8-38 (4EFH)	Automatic Torque Boost Selection	All Modes 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	195
L8-39 (4F0H)	Reduced Carrier Frequency	All Modes Sets the reduced carrier frequency used by the Torque Boost function.	Default: 3.0 kHz Min: 1.0 kHz Max: 15.0 kHz	195
L8-55 (45FH)	Internal Braking Transistor Protection	All Modes 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	195
L8-62 (529H)	Operation Selection at Input Phase Loss	All Modes 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: Emergency Stop - Decelerate to stop using the deceleration ramp in C1-09. 3: Alarm only - Drive continues operation.	Default: 1 Min: 0 Max: 3	192
L8-77 (61EH)	Oscillation Suppression	All Modes 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	196
L8-88 (2F5H)	Safe Disable Operation Mode	All Modes 0: Mode 0 (Ready Signal Off and Alarm Output on when Safe Disable Inputs open) 1: Mode 1 (Ready Signal On and Alarm Output off when Safe Disable Inputs open, Varispeed L7 compatible)	Default: 1 Min: 0 Max: 1	196

<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).

◆ 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.

■ n2: Speed Feedback Detection Control (AFR) Tuning

No. (Addr.)	Name	Description	Setting	Page
n2-01 (584H)	Speed Feedback Detection Control (AFR) Gain	<input type="checkbox"/> V/f <input checked="" type="checkbox"/> OLV <input type="checkbox"/> CLV <input type="checkbox"/> CLV/PM 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	197
n2-02 (585H)	Speed Feedback Detection Control (AFR) Time Constant 1	<input type="checkbox"/> V/f <input checked="" type="checkbox"/> OLV <input type="checkbox"/> CLV <input type="checkbox"/> CLV/PM Sets the time constant used for speed feedback detection control (AFR).	Default: 50 ms Min: 0 ms Max: 2000 ms	197
n2-03 (586H)	Speed Feedback Detection Control (AFR) Time Constant 2	<input type="checkbox"/> V/f <input checked="" type="checkbox"/> OLV <input type="checkbox"/> CLV <input type="checkbox"/> CLV/PM Sets the AFR time constant to be used during regen.	Default: 750 ms Min: 0 ms Max: 2000 ms	197

■ n5: Inertia Compensation

No. (Addr.)	Name	Description	Setting	Page
n5-01 (5B0H)	Inertia Compensation Selection	<input type="checkbox"/> V/f <input type="checkbox"/> OLV <input checked="" type="checkbox"/> CLV <input type="checkbox"/> CLV/PM 0: Disabled 1: Enabled	Default: 0 Min: 0 Max: 1	198
n5-02 (5B1H)	Motor Acceleration Time	<input type="checkbox"/> V/f <input type="checkbox"/> OLV <input checked="" type="checkbox"/> CLV <input type="checkbox"/> CLV/PM 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	198
n5-03 (5B2H)	Inertia Compensation Gain	<input type="checkbox"/> V/f <input type="checkbox"/> OLV <input checked="" type="checkbox"/> CLV <input type="checkbox"/> CLV/PM 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	199

<4> Default setting value is dependent on the drive model (o2-04).

■ n6: Online Tuning

No. (Addr.)	Name	Description	Setting	Page
n6-01 (570H)	Online Tuning Selection	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> 0: Disabled 1: Line-to-line resistance tuning 2: Voltage correction.	Default: 2 Min: 0 Max: 2	199
n6-05 (5C7H)	Online Tuning Gain	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> 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	199

■ n8: PM Motor Control Tuning

No. (Addr.)	Name	Description	Setting	Page
n8-01 (540H)	Initial Polarity Estimation Current	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> 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%	200
n8-02 (541H)	Pole Attraction Current	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> 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%	200
n8-29 (55CH)	q-Axis Current Control Gain during Normal Operation	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> Sets the q axis proportional gain for the normal control range.	Default: 1000 rad/s Min: 0 rad/s Max: 2000 rad/s	201
n8-30 (55DH)	q-Axis Current Control Integral Time during Normal Operation	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> Sets the q axis integral time for the normal control range.	Default: 10.0 ms Min: 0.0 ms Max: 100.0 ms	201
n8-32 (55FH)	d-Axis Current Control Gain during Normal Operation	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> Sets the d axis proportional gain for the normal control range.	Default: 1000 rad/s Min: 0 rad/s Max: 2000 rad/s	202
n8-33 (560H)	d-Axis Current Control Integral Time during Normal Operation	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> Sets the d axis integral time for the normal control range.	Default: 10.0 ms Min: 0.0 ms Max: 100.0 ms	202
n8-35 (562H)	Initial Rotor Position Detection Selection	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> 1: High frequency injection 2: Pulse injection	Default: 1 Min: 1 Max: 2	200
n8-36 (563H)	High Frequency Injection Level	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> Sets the frequency in Hz for the superimposed signal used for superimposed harmonics.	Default: 500 Hz Min: 25 Hz Max: 1000 Hz	200
n8-37 (564H)	High Frequency Injection Amplitude	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> 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%	200
n8-62 (57DH)	Output Voltage Limit	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> 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>	202
n8-81 (2D0H)	High Frequency Injection during Rescue Operation	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> Sets the frequency used for Polar Detection Method 1 during Rescue Operation.	Default: 90 Hz Min: 25 Hz Max: 1000 Hz	201
n8-82 (2D1H)	High Frequency Injection Amplitude during Rescue Operation	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> 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%	201
n8-84 (2D3H)	Polarity Detection Current	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> Sets the current level (E5-03) as a percentage for detecting polarity during Initial Polarity Estimation.	Default: 100% Min: 0% Max: 150%	201
n8-86 (2D5H)	Magnet Pole Search Error Detection Selection	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> 0: Disabled 1: Enabled	Default: 0 Min: 0 Max: 1	201

<9> Values shown here are for 200 V class drives. Double the value when using a 400 V class drive.

■ n9: Current Detection Adjustments

No. (Addr.)	Name	Description	Setting	Page
n9-60 (64DH)	A/D Conversion Start Delay	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> 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	202

<4> Default setting is determined by the drive model (o2-04).

◆ o: Operator Related Parameters

The o parameters are used to set up the digital operator displays.

■ o1: Digital Operator Display Selection

No. (Addr.)	Name	Description	Setting	Page
o1-01 (500H) 	Drive Mode Unit Monitor Selection	All Modes Selects the content of the last monitor that is shown when scrolling through Drive Mode display. Enter the last three digits of the monitor parameter number to be displayed: U□-□□.	Default: 106 (Monitor U1-06) Min: 105 Max: 699	203
o1-02 (501H) 	User Monitor Selection after Power Up	All Modes 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	203
o1-03 (502H)	Digital Operator Display Unit Selection	All Modes 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>	203
o1-04 (503H)	V/f Pattern Setting Units	V/f OLV CLV CLV/PM 0: Hz 1: r/min	Default: <5> Min: 0 Max: 1	204
o1-10 (520H)	User-Set Display Units Maximum Value	All Modes 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.	Default: <20> Min: 1 Max: 60000	204
o1-11 (521H)	User-Set Display Units Decimal Display	o1-11 sets the position of the decimal position.	Default: <20> Min: 0 Max: 3	204
o1-20 (575H)	Traction Sheave Diameter	V/f OLV CLV CLV/PM Sets the traction sheave diameter for display unit calculations.	Default: 400 mm Min: 100 mm Max: 2000 mm	204
o1-21 (576H)	Roping Ratio	V/f OLV CLV CLV/PM Sets the roping ratio. 1: 1:1 2: 1:2 3: 1:3 4: 1:4	Default: 2 Min: 1 Max: 4	204
o1-22 (577H)	Mechanical Gear Ratio	V/f OLV CLV CLV/PM Sets the ratio of the gear installed for display unit calculations.	Default: <5> Min: 0.10 Max: 50.00	204

<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.

■ o2: Digital Operator Keypad Functions

No. (Addr.)	Name	Description	Setting	Page
o2-01 (505H)	LO/RE Key Function Selection	All Modes 0: Disabled 1: Enabled. LO/RE key switches between LOCAL and REMOTE operation.	Default: 0 Min: 0 Max: 1	205
o2-02 (506H)	STOP Key Function Selection	All Modes 0: Disabled. STOP key is disabled in REMOTE operation. 1: Enabled. STOP key is always enabled.	Default: 0 Min: 0 Max: 1	205
o2-03 (507H)	User Parameter Default Value	All Modes 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	205
o2-04 (508H) <I>	Drive Model Selection	All Modes Enter the drive model. Setting required only if installing a new control board.	Default: Determined by drive capacity Min: – Max: –	206
o2-05 (509H)	Speed Reference Setting Method Selection	All Modes 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	206

No. (Addr.)	Name	Description	Setting	Page
o2-06 (50AH)	Operation Selection when Digital Operator is Disconnected	All Modes 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	206
o2-09 (50DH)	Reserved	–	–	–

<1> Parameter setting value is not reset to the default value when the drive is initialized.

■ o3: Copy Function

No. (Addr.)	Name	Description	Setting	Page
o3-01 (515H)	Copy Function Selection	All Modes 0: No action 1: Read parameters from the drive, saving them onto the digital operator. 2: Copy parameters from the digital operator, writing them to the drive. 3: Verify parameter settings on the drive to check if they match the data saved on the operator.	Default: 0 Min: 0 Max: 3	206
o3-02 (516H)	Copy Allowed Selection	All Modes 0: Read operation prohibited 1: Read operation allowed	Default: 0 Min: 0 Max: 1	207

■ o4: Maintenance Monitor Settings

No. (Addr.)	Name	Description	Setting	Page
o4-01 (50BH)	Cumulative Operation Time Setting	All Modes Sets the value for the cumulative operation time of the drive in units of 10 h.	Default: 0 h Min: 0 h Max: 9999 h	207
o4-02 (50CH)	Cumulative Operation Time Selection	All Modes 0: Logs power-on time 1: Logs operation time when the drive output is active (output operation time).	Default: 0 Min: 0 Max: 1	207
o4-03 (50EH)	Cooling Fan Operation Time Setting	All Modes 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	207
o4-05 (51DH)	Capacitor Maintenance Setting	All Modes 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%	207
o4-07 (523H)	DC bus Pre-charge Relay Maintenance Setting	All Modes 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%	208
o4-09 (525H)	IGBT Maintenance Setting	All Modes 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%	208
o4-11 (510H)	U2, U3 Initialization	All Modes 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	208
o4-12 (512H)	kWh Monitor Initialization	All Modes 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	208
o4-13 (528H)	Number of Travels Counter Reset	All Modes 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	208

B.3 Parameter Table

◆ 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. (Addr.)	Name	Description	Setting	Page
S1-01 (680H)	Zero Speed Level at Stop	All Modes 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%	209
S1-02 (681H)	DC Injection Current at Start	V/f OLV CLV CLV/PM 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%	209
S1-03 (682H)	DC Injection Current at Stop	V/f OLV CLV CLV/PM 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%	209
S1-04 (683H)	DC Injection/Position Lock Time at Start	All Modes 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	209
S1-05 (684H)	DC Injection/Position Lock Time at Stop	All Modes 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	209
S1-06 (685H)	Brake Release Delay Time	All Modes 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	210
S1-07 (686H)	Brake Close Delay Time	All Modes 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]	210
S1-10 (687H)	Run Command Delay Time	All Modes 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	210
S1-11 (688H)	Output Contactor Open Delay Time	All Modes 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	210

<5> Default setting is determined by the control mode (A1-02).

■ S2: Slip Compensation for Elevators

No. (Addr.)	Name	Description	Setting	Page
S2-01 (68FH)	Motor Rated Speed	V/f OLV CLV CLV/PM Sets the motor rated speed.	Default: 1380 rpm Min: 300 rpm Max: 1800 rpm	210
S2-02 (690H)	Slip Compensation Gain in Motoring Mode	V/f OLV CLV CLV/PM 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	210
S2-03 (691H)	Slip Compensation Gain in Regenerative Mode	V/f OLV CLV CLV/PM Slip compensation for leveling speed can be set separately for motoring and regenerative states. This can help improve the accuracy of leveling.	Default: 1.0 Min: 0.0 Max: 5.0	210
S2-05 (693H)	Slip Compensation Torque Detection Delay Time	V/f OLV CLV CLV/PM Sets a delay time before detecting torque for slip compensation.	Default: 1000 ms Min: 0 ms Max: 10000 ms	211
S2-06 (694H)	Slip Compensation Torque Detection Filter Time Constant	V/f OLV CLV CLV/PM 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	211

■ S3: Start/Stop Optimization

No. (Addr.)	Name	Description	Setting	Page
S3-01 (697H) 	Position Lock Gain at Start 1		Default: 5 Min: 0 Max: 100	211
S3-02 (698H) 	Position Lock Gain at Start 2 (Anti Rollback Gain)	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: 0.00 Min: 0.00 Max: 100.00	211
S3-03 (699H) 	Position Lock Gain at Stop		Default: 5 Min: 0 Max: 100	211
S3-04 (69AH)	Position Lock Bandwidth		Default: 10 Min: 0 Max: 16383	211
S3-10 (69BH)	Starting Torque Compensation Increase Time		Default: 500 ms Min: 0 ms Max: 5000 ms	212
S3-12 (69DH)	Starting Torque Compensation Bias in Down Direction		Default: 0 Min: -40.0% Max: 40.0%	212
S3-14 (69FH)	Torque Compensation Fade Out Speed		Default: 0.0% Min: 0.0% Max: 100%	212
S3-15 (6A0H)	Torque Compensation Fade Out Time		Default: 1000 ms Min: 0 ms Max: 5000 ms	212
S3-16 (6A1H)	Torque Limit Reduction Time		Default: 100 ms Min: 0 ms Max: 10000 ms	212
S3-25 (6A3H)	DC Injection Gain in Regenerative Operation		Default: 100% Min: 0% Max: 400%	212
S3-26 (6A4H)	DC Injection Gain in Motoring Operation		Default: 20% Min: 0% Max: 400%	212
S3-27 (6BDH)	Torque Compensation Value with Load Condition 1		Default: -50% Min: -100% Max: 100%	212
S3-28 (6BEH)	Torque Compensation Value with Load Condition 2		Default: 50% Min: -100% Max: 100%	213
S3-29 (6BFH)	Analog Input from Load Cell with Load Condition 1		Default: 0.0% Min: -100% Max: 100%	213
S3-30 (6C0H)	Analog Input from Load Cell with Load Condition 2		Default: 100.0% Min: -100.0% Max: 100%	213
S3-34 (6C4H)	Anti-Rollback Torque Bias 1		Default: 0.0% Min: 0.0% Max: 100.0%	213
S3-35 (6C5H)	Anti-Rollback Torque Bias 2		Default: 0.0% Min: 0.0% Max: 100.0%	213
S3-37 (6C7H)	Position Deviation Level to Apply ARB Torque Bias 1		Default: 0 Min: 0 Max: 32767	213
S3-38 (6C8H)	Position Deviation Level to Apply ARB Torque Bias 2		Default: 0 Min: 0 Max: 32767	213
S3-39 (6C9H)	Anti-Rollback Integral Gain		Default: 0.00 Min: -30.00 Max: 30.00	214

B.3 Parameter Table

No. (Addr.)	Name	Description	Setting	Page
S3-40 (6CAH)	Anti-Rollback Movement Detection	V/f OLV CLV CLV/PM Sets the amount of pulses for movement detection during Anti-Rollback.	Default: 1 pulse Min: 0 pulse Max: 100 pulses	214
S3-41 (6CBH)	Position Lock Gain at Start 2 Reduction	V/f OLV CLV CLV/PM 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	214

■ S4: Rescue Operation

No. (Addr.)	Name	Description	Setting	Page
S4-01 (6A6H)	Light Load Direction Search Selection	All Modes 0: Disabled 1: Enabled 2: Enabled for Motor 1 only	Default: 0 Min: 0 Max: 2	214
S4-02 (6A7H)	Light Load Direction Search Method	All Modes Determines how the drive detects the light load direction. 0: Output Current 1: Regenerative direction detection	Default: 1 Min: 0 Max: 1	214
S4-03 (6A8H)	Light Load Direction Search Time	All Modes Sets the time to perform Light Load Direction Search.	Default: 1.0 s Min: 0.0 s Max: 5.0 s	214
S4-04 (6A9H)	Light Load Direction Search Speed Reference	All Modes Sets the speed reference to use during Light Load Direction Search.	Default: <5> Min: 0.00% Max: 20.00%	215
S4-05 (6AAH)	Rescue Operation Torque Limit	All Modes Sets a time limit for Light Load Direction Search.	Default: 100% Min: 0% Max: 300%	215
S4-06 (6CCH)	Rescue Operation Power Supply Selection	All Modes 0: Battery 1: UPS (single-phase) 2: UPS (3-phase)	Default: 0 Min: 0 Max: 2	215
S4-07 (6CDH)	UPS Power	All Modes Sets the capacity of the UPS.	Default: 0.0kVA Min: 0.0kVA Max: 100.0kVA	215
S4-08 (6CEH)	UPS Operation Speed Limit Selection	All Modes Determines how a speed limit should be applied to the Rescue Operation speed (d1-25) 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	215
S4-12 (6D2H)	DC Bus Voltage during Rescue Operation	All Modes Sets the DC bus voltage during Rescue Operation.	Default: 0 V Min: 0 V Max: 800 V	215
S4-13 (6D3H)	Rescue Operation Power Supply Deterioration Detection Level	All Modes Determines at which level of backup power supply deterioration a PF5 fault is triggered.	Default: 80% Min: 10% Max: 100%	215

<5> Default setting is determined by the control mode (A1-02).

■ S5: Short Floor Operation

No. (Addr.)	Name	Description	Setting	Page
S5-01 (6ABH)	Short Floor Operation Selection	All Modes 0: Disabled 1: Enabled	Default: 0 Min: 0 Max: 1	217
S5-02 (6ACH)	Nominal Speed for Short Floor Calculation	All Modes 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%	217

■ S6: Error Detection

No. (Addr.)	Name	Description	Setting	Page
S6-01 (6B3H)	Motor Contactor Response Error (SE1) Detection/Reset Selection	All Modes 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	217
S6-02 (6B4H)	Starting Current Error (SE2) Detection Delay Time	V/f OLV CLV CLV/PM Sets a delay time for detecting SE2.	Default: 200 ms Min: 0.00 ms Max: [S1-04]-[S1-06]	217
S6-04 (6B6H)	Output Current Error (SE3) Detection Delay Time	V/f OLV CLV CLV/PM Sets a delay time for detecting SE3.	Default: 200 ms Min: 0 ms Max: 5000 ms	217

No. (Addr.)	Name	Description	Setting	Page
S6-05 (6B7H)	Brake Response Error (SE4) Detection Time	All Modes Sets a delay time for detecting SE4.	Default: 500 ms Min: 0 ms Max: 10000 ms	218
S6-10 (6B8H)	Overacceleration Detection Level	V/f OLV CLV CLV/PM 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	218
S6-11 (6B9H)	Overacceleration Detection Time	V/f OLV CLV CLV/PM Sets a primary delay for detecting overacceleration.	Default: 50 ms Min: 0 ms Max: 5000 ms	218
S6-12 (6BAH)	Overacceleration Detection Selection	V/f OLV CLV CLV/PM 0: Always enabled 1: During run only	Default: 0 Min: 0 Max: 1	218
S6-15 (6BBH)	Speed Reference Loss Detection	All Modes Enabled or disables detection for speed reference missing (FrL). 0: Disabled 1: Enabled	Default: 1 Min: 0 Max: 1	218
S6-16 (6BCH)	Restart after Baseblock Selection	All Modes 0: No restart after Baseblock/Safe Torque-Off 1: Restart after Baseblock/Safe Torque-Off	Default: 0 Min: 0 Max: 1	218

<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 m/s².

◆ T: Motor Tuning

Enter data into the following parameters to tune the motor and drive for optimal performance

■ T1: Induction Motor Auto-Tuning

No. (Addr.)	Name	Description	Setting	Page
T1-01 (701H)	Auto-Tuning Mode Selection	V/f OLV CLV CLV/PM 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>	100
T1-02 (702H)	Motor Rated Power	V/f OLV CLV CLV/PM Sets the motor rated power as specified on the motor nameplate. Note: Use the following formula to convert horsepower into kilowatts: kW = HP x 0.746.	Default: <4> Min: 0.00 kW Max: 650.00 kW	100
T1-03 (703H)	Motor Rated Voltage	V/f OLV CLV CLV/PM 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>	101
T1-04 (704H)	Motor Rated Current	V/f OLV CLV CLV/PM 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>	101
T1-05 (705H)	Motor Base Frequency	V/f OLV CLV CLV/PM Sets the rated frequency of the motor as specified on the motor nameplate.	Default: 50.0 Hz Min: 0.0 Hz Max: 120.0 Hz	101
T1-06 (706H)	Number of Motor Poles	V/f OLV CLV CLV/PM Sets the number of motor poles as specified on the motor nameplate.	Default: 4 Min: 2 Max: 48	101
T1-07 (707H)	Motor Base Speed	V/f OLV CLV CLV/PM 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	101
T1-08 (708H)	Encoder Resolution (pulses per revolution)	V/f OLV CLV CLV/PM 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	101
T1-09 (709H)	Motor No-Load Current (Stationary Auto-Tuning 1 and 2)	V/f OLV CLV CLV/PM 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>	102
T1-10 (70AH)	Motor Rated Slip (Stationary Auto-Tuning 2)	V/f OLV CLV CLV/PM 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	102

<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.

B.3 Parameter Table

- <10> Differs by drive capacity. Models CIMR-L□2A0018 to 0033 and CIMR-L□4A0009 to 0018 display values in 0.01 A units, while models CIMR-L□2A0047 to 0180 and CIMR-L□4A0024 to 0150 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. (Addr.)	Name	Description	Setting	Page
T2-01 (750H)	Motor Auto-Tuning Mode Selection	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> 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	Default: 0 Min: 0 Max: 11	102
T2-04 (730H)	Motor Rated Power	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> Sets the motor rated power as indicated on the motor nameplate.	Default: <4> Min: 0.00 kW Max: 650.00 kW	102
T2-05 (732H)	Motor Rated Voltage	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> 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>	102
T2-06 (733H)	Motor Rated Current	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> 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>	103
T2-08 (734H)	Number of Motor Poles	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> Enter the number of motor poles for the motor as indicated on the motor nameplate.	Default: 6 Min: 2 Max: 48	103
T2-09 (731H)	Motor Base Speed	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> 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	103
T2-10 (754H)	Single Phase Stator Resistance	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> Enter the 1-phase resistance of the stator winding.	Default: – Min: 0.000 Ω Max: 65.000 Ω	103
T2-11 (735H)	Motor d-Axis Inductance	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> Enter the d-axis inductance for the motor as indicated on the motor nameplate.	Default: – Min: 0.00 mH Max: 600.00 mH	103
T2-12 (736H)	Motor q-Axis Inductance	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> Enter the q-axis inductance for the motor as indicated on the motor nameplate.	Default: – Min: 0.00 mH Max: 600.00 mH	103
T2-13 (755H)	Induced Voltage Constant Unit Selection	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> 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	103
T2-14 (737H)	Motor Induced Voltage Constant	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> Enter the induced voltage coefficient for the motor as indicated on the motor nameplate.	Default: – Min: 0.0 Max: 6500.0 <30>	103
T2-16 (738H)	Encoder Resolution	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> 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	104
T2-17 (757H)	Encoder Offset	<div style="display: flex; justify-content: space-around; align-items: center;"> V/f OLV CLV CLV/PM </div> Sets the offset between encoder offset and the rotor magnetic axis.	Default: 0.0 deg Min: -180.0 deg Max: 180.0 deg	104

<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.

<10> Differs by drive capacity. Models CIMR-L□2A0018 to 0033 and CIMR-L□4A0009 to 0018 display values in 0.01 A units, while models CIMR-L□2A0047 to 0180 and CIMR-L□4A0024 to 0150 display values in 0.1 A units.

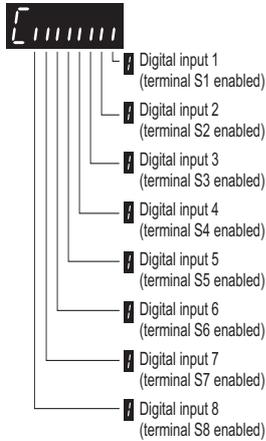
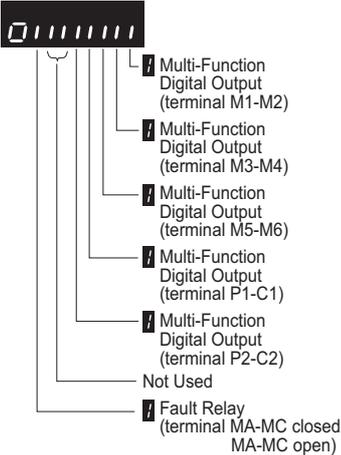
<30> Setting units are determined by the induced voltage constant unit selection for PM motors set to T2-13.

◆ U: Monitors

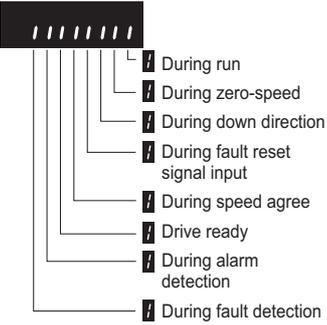
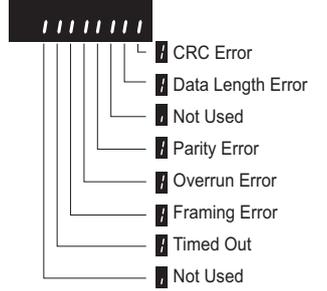
Monitor parameters allow the user to view drive status, fault information, and other data concerning drive operation.

■ U1: Operation Status Monitors

No. (Addr.)	Name	Description	Analog Output Level	Unit	Page
U1-01 (40H)	Speed Reference	<div style="display: flex; justify-content: space-around; align-items: center;"> All Modes </div> Monitors the speed reference.	10 V: Max frequency	0.01% <31>	–
U1-02 (41H)	Output Speed	<div style="display: flex; justify-content: space-around; align-items: center;"> All Modes </div> Displays the output speed.	10 V: Max frequency	0.01% <31>	–
U1-03 (42H)	Output Current	<div style="display: flex; justify-content: space-around; align-items: center;"> All Modes </div> Displays the output current.	10 V: Drive rated current	<10>	–

No. (Addr.)	Name	Description	Analog Output Level	Unit	Page
U1-04 (43H)	Control Method	<p>All Modes</p> <p>0: V/f Control 2: Open Loop Vector Control 3: Closed Loop Vector Control 7: Closed Loop Vector Control for PM</p>	No signal output available	-	-
U1-05 (44H)	Speed Feedback	<p>V/f OLV CLV CLV/PM</p> <p>Displays the motor speed feedback.</p>	10 V: Max Frequency	0.01% <31>	-
U1-06 (45H)	Output Voltage Reference	<p>All Modes</p> <p>Displays the output voltage.</p>	10 V: 200 Vrms <9>	0.1 Vac	-
U1-07 (46H)	DC Bus Voltage	<p>All Modes</p> <p>Displays the DC bus voltage.</p>	10 V: 400 V <9>	1 Vdc	-
U1-08 (47H)	Output Power	<p>All Modes</p> <p>Displays the output power (this value is calculated internally).</p>	10 V: Drive rated power (kW)	<12>	-
U1-09 (48H)	Torque Reference	<p>V/f OLV CLV CLV/PM</p> <p>Monitors the internal torque reference.</p>	10 V: Motor rated torque	0.1%	-
U1-10 (49H)	Input Terminal Status	<p>All Modes</p> <p>Displays the input terminal status.</p> 	No signal output available	-	-
U1-11 (4AH)	Output Terminal Status	<p>All Modes</p> <p>Displays the output terminal status.</p> 	No signal output available	-	-

B.3 Parameter Table

No. (Addr.)	Name	Description	Analog Output Level	Unit	Page
U1-12 (4BH)	Drive Status	<p>All Modes</p> <p>Verifies the drive operation status.</p> 	No signal output available	—	—
U1-13 (4EH)	Terminal A1 Input Voltage	<p>All Modes</p> <p>Displays the voltage input to terminal A1.</p>	10 V: 100%	0.1%	—
U1-14 (4FH)	Terminal A2 Input Voltage	<p>All Modes</p> <p>Displays the voltage input to terminal A2.</p>	10 V: 100%	0.1%	—
U1-16 (53H)	Output Speed after Soft Start	<p>All Modes</p> <p>Displays output speed with ramp time and jerk settings. Units determined by o1-03.</p>	10 V: Max frequency	0.01% <31>	—
U1-17 (58H)	DI-A3 Option Card Input Status	<p>All Modes</p> <p>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. 3FFF: Set (1 bit) + sign (1 bit) + 16 bit</p>	No signal output available	—	—
U1-18 (61H)	oPE Fault Parameter	<p>All Modes</p> <p>Displays the parameter number that caused the oPE□□ or Err (EEPROM write error) error.</p>	No signal output available	—	—
U1-19 (66H)	MEMOBUS/Modbus Error Code	<p>All Modes</p> <p>Displays the contents of a MEMOBUS/Modbus error.</p> 	No signal output available	—	—
U1-25 (4DH)	Software Number (Flash)	<p>All Modes</p> <p>FLASH ID</p>	No signal output available	—	—
U1-26 (5BH)	Software No. (ROM)	<p>All Modes</p> <p>ROM ID</p>	No signal output available	—	—

<9> Values shown here are for 200 V class drives. Double the value when using a 400 V class drive.

<10> Differs by drive capacity. Models CIMR-L□2A0018 to 0033 and CIMR-L□4A0009 to 0018 display values in 0.01 A units, while models CIMR-L□2A0047 to 0180 and CIMR-L□4A0024 to 0150 display values in 0.1 A units.

<12> Differs by drive capacity. Models CIMR-L□2A0018 to 0033 and CIMR-L□4A0009 to 0018 display values in 0.01 kW units, while models CIMR-L□2A0047 to 0180 and CIMR-L□4A0024 to 0150 display values in 0.1 kW units.

<31> 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.

■ U2: Fault Trace

No. (Addr.)	Name	Description	Analog Output Level	Unit	Page
U2-01 (80H)	Current Fault	<p>All Modes</p> <p>Displays the current fault.</p>	No signal output available	—	—
U2-02 (81H)	Previous Fault	<p>All Modes</p> <p>Displays the previous fault.</p>	No signal output available	—	—
U2-03 (82H)	Speed Reference at Previous Fault	<p>All Modes</p> <p>Displays the speed reference at the previous fault.</p>	No signal output available	0.01% <31>	—

No. (Addr.)	Name	Description	Analog Output Level	Unit	Page
U2-04 (83H)	Output Speed at Previous Fault	All Modes Displays the output speed at the previous fault.	No signal output available	0.01% <31>	-
U2-05 (84H)	Output Current at Previous Fault	All Modes Displays the output current at the previous fault.	No signal output available	<10>	-
U2-06 (85H)	Motor Speed at Previous Fault	V/f OLV CLV CLV/PM Displays the motor speed at the previous fault.	No signal output available	0.01% <31>	-
U2-07 (86H)	Output Voltage at Previous Fault	All Modes Displays the output voltage at the previous fault.	No signal output available	0.1 Vac	-
U2-08 (87H)	DC Bus Voltage at Previous Fault	All Modes Displays the DC bus voltage at the previous fault.	No signal output available	1 Vdc	-
U2-09 (88H)	Output Power at Previous Fault	All Modes Displays the output power at the previous fault.	No signal output available	0.1 kW	-
U2-10 (89H)	Torque Reference at Previous Fault	V/f OLV CLV CLV/PM Displays the torque reference at the previous fault.	No signal output available	0.1%	-
U2-11 (8AH)	Input Terminal Status at Previous Fault	All Modes Displays the input terminal status at the previous fault. Displayed as in U1-10.	No signal output available	-	-
U2-12 (8BH)	Output Terminal Status at Previous Fault	All Modes Displays the output status at the previous fault. Displays the same status displayed in U1-11.	No signal output available	-	-
U2-13 (8CH)	Drive Operation Status at Previous Fault	All Modes Displays the operation status of the drive at the previous fault. Displays the same status displayed in U1-12.	No signal output available	-	-
U2-14 (8DH)	Cumulative Operation Time at Previous Fault	All Modes Displays the cumulative operation time at the previous fault.	No signal output available	1 h	-
U2-15 (7E0H)	Soft Starter Output at Previous Fault	All Modes Displays the speed reference for the soft starter at the previous fault. Displayed in the same way as U1-16.	No signal output available	0.01% <31>	-
U2-16 (7E1H)	Motor q-Axis Current at Previous Fault	V/f OLV CLV CLV/PM Displays the q-axis current for the motor at the previous fault. Displayed in the same way as U6-01.	No signal output available	0.10%	-
U2-17 (7E2H)	Motor d-Axis Current at Previous Fault	V/f OLV CLV CLV/PM Displays the d-axis current for the motor at the previous fault. Displayed in the same way as U6-02.	No signal output available	0.10%	-
U2-20 (8EH)	Heatsink Temperature at Previous Fault	All Modes Displays the temperature of the heatsink when the most recent fault occurred.	No signal output available	1°C	-
U2-21 (7E6H)	Peak Hold Current during Fault	All Modes Displays the peak current that occurred just prior to the previous fault.	No signal output available	0.01 A	-
U2-22 (7E7H)	Peak Hold Frequency during Fault	All Modes Displays the output frequency when the peak current displayed in U2-21 occurred.	No signal output available	0.01 Hz	-

<10> Differs by drive capacity. Models CIMR-L□2A0018 to 0033 and CIMR-L□4A0009 to 0018 display values in 0.01 A units, while models CIMR-L□2A0047 to 0180 and CIMR-L□4A0024 to 0150 display values in 0.1 A units.

<31> 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.

■ U3: Fault History

No. (Addr.)	Name	Description	Analog Output Level	Unit	Page
U3-01 to U3-04 (90H to 93H (800H to 803H))	First to 4th Most Recent Fault	All Modes Displays the first to the fourth most recent faults.	No signal output available	-	-
U3-05 to U3-10 (804H to 809H)	5th to 10th Most Recent Fault	All Modes 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 (94H to 97H (80AH to 80DH))	Cumulative Operation Time at 1st to 4th Most Recent Fault	All Modes Displays the cumulative operation time when the first to the fourth most recent faults occurred.	No signal output available	1 h	-

B.3 Parameter Table

No. (Addr.)	Name	Description	Analog Output Level	Unit	Page
U3-15 to U3-20 (80EH to 813H)	Cumulative Operation Time at 5th to 10th Most Recent Fault	All Modes 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. (Addr.)	Name	Description	Analog Output Level	Unit	Page
U4-01 (4CH, 98H, 99H)	Cumulative Operation Time	All Modes 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 (67H, 94H, 9BH)	Cooling Fan Operation Time	All Modes 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 (7EH)	Cooling Fan Maintenance	All Modes 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.	No signal output available	1%	-
U4-05 (7CH)	Capacitor Maintenance	All Modes Displays main circuit capacitor usage time in as a percentage of their expected performance life. Parameter o4-05 can be used to reset this monitor.	No signal output available	1%	-
U4-06 (7D6H)	Soft Charge Bypass Relay Maintenance	All Modes Displays the soft charge bypass relay maintenance time as a percentage of its estimated performance life. Parameter o4-07 can be used to reset this monitor.	No signal output available	1%	-
U4-07 (7D7H)	IGBT Maintenance	All Modes Displays IGBT usage time as a percentage of the expected performance life. Parameter o4-09 can be used to reset this monitor.	No signal output available	1%	-
U4-08 (68H)	Heatsink Temperature	All Modes Displays the heatsink temperature.	10 V: 100°C	1°C	-
U4-09 (5EH)	LED Check	All Modes Lights all segments of the LED to verify that the display is working properly.	No signal output available	-	-
U4-10 (5CH)	kWh, Lower 4 Digits	All Modes 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 (5DH)	kWh, Upper 5 Digits		No signal output available	1 MWh	-
U4-13 (7CFH)	Peak Hold Current	All Modes Displays the highest current value that occurred during a ride.	No signal output available	0.01 A	-
U4-14 (7D0H)	Peak Hold Output Frequency	All Modes Displays the output frequency when the current value shown in U4-13 occurred.	No signal output available	0.01 Hz	-
U4-16 (7D8H)	Motor Overload Estimate (oL1)	All Modes Shows the value of the motor overload detection accumulator. 100% is equal to the oL1 detection level.	10 V: 100%	0.1%	-
U4-17 (7D9H)	Drive Overload Calculations (OL2)	All Modes 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 (7DAH)	Speed Reference Selection Results	All Modes 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 (7DBH)	Speed Reference from MEMOBUS/Modbus Comm.	All Modes Displays the speed reference provided by MEMOBUS/Modbus (decimal).	No signal output available	0.01% <3I>	-

No. (Addr.)	Name	Description	Analog Output Level	Unit	Page
U4-20 (7DCH)	Speed Reference From Option Card	All Modes Displays the speed reference input by an option card (decimal).	No signal output available	0.01% <31>	-
U4-21 (7DDH)	Up/Down Command Source Selection	All Modes Displays the source for the Up/Down command as XY- <i>nn</i> . 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 <i>nn</i> : 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: Emergency 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 (7DEH)	MEMOBUS/Modbus Communications Reference	All Modes 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 (7DFH)	Communication Option Card Reference	All Modes Displays drive control data set by an option card as a four-digit hexadecimal number.	No signal output available	-	-
U4-24 (7E6H)	Number of Travels (Lower 4 digit)	All Modes Displays the lower four digits for the number of trips the drive has made.	No signal output available	1 time	-
U4-25 (7E7H)	Number of Travels (Higher 4 digit)	All Modes Displays the upper four digits for the number of trips the drive has made.	No signal output available	1 time	-
U4-26 (7E8H)	Max. Current during Acceleration	All Modes Shows the maximum current that occurred during acceleration.	No signal output available	0.1 A	-
U4-27 (7E9H)	Max. Current during Deceleration	All Modes Shows the maximum current that occurred during deceleration.	No signal output available	0.1 A	-
U4-28 (7EAH)	Max. Current during Constant Speed	All Modes Shows the maximum current that occurred during ride at top speed.	No signal output available	0.1 A	-
U4-29 (7EDH)	Max. Current during Leveling Speed	All Modes Shows the maximum current that occurred during ride at leveling speed.	No signal output available	0.1 A	-
U4-30 (7EEH)	Slip Compensation Value	V/f OLV CLV CLV/PM Shows the slip compensation value.	No signal output available	0.01%	-
U4-31 (7EFH)	Car Acceleration Rate	V/f OLV CLV CLV/PM Shows the car acceleration rate.	No signal output available	0.01 m/s ²	-
U4-40 (7FDH)	Speed Reference Limit at Rescue Operation	All Modes 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%	-

<31> 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.

■ U6: Control Monitors

No. (Addr.)	Name	Description	Analog Output Level	Unit	Page
U6-01 (51H)	Motor Secondary Current (Iq)	All Modes Displays the value of the motor secondary current (Iq). Motor rated secondary current is 100%.	10 V: Motor secondary rated current	0.1%	-
U6-02 (52H)	Motor Excitation Current (Id)	V/f OLV CLV CLV/PM Displays the value calculated for the motor excitation current (Id). Motor rated secondary current is 100%.	10 V: Motor secondary rated current	0.1%	-
U6-03 (54H)	Speed Control Loop Input	V/f OLV CLV CLV/PM Displays the input and output values of the speed control loop.	10 V: Max frequency	0.01%	-
U6-04 (55H)	Speed Control Loop Output		10 V: Motor secondary rated current		
U6-05 (59H)	Output Voltage Reference (Vq)	V/f OLV CLV CLV/PM Output voltage reference (Vq) for the q-axis.	10 V: 200 Vrms <3>	0.1 Vac	-

B.3 Parameter Table

No. (Addr.)	Name	Description	Analog Output Level	Unit	Page
U6-06 (5AH)	Output Voltage Reference (Vd)	<input type="radio"/> V/f <input checked="" type="radio"/> OLV <input checked="" type="radio"/> CLV <input checked="" type="radio"/> CLV/PM Output voltage reference (Vd) for the d-axis.	10 V: 200 Vrms <9>	0.1 Vac	–
U6-07 (5FH)	q-Axis Current Controller Output	<input type="radio"/> V/f <input checked="" type="radio"/> OLV <input checked="" type="radio"/> CLV <input checked="" type="radio"/> CLV/PM Displays the output value for current control relative to motor secondary current (q-axis).	10 V: 200 Vrms <9>	0.1%	–
U6-08 (60H)	d-Axis Current Controller Output	<input type="radio"/> V/f <input checked="" type="radio"/> OLV <input checked="" type="radio"/> CLV <input checked="" type="radio"/> CLV/PM Displays the output value for current control relative to motor secondary current (d-axis).	10 V: 200 Vrms <9>	0.1%	–
U6-13 (7CAH)	Flux Position Detection (sensor)	<input type="radio"/> V/f <input type="radio"/> OLV <input type="radio"/> CLV <input checked="" type="radio"/> CLV/PM Monitors the value of the flux position detection (sensor).	10 V: 180 deg –10 V: –180 deg	0.1 deg	
U6-18 (7CDH)	Speed Detection PG1 Counter	<input checked="" type="radio"/> All Modes Monitors the number of pulses for speed detection (PG1).	10 V: 65536	1 pulse	
U6-22 (62H)	Position Lock Deviation Counter	<input type="radio"/> V/f <input type="radio"/> OLV <input checked="" type="radio"/> CLV <input checked="" type="radio"/> CLV/PM Displays how far the rotor has moved from its last position in PG pulses (multiplied by 4).	10 V: No. of pulses per revolution	1	–
U6-25 (6BH)	Feedback Control Output	<input type="radio"/> V/f <input type="radio"/> OLV <input checked="" type="radio"/> CLV <input checked="" type="radio"/> CLV/PM Output monitor for the speed control loop.	10 V: Motor secondary rated current	0.01%	–
U6-26 (6CH)	Inertia Compensation Output	<input type="radio"/> V/f <input type="radio"/> OLV <input checked="" type="radio"/> CLV <input checked="" type="radio"/> CLV/PM Output monitor for Inertia Compensation.	10 V: Motor secondary rated current	0.01%	–
U6-80 to U6-99 (7B0 to 7B9, 7F0 to 7F9H)	Option Monitor 1 to 20	<input checked="" type="radio"/> All Modes 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.

B.4 Control Mode Dependent Parameter Default Values

The tables below list parameters that depend on the control mode selection (A1-02). These parameters are initialized to the shown values if the control mode is changed.

◆ A1-02 (Control Mode) Dependent Parameters

Table B.2 A1-02 (Control Mode) Dependent Parameters and Default Values

No.	Name	Setting Range	Resolution	Control Modes (A1-02)			
				V/f (0)	OLV (2)	CLV (3)	CLV/PM (7)
C3-05	Output Voltage Limit Operation Selection	0, 1	–	–	1	1	0
C4-02	Torque Compensation Primary Delay Time	0 to 60000	1 ms	200 <32>	50	–	–
C5-01	Speed Control Loop Proportional Gain 1	0.00 to 300.00	0.01	–	–	40.00	3.00
C5-02	Speed Control Loop Integral Time 1	0.000 to 10.000	0.001 s	–	–	0.500	0.300
C5-03	Speed Control Loop Proportional Gain 2	0.00 to 300.00	0.01	–	–	20.00	3.00
C5-07	Speed Control Loop Gain Switching Speed	0.0 to 100.0	0.1%	–	–	0.0	2.0
C5-13	Speed Control Loop Proportional Gain 3	0.00 to 300.00	0.01	–	–	40.00	3.00
C5-14	Speed Control Loop Integral Time 3	0.000 to 10.000	0.001 s	–	–	0.500	0.300
C5-19	Speed Control Loop Proportional Gain Time during Position Lock	0.00 to 300.00	0.01	–	–	40.00	10.00
E1-04	Maximum Output Frequency	<33>	0.1 Hz/1 rpm	50.0 Hz	50.0 Hz	50.0 Hz	150 rpm
E1-06	Base Frequency	0.0 to 120.0	0.1 Hz/1 rpm	50.0 Hz	50.0 Hz	50.0 Hz	150 rpm
E1-08	Middle Output Frequency Voltage <9>	0.0 to 255.0	0.1 V	<3>	13.2	–	–
E1-09	Minimum Output Frequency	0.0 to 120.0	0.1 Hz/1 rpm	0.5 Hz	0.5	0.0 Hz	0 rpm
E1-10	Minimum Output Frequency Voltage <9>	0.0 to 255.0	0.1 V	<3>	2.4	–	–
F1-01	Encoder 1 Resolution	1 to 60000	1 ppr	–	2.4	1024	2048
F1-05	Encoder 1 Rotation Direction Selection	0, 1	–	–	–	0	1
L1-01	Motor Overload Protection Selection	0 to 3, 5	–	1	1	1	5
o1-04	V/f Pattern Setting Units	0, 1	–	–	–	0	1
o1-22	Mechanical Gear Ratio	0.10 to 50.00	0.01	–	–	14.00	1.00
S1-01	Zero Speed Level at Stop	0.0000 to 9.999	0.001%	2.400	1.000	0.200	0.350
S4-04	Light Load Direction Search Speed Reference	0.00 to 20.00	0.01%	5.00	5.00	5.00	10.00

<3> Default setting value varies by drive model (o2-04).

For models CIMR-L□2A0018 to 0180, 4A0009 to 0091, the default setting is 14.0 for E1-08, and 7.0 for E1-10.

For models CIMR-L□4A0018 and 4A0150, the default setting is 12.0 for E1-08 and, 6.0 for E1-10.

<9> Values shown here are for 200 V class drives. Double the value when using a 400 V class drive.

<32> Default setting value varies by drive model (o2-04). The default setting for models CIMR-L□2A0015 to 0180, CIMR-L□4A0112 to 0150 is 1000 ms when using V/f control.

<33> Setting range depends on the type of motor being used. An induction motor has a setting range of 10.0 to 120.0 Hz, while a PM motor has a setting range of 4.0 to 120.0 Hz.

B.5 Defaults by Drive Model Selection (o2-04)

The following tables show parameters and default settings that change with the drive model selection (o2-04)

Table B.3 200 V Class Drives Default Settings by Drive Model Selection

No.	Name	Unit	Default Settings									
			Model CIMR-L□	2A0018	2A0025	2A0033	2A0047	2A0060	2A0075	2A0085	2A0115	2A0145
o2-04	Drive Model Selection	Hex.	68	6A	6B	6D	6E	6F	70	72	73	74
E2-11	Motor Rated Output	kW	3.7	5.5	7.5	11	15	18.5	22	30	37	45
C6-03	Carrier Frequency	kHz	8	8	8	8	8	8	8	8	5	5
E2-01	Motor Rated Current	A	14	19.6	26.6	39.7	53	65.8	77.2	105	131	160
E2-02	Motor Rated Slip	Hz	2.73	1.5	1.3	1.7	1.6	1.67	1.7	1.8	1.33	1.6
E2-03	Motor No-Load Current	A	4.5	5.1	8	11.2	15.2	15.7	18.5	21.9	38.2	44
E2-05	Motor Line-to-Line Resistance	Ω	0.771	0.399	0.288	0.23	0.138	0.101	0.079	0.064	0.039	0.03
E2-06	Motor Leakage Inductance	%	19.6	18.2	15.5	19.5	17.2	20.1	19.5	20.8	18.8	20.2
E2-10	Motor Iron Loss for Torque Compensation	W	112	172	262	245	272	505	538	699	823	852
E5-02	Motor Rated Power	kW	3.7	5.5	7.5	11	15	18.5	22	30	37	45
E5-03	Motor Rated Current	A	14.6	20	29.3	37.9	53.2	65	76.4	103.5	133.1	149.4
E5-05	Motor Stator Resistance	Ω	0.331	0.37	0.223	0.153	0.095	0.069	0.054	0.041	0.027	0.022
E5-06	Motor d-Axis Inductance	mH	4.78	5.39	3.58	3.46	2.46	1.99	1.7	1.29	0.91	0.9
E5-07	Motor q-Axis Inductance	mH	6.52	7.36	4.89	4.96	3.7	2.99	2.55	2	1.41	1.39
E5-09	Motor Induction Voltage Constant 1	mV/(rad/sec)	239.3	254.3	237	270	254.3	256.7	261.1	260.4	245.1	276
L8-02	Overheat Alarm Level	°C	110	120	125	120	120	125	130	130	130	125
L8-06	Input Phase Loss Detection Level	%	14.0	18.0	20.0	22.0	20.0	21.0	21.0	17.0	27.0	28.0
n5-02	Motor Acceleration Time	s	0.154	0.168	0.175	0.265	0.244	0.317	0.355	0.323	0.32	0.387
n9-60	A/D Conversion Start Delay	μsec	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0

Table B.4 400 V Class Drives Default Settings by Drive Capacity

No.	Name	Unit	Default Settings											
			Model CIMR-L□	4A0009	4A0015	4A0018	4A0024	4A0031	4A0039	4A0045	4A0060	4A0075	4A0091	4A0112
o2-04	Drive Model Selection	Hex.	97	99	9A	9C	9D	9E	9F	A1	A2	A3	A4	A5
E2-11	Motor Rated Output	kW	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75
C6-03	Carrier Frequency	kHz	8	8	8	8	8	8	8	8	5	5	5	5
E2-01	Motor Rated Current	A	7	9.8	13.3	19.9	26.5	32.9	38.6	52.3	65.6	79.7	95	130
E2-02	Motor Rated Slip	Hz	2.7	1.5	1.3	1.7	1.6	1.67	1.7	1.8	1.33	1.6	1.46	1.39
E2-03	Motor No-Load Current	A	2.3	2.6	4	5.6	7.6	7.8	9.2	10.9	19.1	22	24	36
E2-05	Motor Line-to-Line Resistance	Ω	3.333	1.595	1.152	0.922	0.55	0.403	0.316	0.269	0.155	0.122	0.088	0.092
E2-06	Motor Leakage Inductance	%	19.3	18.2	15.5	19.6	17.2	20.1	23.5	20.7	18.8	19.9	20	20
E2-10	Motor Iron Loss for Torque Compensation	W	130	193	263	385	440	508	586	750	925	1125	1260	1600
E5-02	Motor Rated Power	kW	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55	75
E5-03	Motor Rated Current	A	7.3	10	14.6	19	26.6	32.5	38.2	51.8	66.6	74.7	90.8	130.0
E5-05	Motor Stator Resistance	Ω	1.326	1.479	0.892	0.613	0.378	0.276	0.217	0.165	0.107	0.087	0.064	0.022
E5-06	Motor d-Axis Inductance	mH	19.11	21.58	14.33	13.84	9.85	7.95	6.8	5.15	3.62	3.59	2.87	1.80
E5-07	Motor q-Axis Inductance	mH	26.08	29.44	19.56	19.83	14.79	11.94	10.22	8	5.63	5.55	4.44	2.80
E5-09	Motor Induction Voltage Constant 1	mV/(rad/sec)	478.6	508.4	473.9	540	508.4	513.7	522.3	520.8	490.2	552	554.4	1280.0
L8-02	Overheat Alarm Level	°C	110	110	115	120	120	115	120	120	110	120	130	130
L8-06	Input Phase Loss Detection Level	%	14.0	26.0	26.0	21.0	22.0	26.0	18.0	17.0	18.0	20.0	20.0	29.0
n5-02	Motor Acceleration Time	s	0.154	0.168	0.175	0.265	0.244	0.317	0.355	0.323	0.32	0.387	0.317	0.533
n9-60	A/D Conversion Start Delay	μsec	14.0	14.0	14.0	14.0	14.0	114.0	14.0	14.0	14.0	14.0	14.0	14.0

B.6 Defaults and Setting Ranges by Display Unit Selection (o1-03)

The following table shows parameters, default settings and setting range that change according to the digital operator display unit selection (o1-03).

Table B.5 Defaults and Setting Ranges by Display Unit Selection (o1-03)

No.	Name	o1-03 (Digital Operator Display Unit Selection)						Default Settings						
		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						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	Emergency Stop Time													
C1-15	Inspection Run Deceleration Ramp							0.00 s						
C2-01	Jerk at Accel Start	0.00 to 10.00 s						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 <1> m/s						0.0%						
d1-01	Speed Reference 1													
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							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	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.



MEMOBUS/Modbus Communications

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C.1 MEMOBUS/Modbus Configuration

Drives can be controlled from a PLC or other master device via serial communications using the MEMOBUS/Modbus protocol.

MEMOBUS/Modbus communication can be configured using one master (PLC) and a maximum of 255 slaves. The drive has slave functionality only, meaning that serial communication is normally initiated from the master and responded to by the slaves.

The master performs serial communications with only one slave at a time. The address or node for each slave must be set beforehand so that the master can communicate with the slave at that address. A slave that receives a command from the master will perform the specified function and then send a response back to the master.

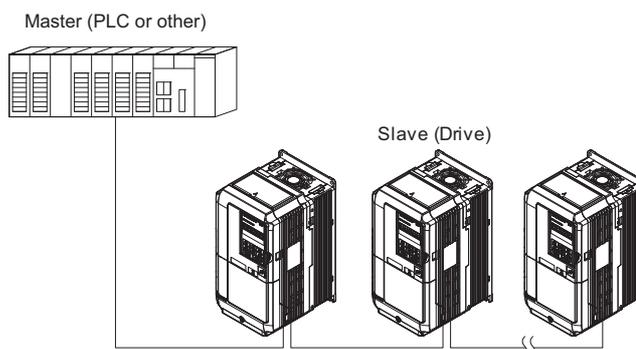


Figure C.1 Connecting Multiple Drives to a PLC

C.2 Communication Specifications

MEMOBUS/Modbus specifications appear in the following table:

Item	Specifications	
Interface	RS-422, RS-485	
Communications Cycle	Asynchronous (Start-stop synchronization)	
Communication Parameters	Communication Speeds Available	1.2; 2.4; 4.8; 9.6; 19.2; 38.4; 57.6; 76.8; 115.2 kbps
	Data length	8 bit (fixed)
	Parity	Select even, odd, or none
	Stop bit	1 bit (fixed)
Protocol	MEMOBUS/Modbus (using RTU mode only)	
Max Number of Slaves	255 drives	

C.3 Connecting to a Network

This section explains how to connect the drive to a MEMOBUS/Modbus network and the network termination required.

◆ Network Cable Connection

Follow the instructions below to connect the drive to a MEMOBUS/Modbus network.

1. With the power shut off, connect the communications cable to the drive and the master. Use terminals R+/S+ and R-/S- for MEMOBUS/Modbus.

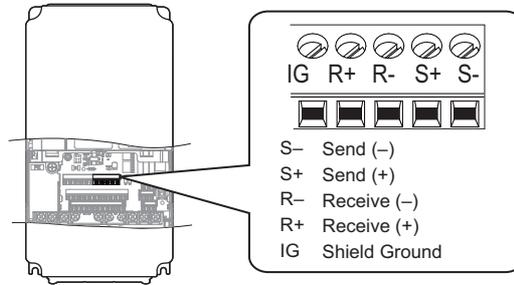


Figure C.2 Serial Communications Cable Connection Terminals

Note: Separate the communications cables from the main circuit cables and other wiring and power cables. Use shielded cables for the communications cables, and properly shielded clamps to prevent problems with noise. When using RS-485 communications, connect S+ to R+, and S- to R- as shown in the diagram below.

2. Check or set the termination resistor selection at all slaves. Use the description in [Network Termination on page 345](#) for slaves that are L1000A drives.
3. Switch the power on.
4. Set the parameters needed for serial communications (H5-01 through H5-11) using the digital operator.
5. Shut the power off and wait until the display on the digital operator goes out completely.
6. Turn the power back on.
7. The drive is now ready to begin communicating with the master.

◆ Wiring Diagram for Multiple Connection

[Figure C.3](#) and [Figure C.4](#) explain the wiring diagrams for multiple connections using MEMOBUS/Modbus communication.

■ RS-485 Interface

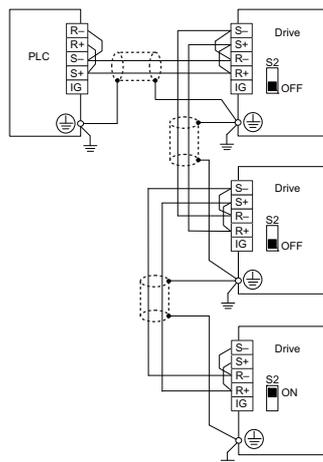


Figure C.3 RS-485 Interface

- Note:**
1. Turn on the DIP switch on the drive that is located at the end of the network. All other slave devices must have this DIP switch set to the OFF position.
 2. Set H5-07 to “1” when using the RS-485 interface.

C.4 MEMOBUS/Modbus Setup Parameters

◆ MEMOBUS/Modbus Serial Communication

This section describes parameters necessary to set up MEMOBUS/Modbus communications.

■ H5-01: Drive Slave Address

Sets the drive slave address used for MEMOBUS/Modbus communications.

Note: After changing this parameter, the power must be cycled to enable the new setting.

No.	Name	Setting Range	Default
H5-01	Drive Slave Address	0 to FFH </>	1FH

<1> If the address is set to 0, no response will be provided during communications.

For serial communications to work, each individual slave drive must be assigned a unique slave address. Setting H5-01 to any value besides 0 assigns the drive its address in the network. Slave address don't need to be assigned in sequential order, but each address needs to be unique so that no two drives have the same address.

■ H5-02: Communication Speed Selection

Sets the MEMOBUS/Modbus communications speed.

Note: After changing this parameter, the power must be cycled to enable the new setting.

No.	Name	Setting Range	Default
H5-02	Communication Speed Selection	0 to 5	3

H5-02	Communication Speed	H5-02	Communication Speed
0	1200 bps	5	38400 bps
1	2400 bps	6	57600 bps
2	4800 bps	7	76800 bps
3	9600 bps	8	115200 bps
4	19200 bps		

■ H5-03: Communication Parity Selection

Sets the parity used for MEMOBUS/Modbus communications.

Note: After changing this parameter, the power must be cycled to enable the new setting.

No.	Name	Setting Range	Default
H5-03	Communication Parity Selection	0 to 2	0

Setting 0: No parity

Setting 1: Even parity

Setting 2: Odd parity

■ H5-04: Stopping Method after Communication Error

Selects the stopping method after a communications error (CE) has occurred.

No.	Name	Setting Range	Default
H5-04	Stopping Method after Communication Error	0 to 3	3

Setting 0: Ramp to stop (uses the deceleration ramp currently enabled)

Setting 1: Emergency Stop (uses the deceleration ramp in C1-09)

Setting 2: Coast to stop

Setting 3: Alarm only (continue operation)

■ **H5-05: Communication Fault Detection Selection**

Enables or disabled the communication error (CE) detection for MEMOBUS/Modbus communications.

No.	Name	Setting Range	Default
H5-05	Communication Fault Detection Selection	0 or 1	1

Setting 0: Disabled

No communication error detection. The drive continues operation.

Setting 1: Enabled

If the drive does not receive data from the master for longer than the time set to H5-09, then a CE fault will be triggered and the drive will operate as determined by parameter H5-04.

■ **H5-06: Drive Transmit Wait Time**

Sets the time the drive waits after receiving data from a master until responding data.

No.	Name	Setting Range	Default
H5-06	Drive Transmit Wait Time	5 to 65 ms	5 ms

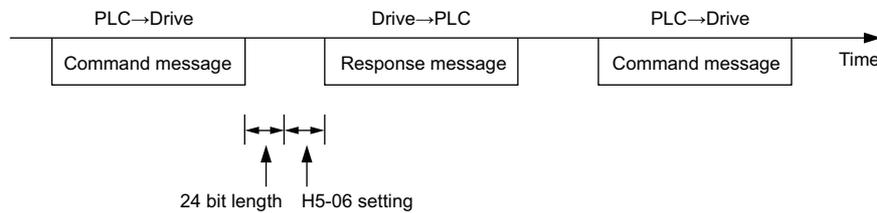


Figure C.6 Drive Transmit Wait Time Setting

■ **H5-07: RTS Control Selection**

Enables or disables RTS control.

No.	Name	Setting Range	Default
H5-07	RTS Control Selection	0 or 1	1

Setting 0: Disabled. RTS is always on.

Use this setting when using RS-485 signals for communications.

Setting 1: Enabled. RTS switches while sending.

Use this setting when using RS-422 signals for communications.

■ **H5-09: CE Detection Time**

Sets the time the communications must be lost before the drive triggers a CE fault.

No.	Name	Setting Range	Default
H5-09	CE Detection Time	0.0 to 10.0 s	2.0 s

■ **H5-10: Unit Selection for MEMOBUS/Modbus Register 0025H**

Sets the unit for the output voltage monitor value in MEMOBUS/Modbus register 0025H.

No.	Name	Setting Range	Default
H5-10	Unit Selection for MEMOBUS/Modbus Register 0025H	0 or 1	0

Setting 0: 0.1 V units

Setting 1: 1 V units

■ H5-11: Communications Enter Function Selection

Selects if an Enter command is needed to change parameter values via MEMOBUS/Modbus communications. *Refer to [Enter Command on page 365](#).*

No.	Name	Setting Range	Default
H5-11	Communications Enter Function Selection	0 or 1	0

Setting 0: Enter command necessary

Parameter changes become effective after an Enter command. An Enter command must only be sent after the last parameter change, not for each single parameter.

Setting 1: Enter command not necessary

Parameter value changes become effective immediately without the need to send an Enter command.

C.5 Drive Operations by MEMOBUS/Modbus

The drive operations that can be performed by MEMOBUS/Modbus communication depend on drive parameter settings. This section explains the functions that can be used and related parameter settings.

◆ Observing the Drive Operation

A PLC can perform the following actions with MEMOBUS/Modbus communications at any time regardless of parameter settings (except H5-□□).

- Observe drive status and drive control terminal status from a PLC.
- Read and write parameters.
- Set and reset faults.
- Set multi-function inputs. Inputs settings from the input terminals S□ and from MEMOBUS/Modbus communications are both linked by an OR operation.

◆ Controlling the Drive

To operate the drive using MEMOBUS/Modbus communications, an external reference must be selected and the parameters listed in [Table C.1](#) must be adjusted accordingly.

Table C.1 Setting Parameters for Drive Control from MEMOBUS/Modbus

Reference Source	Parameter	Name	Required Setting
External Reference	b1-01	Speed Reference Selection	2
	b1-02	Up/Down command Selection	2

Refer to b1-01: Speed Reference Selection on page 136 and Refer to b1-02: Up/Down Command Selection on page 137 for details on operation mode parameter selections.

C.6 Communications Timing

To prevent overrun in the slave drive, the master should wait a certain time between sending messages to the same drive. In the same way, the slave drive must wait before sending response messages to prevent an overrun in the master. This section explains the message timing.

◆ Command Messages from Master to Drive

In order to prevent overrun and data loss, the master must wait between receiving a response and sending the same type of command as before to the same slave drive. The minimum wait time depends on the command as shown in the table below.

Table C.2 Minimum Wait Time for Sending Messages

Command Type	Example	Minimum Wait Time
1	<ul style="list-style-type: none"> Control command (Run, Stop) Set inputs/outputs Read monitors and parameter values 	5 ms
2	<ul style="list-style-type: none"> Write parameters 	H5-11 = 0: 50 ms H5-11 = 1: 200ms </>
3	<ul style="list-style-type: none"> Save changes using an Enter command 	200 ms to 2 s, depending on the number of parameters that were changed </>

<1> If the drive receives command type 1 data during the minimum wait time, it will perform the command and then respond. However, if it receives a command type 2 or 3 during that time, either a communication error will result or the command will be ignored.

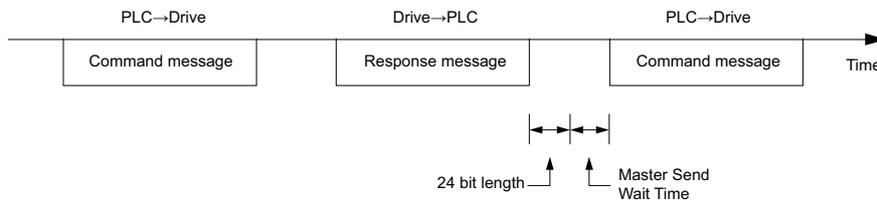


Figure C.7 Minimum Wait Time for Sending Messages

A timer should be set in the master to check how long it takes for the slave drive(s) to respond to the master. If no response is received within a certain amount of time, the master should try resending the message.

◆ Response Messages from Drive to Master

If the drive receives a command from the master, it will process the data received and wait for the time set in H5-06 until it responds. Increase H5-06 if the drive response causes overrun in the master.

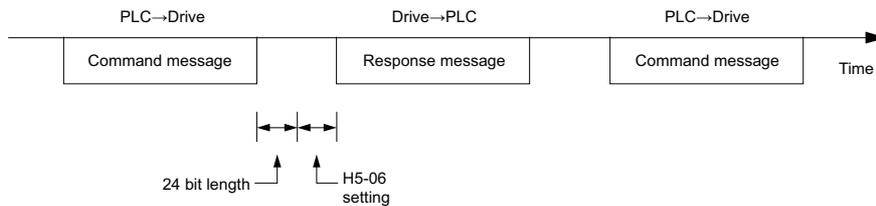


Figure C.8 Minimum Response Wait Time

C.7 Message Format

◆ Message Content

In MEMOBUS/Modbus communications, the master sends commands to the slave, and the slave responds. The message format is configured for both sending and receiving as shown below, and the length of data packets depends on the command (function) content.

SLAVE ADDRESS
FUNCTION CODE
DATA
ERROR CHECK

◆ Slave Address

The slave address in the message defines the note the message is sent to. Use addresses between 0 and FF (hex). If a message with slave address 0 is sent (broadcast), the command from the master will be received by all slaves. The slaves do not provide a response to a broadcast type message.

◆ Function Code

The three types of function codes are shown in the table below.

Function Code	Function Name	Data Length (bytes)			
		Command Message		Response Message	
		Minimum	Maximum	Minimum	Maximum
03H	Read MEMOBUS/Modbus registers	8	8	7	37
08H	Loopback test	8	8	8	8
10H	Write to multiple MEMOBUS/Modbus registers	11	41	8	8

◆ Data

Configure consecutive data by combining the MEMOBUS/Modbus register address (test code in case of a loopback test) and the data the register contains. The data length changes depending on the command details.

A drive MEMOBUS/Modbus register always has a data length of two bytes. Therefore data written into drive registers must also always have a length of two bytes. Register data read out from the drive will always consist of two bytes.

◆ Error Check

The drive uses a CRC-16 (cyclic redundancy check, checksum method) for checking data validity. Use the procedure described below when calculating the CRC-16 checksum for command data or when verifying response data.

■ Command Data

When the drive receives data, it calculates the CRC-16 checksum from the data and compares it to the CRC-16 value received within the message. Both must match before a command is processed.

An initial value of FFFFH (i.e., all 16 bits equal 1) must be used for CRC-16 calculations in the MEMOBUS/Modbus protocol.

Calculate the CRC-16 checksum using the following steps:

1. The starting value is FFFFH.
2. Perform an XOR operation of this value and the slave address.
3. Right shift the result.
4. When the overflow bit of the shift operation becomes 1, perform an XOR operation of the result from step 3 above and the fix value A001H.
5. Repeat steps 3 and 4 until eight shift operations have been performed.
6. After eight shift operations, perform an XOR operation with the result and the next data in the message (function code, register address, data). Continue with steps 3 to 5 until the last data has been processed.
7. The result of the last shift or XOR operation is the checksum.

C.7 Message Format

The example in [Table C.3](#) shows the CRC-16 calculation of the slave address 02H and the function code 03H, yielding the result 40D1H.

Note: This example does not show the calculation for a complete MEMOBUS/Modbus command. Normally data would follow in the calculation.

Table C.3 CRC-16 Checksum Calculation Example

Description	Calculation	Overflow	Description	Calculation	Overflow
Initial Value (FFFFH)	1111 1111 1111 1111		Function Code 03H	0000 0000 0000 0011	
Address 02H	0000 0000 0000 0010		XOR w result	1000 0001 0011 1101	
XOR w initial value	1111 1111 1111 1101		Shift 1	0100 0000 1001 1110	1
Shift 1	0111 1111 1111 1110	1	XOR w A001H	1010 0000 0000 0001	
XOR w A001H	1010 0000 0000 0001		XOR result	1110 0000 1001 1111	
XOR result	1101 1111 1111 1111		Shift 2	0111 0000 0100 1111	1
Shift 2	0110 1111 1111 1111	1	XOR w A001H	1010 0000 0000 0001	
XOR w A001H	1010 0000 0000 0001		XOR result	1101 0000 0100 1110	
XOR result	1100 1111 1111 1110		Shift 3	0110 1000 0010 0111	0
Shift 3	0110 0111 1111 1111	0	Shift 4	0011 0100 0001 0011	1
Shift 4	0011 0011 1111 1111	1	XOR w A001H	1010 0000 0000 0001	
XOR w A001H	1010 0000 0000 0001		XOR result	1001 0100 0001 0010	
XOR result	1001 0011 1111 1110		Shift 5	0100 1010 0000 1001	0
Shift 5	0100 1001 1111 1111	0	Shift 6	0010 0101 0000 0100	1
Shift 6	0010 0100 1111 1111	1	XOR w A001H	1010 0000 0000 0001	
XOR w A001H	1010 0000 0000 0001		XOR result	1000 0101 0000 0101	
XOR result	1000 0100 1111 1110		Shift 7	0100 0010 1000 0010	1
Shift 7	0100 0010 0111 1111	0	XOR w A001H	1010 0000 0000 0001	
XOR w A001H	0010 0001 0011 1111	1	XOR result	1110 0010 1000 0011	
XOR result	1010 0000 0000 0001		Shift 8	0111 0001 0100 0001	1
Shift 8	1010 0000 0000 0001		XOR w A001H	1010 0000 0000 0001	
XOR w A001H	1000 0001 0011 1110		XOR result	1101 0001 0100 0000	
XOR result			CRC-16	1101 0001 0100 0000	
Perform operations with next data (function code)				D140H	
			Continue from here with next data.		

■ Response Data

To be sure that the data is valid, perform a CRC-16 calculation on the response message data as described above. Compare the result to the CRC-16 checksum that was received within the response message. Both should match.

C.8 Message Examples

Below are some examples of command and response messages.

◆ Reading Drive MEMOBUS/Modbus Register Contents

Using the function code 03H (Read), a maximum of 16 MEMOBUS/Modbus registers can be read out at a time.

The following table shows message examples when reading status signals, error details, data link status, and speed references from the slave 2 drive.

Command Message			Response Message (normal)			Response Message (fault)		
Slave Address		02H	Slave Address		02H	Slave Address		02H
Function Code		03H	Function Code		03H	Function Code		83H
Starting No.	Upper	00H	Data Quantity		08H	Error Code		03H
	Lower	20H	1st storage register	Upper	00H	CRC-16	Upper	F1H
Data Quantity	Upper	00H		Lower	65H		Lower	31H
	CRC-16	Lower	04H	Next storage register	Upper	00H		
Upper		45H	Lower		00H			
CRC-16	Lower	FOH	Next storage register	Upper	00H			
				Lower	00H			
			Next storage register	Upper	01H			
				Lower	F4H			
			CRC-16	Upper	AFH			
				Lower	82H			

◆ Loopback Test

Function code 08H performs a loopback test. This test returns a response message with exactly the same content as the command message and can be used to check communications between the master and slave. User-defined test code and data values can be set.

The following table shows a message example when performing a loopback test with the slave 1 drive.

Command Message			Response Message (normal)			Response Message (fault)		
Slave Address		01H	Slave Address		01H	Slave Address		01H
Function Code		08H	Function Code		08H	Function Code		89H
Test Code	Upper	00H	Test Code	Upper	00H	Error Code		01H
	Lower	00H		Lower	00H	CRC-16	Upper	86H
Data	Upper	A5H	Data	Upper	A5H		Lower	50H
	Lower	37H		Lower	37H			
CRC-16	Upper	DAH	CRC-16	Upper	DAH			
	Lower	8DH		Lower	8DH			

◆ Writing to Multiple Registers

Function code 10h allows the user to write multiple drive MEMOBUS/Modbus registers with one message. This process works similar to reading registers, i.e., the address of the first register that is to be written and the data quantity must be set in the command message. The data to be written must be consecutive so that the register addresses are in order, starting from the specified address in the command message. The data order must be high byte, then lower byte.

The following table shows an example of a message where a forward (Up) operation has been set with a speed reference of 100% for the slave 1 drive.

If parameter values are changed using the Write command, depending on the setting of H5-11, an Enter command will be necessary to activate the data or save them. *Refer to H5-11: Communications Enter Function Selection on page 348* and *Refer to Enter Command on page 365* for detailed descriptions.

Command Message			Response Message (normal)			Response Message (fault)					
Slave Address		01H	Slave Address		01H	Slave Address		01H			
Function Code		10H	Function Code		10H	Function Code		90H			
Starting No.	Upper	00H	Starting No.	Upper	00H	Error Code		02H			
	Lower	01H		Lower	01H	CRC-16	Upper	CDH			
Data Quantity	Upper	00H	Data Quantity	Upper	00H		Lower	C1H			
	Lower	02H		Lower	02H						
Number of Bytes		04H	CRC-16	Upper	10H						
Starting Data	Upper	00H		Lower	08H						
	Next Data	Upper	02H								
Lower		58H									
CRC-16	Upper	63H									
	Lower	39H									

Note: For the number of bytes in the command message, take double the number of the data quantity.

C.9 MEMOBUS/Modbus Data Table

Table below lists all MEMOBUS/Modbus data. There are three types of data: command data, monitor data, and broadcast data.

◆ Command Data

It is possible to both read and write command data.

Note: Bits that are not used should be set to 0. Refrain from writing to reserved registers.

Register No.	Contents		
0000H	Reserved		
0001H	Operation Commands and Multi-function Inputs		
	bit 0	Up command	
	bit 1	Down command	
	bit 2	External Fault (EF0)	
	bit 3	Fault Reset	
	bit 4	ComRef	
	bit 5	ComCtrl	
	bit 6	Multi-Function Input 3	
	bit 7	Multi-Function Input 4	
	bit 8	Multi-Function Input 5	
	bit 9	Multi-Function Input 6	
	bit A	Multi-Function Input 7	
	bit B	Multi-Function Input 8	
bit C to F	Reserved		
0002H	Speed Reference	Units are determined by parameter o1-03.	
0003H	Reserved		
0004H	Torque Limit, 0.1% units, signed		
0005H	Torque Compensation, 0.1% units, signed		
0006H	Reserved		
0007H	Analog Output Terminal FM Setting (10 V / 4000 H)		
0008H	Analog Output Terminal AM Setting (10 V / 4000 H)		
0009H	Settings for Multi-Function Digital Outputs		
	bit 0	Multi-Function Relay Output 1 (terminal M1-M2)	
	bit 1	Multi-Function Relay Output 2 (terminal M3-M4)	
	bit 2	Multi-Function Relay Output 3 (terminal M5-M6)	
	bit 3	Multi-Function Photocoupler Output 1 (terminal P1-C1)	
	bit 4	Multi-Function Photocoupler Output 2 (terminal P2-C2)	
	bit 5	Reserved	
	bit 6	Enables the function in bit 7	
	bit 7	Fault Contact Output (terminal MA/MB-MC)	
bit 8 to F	Reserved		
000AH to 000EH	Reserved		
000FH	Control Selection Setting		
	bit 0, 1	Reserved	
	bit 2	Torque limit input (enables the setting from MEMOBUS/Modbus)	
	bit 3	Torque compensation input (enables the setting from MEMOBUS/Modbus)	
	bit 4 to B	Reserved	
	bit C	Enable Terminal S5 Input for Broadcast Data	
	bit D	Enable Terminal S6 Input for Broadcast Data	
	bit E	Enable Terminal S7 Input for Broadcast Data	
bit F	Enable Terminal S8 Input for Broadcast Data		
0010H to 001AH	Reserved		
001BH	Analog Monitor Option AO-A3 Analog Output 1 (10 V/4000 H)		
001CH	Analog Monitor Option AO-A3 Analog Output 2 (10 V/4000 H)		
001DH	Digital Output Option DO-A3 Output (Binary)		
001EH to 001FH	Reserved		

◆ Monitor Data

Monitor data can be read only.

Register No.	Contents	
0020H	Drive Status 1	
	bit 0	During Run
	bit 1	During Reverse
	bit 2	Drive Ready
	bit 3	Fault
	bit 4	Data Setting Error
	bit 5	Multi-Function Relay Output (terminal M1-M2)
	bit 6	Multi-Function Relay Output (terminal M3-M4)
	bit 7	Multi-Function Relay Output (terminal M5-M6)
	bit 8	Multi-Function Photocoupler Output 1 (terminal P1-C1)
	bit 9	Multi-Function Photocoupler Output 2 (terminal P2-C2)
	bit A to bit D	Reserved
bit E	ComRef status	
bit F	ComCtrl status	
0021H	Fault Contents 1	
	bit 0	Overcurrent (oC), Ground fault (GF)
	bit 1	Overvoltage (ov)
	bit 2	Drive Overload (oL2)
	bit 3	Overheat 1 (oH1)
	bit 4	Dynamic Braking Transistor Fault (rr)
	bit 5, 6	Reserved
	bit 7	EF, EF0, EF3 to EF8: External Fault
	bit 8	CPF□□: Hardware Fault (includes oFx)
	bit 9	Motor Overload (oL1), Overtorque Detection 1/2 (oL3/oL4), Undertorque Detection 1/2 (UL3/UL4)
	bit A	Encoder Disconnected (PGo), Option Card Hardware Fault (PGoH), Overspeed (oS), Excessive Speed Deviation (dEv)
	bit B	Main Circuit Undervoltage (Uv)
	bit C	Undervoltage (Uv1), Control Power Supply Undervoltage (Uv2), Soft Charge Circuit Fault (Uv3)
	bit D	Output Phase Loss (LF), Input Phase Loss (PF)
bit E	MEMOBUS/Modbus Communication Error (CE), Option Communication Error (bUS)	
bit F	Operator Connection Fault (oPr)	
0022H	Data Link Status	
	bit 0	Writing data or switching motors
	bit 1	Reserved
	bit 2	
	bit 3	Upper or lower limit error
	bit 4	Data conformity error
	bit 5	Writing to EEPROM
bit 6 to bit F	Reserved	
0023H	Speed Reference, </>	
0024H	Output Speed, </>	
0025H	Output Voltage Reference, 0.1 V units (units are determined by parameter H5-10)	
0026H	Output Current, 0.1 A units	
0027H	Output Power	
0028H	Torque Reference	
0029H	Fault Contents 2	
	bit 0	Reserved
	bit 1	Ground Fault (GF)
	bit 2	Input Phase Loss (PF)
	bit 3	Output Phase Loss (LF)
	bit 4 to bit F	Reserved
002AH	Alarm Contents1	
	bit 0, 1	Reserved
	bit 2	Up/Down command Input Error (EF)
	bit 3	Drive Baseblock (bb)
	bit 4	Overtorque Detection 1 (oL3)
	bit 5	Heatsink Overheat (oH)
	bit 6	Overvoltage (ov)
	bit 7	Undervoltage (Uv)
	bit 8	Reserved
	bit 9	MEMOBUS/Modbus Communication Error (CE)
	bit A	Option Communication Error (bUS)
	bit B	Undertorque Detection 1/2 (UL3/UL4)
	bit C to E	Reserved
	bit F	Serial Communication Transmission Error (CALL)

Register No.	Contents	
002BH	Input Terminal Status	
	bit 0	Terminal S1 Closed
	bit 1	Terminal S2 Closed
	bit 2	Terminal S3 Closed
	bit 3	Terminal S4 Closed
	bit 4	Terminal S5 Closed
	bit 5	Terminal S6 Closed
	bit 6	Terminal S7 Closed
	bit 7	Terminal S8 Closed
bit 8 to bit F	Reserved	
002CH	Drive Status 2	
	bit 0	During Run
	bit 1	Zero Speed
	bit 2	Speed Agree
	bit 3	User Speed Agree
	bit 4	Speed Detection 1
	bit 5	Speed Detection 2
	bit 6	Drive Ready
	bit 7	During Undervoltage
	bit 8	During Baseblock
	bit 9	Speed Reference from Operator Keypad
	bit A	Up/Down command from Operator Keypad
	bit B	Over/Undertorque 1, 2
	bit C	Speed Reference Loss
	bit D	During Fault Restart
bit E	Fault	
bit F	Communication Timeout	
002DH	Output Terminal Status	
	bit 0	Multi-Function Relay Output (terminal M1-M2)
	bit 1	Multi-Function Relay Output (terminal M3-M4)
	bit 2	Multi-Function Relay Output (terminal M5-M6)
	bit 3	Multi-Function Photocoupler Output 1 (terminal P1-C1)
	bit 4	Multi-Function Photocoupler Output 2 (terminal P2-C2)
	bit 3 to 6	Reserved
	bit 7	Fault Contact Output (terminal MA/MB-MC)
bit 8 to F	Reserved	
002EH to 0030H	Reserved	
0031H	DC Bus Voltage, 1 Vdc units	
0032H	Torque Reference (U1-09), 1% units	
0033H	Reserved	
0034H	Product Code 1 [ASCII], Product Type (LA for L1000A)	
0035H	Product Code 2 [ASCII], Region Code	
0036H to 003CH	Reserved	
003DH	Communications Error Contents <>	
	bit 0	CRC Error
	bit 1	Data Length Error
	bit 2	Reserved
	bit 3	Parity Error
	bit 4	Overrun Error
	bit 5	Framing Error
	bit 6	Timeout
bit 7 to bit F	Reserved	
003EH	Output Speed	r/min <>
003FH		0.01% units
0040H to 004AH	Used for various monitors U1-□□. Refer to U: Monitors on page 330 for parameter details.	

C.9 MEMOBUS/Modbus Data Table

Register No.	Contents	
004BH	Drive status (U1-12)	
	bit 0	During Run
	bit 1	During Zero Speed
	bit 2	During Reverse Run
	bit 3	During Fault Reset Signal Input
	bit 4	During Speed Agree
	bit 5	Drive Ready
	bit 6	Alarm
	bit 7	Fault
	bit 8	During Operation Error (oPE□□)
	bit 9	During Momentary Power Loss
	bit A	Reserved
	bit B	Reserved
	bit C	Reserved
	bit D	Reserved
bit E	ComRef status, NetRef status	
bit F	ComCtrl status, NetCtrl status	
004CH to 007EH	Used for various monitors U1-□□, U4-□□, and U6-□□. Refer to U: Monitors on page 330 for parameter details.	
007FH	Alarm Code, Refer to Alarm Register Contents on page 364 for alarm codes.	
0080H to 0097H	Used for monitors U2-□□, U3-□□. Refer to U: Monitors on page 330 for parameter details and Refer to Fault Trace Contents on page 363 for register value descriptions.	
0098H	High Word of Accumulated Operation Time Monitor, 10h units (U4-01)	
0099H	Low Word of Accumulated Operation Time Monitor, 1h units (U4-01)	
009AH	High Word of Cooling Fan Operation Time Monitor (U4-03)	
009BH	Low Word of Cooling Fan Operation Time Monitor (U4-03)	
009CH to 00AAH	Reserved	
00ABH	Drive Rated Current <2>	
00ACH	Speed Feedback (U1-05)	r/min units <4>
00ADH		0.01% units
00AEH, 00AFH	Reserved	
00B0H	Option Code Connected to CN5-A	Register contains ASCII code of the option card. DI-A3 = 0x01 DO-A3 = 0x02 AO-A3 = 0x04 PG-B3 = 0x11 PG-X3 = 0x12 PG-F3 = 0x21 PG-E3 = 0x22 Communication Option: Register contains ASCII code of 1st and 3rd digit of the option card type number. Example: Register value is 5353H for "SS" if a SI-S3 option card is installed.
00B1H	Reserved	
00B2H	Option Code Connected to CN5-B	
00B3H	Option Code Connected to CN5-C	
00B4H	Reserved	
00B5H	Output Speed After Soft Start (U1-16)	r/min units <4>
00B6H		0.01% units
00B7H	Speed Reference	r/min units <4>
00B8H		0.01% units
00B9H to 00BEH	Reserved	
00BFH	Lists the last to digits of operation error code oPE□□.	
00C0H	Fault contents 3	
	bit 1	Undervoltage (Uv1)
	bit 2	Control Power Supply Undervoltage (Uv2)
	bit 3	Soft Charge Circuit Fault (Uv3)
	bit 4	Reserved
	bit 5	Ground Fault (GF)
	bit 6	Overcurrent (oC)
	bit 7	Overvoltage (ov)
	bit 8	Heatsink Overheat (oH)
	bit 9	Heatsink Overheat (oH1)
	bit A	Motor Overload (oL1)
	bit B	Drive Overload (oL2)
	bit C	Overtorque Detection 1 (oL3)
	bit D	Overtorque Detection 2 (oL4)
	bit E	Dynamic Braking Transistor Fault (rr)
bit F	Reserved	

Register No.	Contents	
00C1H	Fault contents 4	
	bit 0	External Fault at input terminal S3 (EF3)
	bit 1	External Fault at input terminal S4 (EF4)
	bit 2	External Fault at input terminal S5 (EF5)
	bit 3	External Fault at input terminal S6 (EF6)
	bit 4	External Fault at input terminal S7 (EF7)
	bit 5	External Fault at input terminal S8 (EF8)
	bit 6	Reserved
	bit 7	Overspeed (os)
	bit 8	Excessive Speed Deviation (dEv)
	bit 9	Encoder Disconnected (PGo)
	bit A	Input Phase Loss (PF)
	bit B	Output Phase Loss (LF)
	bit C	Reserved
	bit D	Digital Operator Connection Fault (oPr)
	bit E	EEPROM Write Error (Err)
bit F	Reserved	
00C2H	Fault contents 5	
	bit 0	MEMOBUS/Modbus Communication Error (CE)
	bit 1	Option Communication Error (bUS)
	bit 2, 3	Reserved
	bit 4	Control Fault (CF)
	bit 5	Position Lock Error (SvE)
	bit 6	Option External Fault (EF0)
	bit 7	Reserved
	bit 8	Undertorque Detection 1 (UL3)
	bit 9	Undertorque Detection 2 (UL4)
	bit A to E	Reserved
	bit F	Hardware Fault (includes ofx)
00C3H	Fault contents 6	
	bit 0	Reserved
	bit 1	Z Pulse Fault Detection (dv1)
	bit 2	Z Pulse Noise Fault Detection (dv2)
	bit 3	Inversion Detection (dv3)
	bit 4	Inversion Prevention Detection (dv4)
	bit 5	Current Imbalance (LF2)
	bit 6	Pullout Detection (STo)
	bit 7	Option Card Hardware Fault (PGoH)
bit 8 to F	Reserved	
00C4H	Fault contents 7	
	bit 0 to 4	Reserved
	bit 5	Current Offset Fault (CoF)
	bit 6 to B	Reserved
	bit C	Output Voltage Detection Fault (voF)
	bit D	Reserved
	bit E	Braking Transistor Overload Fault (boL)
bit F	Reserved	
00C5H	bit 0 to 3	Reserved
	bit 4	Overacceleration (dv6)
	bit 5 to F	Reserved
00C6H, 00C7H		Reserved
00C8H	Alarm contents 2	
	bit 0	Undervoltage (Uv)
	bit 1	Overvoltage (ov)
	bit 2	Heatsink Overheat (oH)
	bit 3	Reserved
	bit 4	Overtorque 1 (oL3)
	bit 5	Overtorque 2 (oL4)
	bit 6	Up/Down commands Input Error (EF)
	bit 7	Drive Baseblock (bb)
	bit 8	External Fault 3, input terminal S3 (EF3)
	bit 9	External Fault 4, input terminal S4 (EF4)
	bit A	External Fault 5, input terminal S5 (EF5)
	bit B	External Fault 6, input terminal S6 (EF6)
	bit C	External Fault 7, input terminal S7 (EF7)
	bit D	External Fault 8, input terminal S8 (EF8)
bit E	Reserved	
bit F	Overspeed (oS)	

C.9 MEMOBUS/Modbus Data Table

Register No.	Contents	
00C9H	Alarm contents 3	
	bit 0	Excessive Speed Deviation (dEv)
	bit 1	Encoder Disconnected (PGo)
	bit 2	Digital Operator Connection Fault (oPr)
	bit 3	MEMOBUS/Modbus Communication Error (CE)
	bit 4	Option Communication Error (bUS)
	bit 5	Serial Communication Transmission Error (CALL)
	bit 6	Motor Overload (oL1)
	bit 7	Drive Overload (oL2)
	bit 8	Reserved
	bit 9	Option Card External fault (EF0)
	bit A	Reserved
	bit B	Reserved
	bit C	Serial Communication Transmission Error (CALL)
	bit D	Undertorque Detection 1 (UL3)
bit E	Undertorque Detection 2 (UL4)	
bit F	MEMOBUS/Modbus Test Mode Fault (SE)	
00CAH	Alarm contents 4	
	bit 0 to 9	Reserved
	bit A	Encoder Disconnected (PGo)
	bit B to F	Reserved
00CBH	Alarm Contents 5	
	bit 0 to 2	Reserved
	bit 3	High Current Alarm (HCA)
	bit 4	Cooling Fan Maintenance Time (LT-1)
	bit 5	Soft Charge Bypass Relay Maintenance Time (LT-2)
	bit 6	Reserved
	bit 7	SI-S EEPROM Error (EEP)
	bit 8 to 9	Reserved
	bit A	Safe Disable Input (HbbF)
	bit B	Safe Disable Input (Hbb)
bit C to F	Reserved	
00CCH	Alarm Contents 6	
	bit 0	Output Voltage Detection Fault (VoF)
	bit 1	Reserved
	bit 2	Capacitor Maintenance Time (LT-3)
	bit 3	IGBT Maintenance Time (50%) (LT-4)
	bit 4	Braking Transistor Overload Fault (boL)
bit 5 to F	Reserved	
00CDH to 00CFH	Reserved	
00D0H	CPF Contents 1	
	bit 0, 1	Reserved
	bit 2	A/D Conversion Error (CPF02)
	bit 3	PWM Data Fault (CPF03)
	bit 4, 5	Reserved
	bit 6	EEPROM Memory Data Error (CPF06)
	bit 7	Terminal Board Connection Error (CPF07)
	bit 8	EEPROM Serial Communications Fault (CPF08)
	bit 9, A	Reserved
	bit B	RAM Fault (CPF11)
	bit C	FLASH Memory Fault (CPF12)
	bit D	Watchdog Circuit Exception (CPF13)
	bit E	Control Circuit Fault (CPF14)
	bit F	Reserved

Register No.	Contents		
00D1H	CPF Contents 2		
	bit 0	Clock Fault (CPF16)	
	bit 1	Timing Fault (CPF17)	
	bit 2	Control Circuit Fault (CPF18)	
	bit 3	Control Circuit Fault (CPF19)	
	bit 4	Hardware fault at power up (CPF20)	
	bit 5	Hardware fault at communication start up (CPF21)	
	bit 6	A/D Conversion Fault (CPF22)	
	bit 7	PWM Feedback Fault (CPF23)	
	bit 8	Drive Unit Signal Fault (CPF24)	
	bit 9	Terminal board is not properly connected. (CPF25)	
	bit A	ASIC BB Circuit Error (CPF26)	
	bit B	ASIC PWM Setting Register Error (CPF27)	
	bit C	ASIC PWM Pattern Error (CPF28)	
	bit D	ASIC On-delay Error (CPF29)	
	bit E	ASIC BBON Error (CPF30)	
bit F	ASIC Code Error (CPF31)		
00D2H	bit 0	ASIC Start-up Error (CPF32)	
	bit 1	Watch-dog Error (CPF33)	
	bit 2	ASIC Power/Clock Error (CPF34)	
	bit 3	External A/D Converter Error (CPF35)	
bit 4 to F	Reserved		
00D3H to 00D7H	oFA0x Contents (CN5-A)		
00D8H	oFA0x Contents (CN5-A)		
	bit 0	Option Compatibility Error (oFA00)	
	bit 1	Option not properly connected (oFA01)	
	bit 2	Same type of option card already connected (oFA02)	
	bit 3, 4	Reserved	
	bit 5	A/D Conversion Error (oFA05)	
	bit 6	Option Response Error (oFA06)	
bit 7 to F	Reserved		
00D9H	oFA1x Contents (CN5-A)		
	bit 0	Option RAM Fault (oFA10)	
	bit 1	Option Operation Mode Fault (SLMOD) (oFA11)	
	bit 2	Drive Receive CRC Error (oFA12)	
	bit 3	Drive Receive Frame Error (oFA13)	
	bit 4	Drive Receive Abort Error (oFA14)	
	bit 5	Option Receive CRC Error (oFA15)	
	bit 6	Option Receive Frame Error (oFA16)	
bit 7	Option Receive Abort Error (oFA17)		
bit 8 to F	Reserved		
00DAH to 00DBH	Reserved		
00DBH	oFA3x Contents (CN5-A)		
	bit 0	Comm. ID Error (oFA30)	
	bit 1	Model Code Error (oFA31)	
	bit 2	Sumcheck Error (oFA32)	
	bit 3	Comm. option timeout waiting for response (oFA33)	
	bit 4	MEMOBUS Timeout (oFA34)	
	bit 5	Drive timeout waiting for response (oFA35)	
	bit 6	CI Check Error (oFA36)	
	bit 7	Drive timeout waiting for response (oFA37)	
	bit 8	Control Command Selection Error (oFA38)	
	bit 9	Drive timeout waiting for response (oFA39)	
	bit A	Control Response Selection 1 Error (oFA40)	
	bit B	Drive timeout waiting for response (oFA41)	
	bit C	Control Response Selection 2 Error (oFA42)	
bit D	Control Response Selection Error (oFA43)		
bit E, F	Reserved		
00DCH	oFb0x Contents (CN5-B)		
	bit 0	Option compatibility error (oFb00)	
	bit 1	Option not properly connected (oFb01)	
	bit 2	Same type of option card already connected (oFb02)	
	bit 3, 4	Reserved	
	bit 5	A/D Conversion Fault (oFb05)	
	bit 6	Option Response Error (oFb06)	
bit 7 to F	Reserved		

C.9 MEMOBUS/Modbus Data Table

Register No.	Contents	
00DDH	oFb1x Contents (CN5-B)	
	bit 0	Option RAM Fault (oFb10)
	bit 1	Option Operation Mode Fault (SLMOD) (oFb11)
	bit 2	Drive Receive CRC Error (oFb12)
	bit 3	Drive Receive Frame Error (oFb13)
	bit 4	Drive Receive Abort Error (oFb14)
	bit 5	Option Receive CRC Error (oFb15)
	bit 6	Option Receive Frame Error (oFb16)
	bit 7	Option Receive Abort Error (oFb17)
	bit 8 to F	Reserved
00DEH to 00DFH	Reserved	
00E0H	oFb3x Contents (CN5-B)	
	bit 0	Comm. ID Error (oFb30)
	bit 1	Model Code Error (oFb31)
	bit 2	Sumcheck Error (oFb32)
	bit 3	Comm. option timeout waiting for response (oFb33)
	bit 4	MEMOBUS Timeout (oFb34)
	bit 5	Drive timeout waiting for response (oFb35)
	bit 6	CI Check Error (oFb36)
	bit 7	Drive timeout waiting for response (oFb37)
	bit 8	Control Command Selection Error (oFb38)
	bit 9	Drive timeout waiting for response (oFb39)
	bit A	Control Response Selection 1 Error (oFb40)
	bit B	Drive timeout waiting for response (oFb41)
	bit C	Control Response Selection 2 Error (oFb42)
	bit D	Control Response Selection Error (oFb43)
	bit E, F	Reserved
00E1H	oFC0x Contents (CN5-C)	
	bit 0	Option compatibility error (oFC00)
	bit 1	Option not properly connected (oFC01)
	bit 2	Same type of option card already connected (oFC02)
	bit 3, 4	Reserved
	bit 5	A/D Conversion Fault (oFC05)
	bit 6	Option Response Error (oFC06)
	bit 7 to F	Reserved
00E2H	oFC1x Contents (CN5-C)	
	bit 0	Option RAM Fault (oFC10)
	bit 1	Option Operation Mode Fault (SLMOD) (oFC11)
	bit 2	Drive Receive CRC Error (oFC12)
	bit 3	Drive Receive Frame Error (oFC13)
	bit 4	Drive Receive Abort Error (oFC14)
	bit 5	Option Receive CRC Error (oFC15)
	bit 6	Option Receive Frame Error (oFC16)
	bit 7	Option Receive Abort Error (oFC17)
bit 8 to F	Reserved	
00E3H, 00E4H	Reserved	
00E5H	oFC3x Contents (CN5-C)	
	bit 0	Comm. ID Error (oFC30)
	bit 1	Model Code Error (oFC31)
	bit 2	Sumcheck Error (oFC32)
	bit 3	Comm. option timeout waiting for response (oFC33)
	bit 4	MEMOBUS Timeout (oFC34)
	bit 5	Drive timeout waiting for response (oFC35)
	bit 6	CI Check Error (oFC36)
	bit 7	Drive timeout waiting for response (oFC37)
	bit 8	Control Command Selection Error (oFC38)
	bit 9	Drive timeout waiting for response (oFC39)
	bit A	Control Response Selection 1 Error (oFC40)
	bit B	Drive timeout waiting for response (oFC41)
	bit C	Control Response Selection 2 Error (oFC42)
	bit D	Control Response Selection Error (oFC43)
bit E, F	Reserved	
00E6H to 00FFH	Reserved	

<1> Units are determined by parameter o1-03.

<2> The value will have two decimal places (0.01 A) in the drive models 2A0018 to 0033 and 4A0009 to 0018 (refer to [Table A.1](#) and [Table A.2](#)), and one decimal place (0.1 A) in the drive models 2A0047 to 0180 and 4A0024 to 0150.

<3> The contents of a communication error are saved until the fault is reset.

<4> Depending on the motor used, the correct motor pole number must be set to parameter E2-04, or E5-05.

◆ Broadcast Messages

Data can be written from the master to all slave devices at the same time.

The slave address in a broadcast command message must be set to 00H. All slaves will receive the message, but will not respond.

Register No.	Contents	
0001H	Digital Input Command	
	bit 0	Up/Down Command (0: Run 1: Stop)
	bit 1	Direction Command (0: Down, 1: Up)
	bit 2, 3	Reserved
	bit 4	External Fault
	bit 5	Fault Reset
	bit 6 to B	Reserved
	bit C	Multi-Function Digital Input S5
	bit D	Multi-Function Digital Input S6
	bit E	Multi-Function Digital Input S7
bit F	Multi-Function Digital Input S8	
0002H	Speed Reference	100%

◆ Fault Trace Contents

The table below shows the fault codes that can be read out by MEMOBUS/Modbus commands from the U2-□□ monitor parameters.

Table C.4 Fault Trace / History Register Contents

Fault Code	Fault Name	Fault Code	Fault Name
0002H	Undervoltage (Uv1)	009EH	ASIC On-Delay Error (CPF29)
0003H	Control Power Supply Undervoltage (Uv2)	009FH	ASIC BBON Error (CPF30)
0004H	Soft Charge Circuit Fault (Uv3)	00A0H	ASIC Code Error (CPF31)
0006H	Ground Fault (GF)	00A1H	ASIC Start-p Error (CPF32)
0007H	Overcurrent (oC)	00A2H	Watch-dog Error (CPF33)
0008H	Overvoltage (ov)	00A3H	ASIC Power/Clock Error (CPF34)
0009H	Heatsink Overheat (oH)	00A4H	External A/D Converter Error (CPF35)
000AH	Heatsink Overheat (oH1)	0101H	Option compatibility error (oFA00)
000BH	Motor Overload (oL1)	0102H	Option not properly connected (oFA01)
000CH	Drive Overload (oL2)	0103H	Same type of option card already connected (oFA02)
000DH	Overtorque Detection 1 (oL3)	0106H	A/D Conversion Error (oFA05)
000EH	Overtorque Detection 2 (oL4)	0107H	Option Response Error (oFA06)
000FH	Dynamic Braking Transistor (rr)	009CH	ASIC PWM Setting Register Error (CPF27)
0011H	External Fault at input terminal S3 (EF3)	0111H	Option RAM Fault (oFA10)
0012H	External Fault at input terminal S4 (EF4)	0112H	Option Operation Mode Fault (SLMOD) (oFA11)
0013H	External Fault at input terminal S5 (EF5)	0113H	Drive Receive CRC Error (oFA12)
0014H	External Fault at input terminal S6 (EF6)	0114H	Drive Receive Frame Error (oFA13)
0015H	External Fault at input terminal S7 (EF7)	0115H	Drive Receive Abort Error (oFA14)
0016H	External Fault at input terminal S8 (EF8)	0116H	Option Receive CRC Error (oFA15)
0018H	Overspeed (oS)	0117H	Option Receive Frame Error (oFA16)
0019H	Excessive Speed Deviation (dEv)	0118H	Option Receive Abort Error (oFA17)
001AH	Encoder Disconnect (PGo)	0131H	Comm. ID Error (oFA30)
001BH	Input Phase Loss (PF)	0132H	Model Code Error (oFA31)
001CH	Output Phase Loss (LF)	0133H	Sumcheck Error (oFA32)
001EH	Digital Operator Connection (oPr)	0134H	Comm. option timeout waiting for response (oFA33)
001FH	EEPROM Write Error (Err)	0135H	MEMOBUS Timeout (oFA34)
0021H	MEMOBUS/Modbus Communication Error (CE)	0136H	Drive timeout waiting for response (oFA35)
0022H	Option Communication Error (bUS)	0137H	CI Check Error (oFA36)
0025H	Control fault (CF)	0138H	Drive timeout waiting for response (oFA37)
0026H	Position Lock Error (SvE)	0139H	Control Command Selection Error (oFA38)
0027H	Option External Fault (EF0)	013AH	Drive timeout waiting for response (oFA39)
0029H	Undertorque Detection 1 (UL3)	013BH	Control Response Selection 1 Error (oFA40)
002AH	Undertorque Detection 2 (UL4)	013CH	Drive timeout waiting for response (oFA41)
0030H	Hardware Fault (including oFx)	013DH	Control Response Selection 2 Error (oFA42)
0032H	Z Pulse Fall Detection (dv1)	013EH	Control Response Selection Error (oFA43)
0033H	Z Pulse Noise Fault Detection (dv2)	0201H	Option Connection Error (oFb01)
0034H	Inversion Detection (dv3)	0202H	Same type of option card already connected (oFb02)

C.9 MEMOBUS/Modbus Data Table

Fault Code	Fault Name	Fault Code	Fault Name
0035H	Inversion Prevention Detection (dv4)	0205H	A/D Conversion Error (oFb05)
0036H	Output Current Imbalance (LF2)	0206H	Option Response Error (oFb06)
0037H	Pullout Detection (Sto)	0210H	Option RAM Fault (oFb10)
0038H	PG Option Card Hardware Fault	0211H	Option Operation Mode Fault (SLMOD) (oFb11)
0046H	Current Offset Fault (CoF)	0212H	Drive Receive CRC Error (oFb12)
004DH	Output Voltage Detection Fault (voF)	0213H	Drive Receive Frame Error (oFb13)
0054H	Overacceleration (dv6)	0214H	Drive Receive Abort Error (oFb14)
0055H	Motor Contactor Response Error (SE1)	0215H	Option Receive CRC Error (oFb15)
0056H	Starting Current Error (SE2)	0216H	Option Receive Frame Error (oFb16)
0057H	Output Current Error (SE3)	0217H	Option Receive Abort Error (oFb17)
0058H	Brake Feedback Error (SE4)	0231H	Comm. ID Error (oFb30)
0059H	Reference Missing (FrL)	0232H	Model Code Error (oFb31)
005BH	Initial magnet Pole Search Overtime (dv7)	0233H	Sumcheck Error (oFb32)
005DH	Initial magnet Pole Search Error (dv8)	0234H	Comm. option timeout waiting for response (oFb33)
0083H	A/D Conversion Error (CPF02)	0235H	MEMOBUS Timeout (oFb34)
0084H	PWM Data Fault (CPF03)	0236H	Drive timeout waiting for response (oFb35)
0087H	EEPROM Memory Data Error (CPF06)	0237H	CI Check Error (oFb36)
0088H	Terminal Board Connection Error (CPF07)	0238H	Drive timeout waiting for response (oFb37)
0089H	EEPROM Serial Communication Fault (CPF08)	0239H	Control Command Selection Error (oFb38)
008CH	RAM Fault (CPF11)	023AH	Drive timeout waiting for response (oFb39)
008DH	Flash Memory Circuit Exception (CPF12)	023BH	Control Response Selection 1 Error (oFb40)
008EH	Watchdog Circuit Exception (CPF13)	023CH	Drive timeout waiting for response (oFb41)
008FH	Control Circuit Fault (CPF14)	023DH	Control Response Selection 2 Error (oFb42)
0091H	Clock Fault (CPF16)	023EH	Control Response Selection Error (oFb43)
0092H	Timing Fault (CPF17)	0300H	Option Compatibility Error (oFC00)
0093H	Control Circuit Fault (CPF18)	0301H	Option not properly connected (oFC01)
0094H	Control Circuit Fault (CPF19)	0302H	Same type of option card already connected (oFC02)
0095H	Hardware fault at power up (CPF20)	0305H	A/D Conversion Error (oFC05)
0096H	Hardware fault at communication start up (CPF21)	0306H	Option Response Error (oFC06)
0097H	A/D Conversion Fault (CPF22)	0351H	Encoder Option A/D Conversion Error (OFC50)
0098H	PWM Feedback Fault (CPF23)	0352H	Encoder Option Analog Circuit Error (OFC51)
0099H	Drive Unit Signal Fault (CPF24)	0353H	Encoder Communications Timeout (OFC52)
009AH	Terminal board is not properly connected. (CPF25)	0354H	Encoder Communications Data Error (OFC53)
009BH	ASIC BB Circuit Error (CPF26)	0355H	Encoder Error (OFC54)
009DH	ASIC PWM Pattern Error (CPF28)		

◆ Alarm Register Contents

The table below shows the alarm codes that can be read out from MEMOBUS/Modbus register 007FH.

Table C.5 Alarm Register 007FH Contents

Alarm Code	Fault Name	Alarm Code	Fault Name
0001H	Undervoltage (Uv)	0017H	Motor Overload (oL1)
0002H	Overvoltage (ov)	0018H	Drive Overload (oL2)
0003H	Heatsink Overheat (oH)	001AH	Option Card External Fault (EF0)
0005H	Overtorque 1 (oL3)	001DH	Serial Communication Transmission Error (CALL)
0006H	Overtorque 2 (oL4)	001EH	Undertorque Detection 1 (UL3)
0007H	Up/Down commands input error (EF)	001FH	Undertorque Detection 2 (UL4)
0008H	Drive Baseblock (bb)	0020H	MEMOBUS/Modbus Test Mode Fault (SE)
0009H	External Fault at input terminal S3 (EF3)	002BH	Encoder Disconnected (PGo)
000AH	External Fault at input terminal S4 (EF4)	0034H	High Current Alarm (HCA)
000BH	External Fault at input terminal S5 (EF5)	0035H	Cooling Fan Maintenance Time (LT-1)
000CH	External Fault at input terminal S6 (EF6)	0036H	Capacitor Maintenance Time (LT-2)
000DH	External Fault at input terminal S7 (EF7)	0038H	SI-S EEPROM Error (EEP)
000EH	External Fault at input terminal S8 (EF8)	003BH	Safe Disable Input (HbbF)
0010H	Overspeed (oS)	003CH	Safe Disable Input (Hbb)
0011H	Excessive Speed Deviation (dEv)	0041H	Output Voltage Detection Fault (voF)
0012H	Encoder Disconnected (PGo)	0043H	Soft Charge Bypass Relay Maintenance Time (LT-3)
0014H	MEMOBUS/Modbus Communication Error (CE)	0044H	IGBT Maintenance Time (50%) (LT-4)
0015H	Option Communication Error (bUS)	0045H	Braking Transistor Overload (boL)
0016H	Serial Communication Transmission Error (CALL)		

C.10 Enter Command

When writing parameters to the drive from the PLC using MEMOBUS/Modbus communication, explains parameter H5-11 determines if an Enter command must be issued to enable these parameters or not. This section explains the types of Enter commands and how they work.

◆ Enter Command Types

The drive supports two types of Enter commands as shown in the table below. An Enter command is enabled by writing 0 to register number 0900H or 0910H. These registers can only be written to. An error will occur if the user attempts to read from these registers.

Table C.6 Enter Command Types

Register No.	Description
0900H	Writes data into the EEPROM (non-volatile memory) of the drive and enables the data in RAM at the same time. Parameter changes remain even if the power supply is cycled.
0910H	Writes data in the RAM only. Parameter changes are lost when the drive is shut off.

Note: Because the EEPROM can be written to a maximum of 100,000 times, refrain from writing to the EEPROM too often. The Enter command registers are write-only. Consequently, if these registers are read, then the register address will be invalid (Error code: 02H). An Enter command is not required if reference or broadcast data are sent to the drive.

◆ Parameter H5-11 and the Enter Command

When changing parameters via MEMOBUS/Modbus, the setting of H5-11 determines if an Enter command is needed or not but also how relations to other parameters are handled.

H5-11 Settings	H5-11 = 0	H5-11 = 1
How parameter settings are enabled	When the Enter command is received from the master.	As soon as the value is changed.
Upper/lower limit check	Upper/lower limit check is performed, taking the settings of related parameters into account.	Checks only the upper/lower limits of the parameters that were changed.
Default value of related parameters	Not affected. The settings of related parameters remain unchanged. They must be changed manually if needed.	Default settings of related parameters are changed automatically.
Error handling when setting multiple parameters	Data is accepted even if one setting is invalid. The invalid setting will be discarded. No error message occurs.	Error occurs if only one setting is invalid. All data that was sent are discarded.

C.11 Communication Errors

◆ MEMOBUS/Modbus Error Codes

A list of MEMOBUS/Modbus errors appears below.

When an error occurs, remove whatever caused the error and restart communications.

Error Code	Error Name
	Cause
01H	Function Code Error
	<ul style="list-style-type: none"> Attempted to set a function code from a PLC other than 03H, 08H, and 10H.
02H	Register Number Error
	<ul style="list-style-type: none"> A register number specified in the command message does not exist. Attempted to send a broadcast message using other register numbers than 0001H or 0002H.
03H	Bit Count Error
	<ul style="list-style-type: none"> Read data or write data is greater than 16 bits. Invalid command message quantity. In a write message, the "Number of Data Items" contained within the message does not equal twice the amount of data words (i.e., the total of Data 1 + Data 2, etc.).
21H	Data Setting Error
	<ul style="list-style-type: none"> Control data or parameter write data is outside the allowable setting range. Attempted to write a contradictory parameter setting.
22H	Write Mode Error
	<ul style="list-style-type: none"> During run, the user attempted to write a parameter that cannot be written to during run. During an EEPROM memory data error (CPF06), the master attempted to write to a parameter other than A1-00 to A1-05, E1-03, or o2-04. Attempted to write to read-only data.
23H	DC Bus Undervoltage Write Error
	<ul style="list-style-type: none"> During an undervoltage situation, the master attempted to write to parameters that cannot be written to during undervoltage.
24H	Write Error During Parameter Process
	<ul style="list-style-type: none"> Master attempted writing to the drive while the drive was processing parameter data.

◆ Slave Not Responding

In the following situations, the slave drive will ignore the command message sent from the master, and not send a response message:

- When a communications error (overflow, framing, parity, or CRC-16) is detected in the command message.
- When the slave address in the command message and the slave address in the drive do not match (remember to set the slave address for the drive using H5-01).
- When the gap between two blocks (8 bit) of a message exceeds 24 bits.
- When the command message data length is invalid.

Note: If the slave address specified in the command message is 00H, all slaves execute the write function, but do not return response messages to the master.

C.12 Self-Diagnostics

The drive has a built-in self-diagnosing function of the serial communication interface circuits. To perform the self-diagnosis function, use the following procedure.

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 one minute after all indicators are OFF and measure the DC bus voltage level to confirm safe level.*

1. Turn on the power to the drive.
2. Note the present terminal S6 function selection setting (H1-06) and set it for the communications test mode (H1-06 = 67).
3. Turn off the power to the drive.

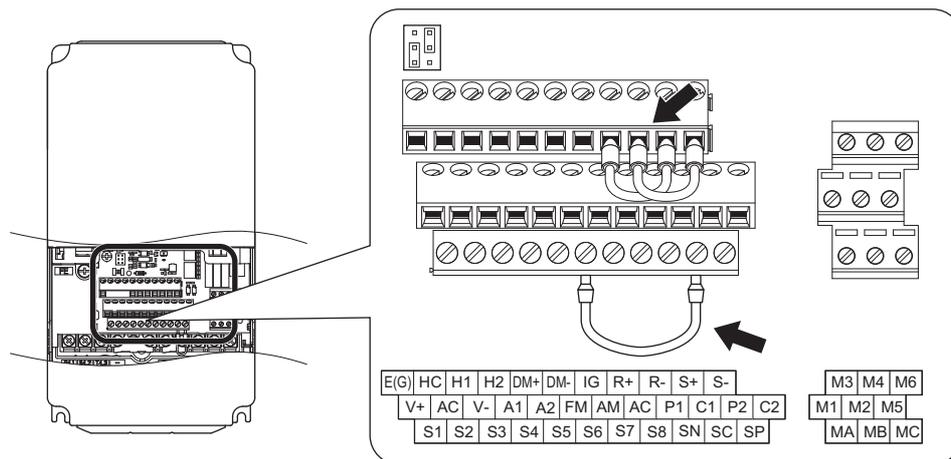


Figure C.9 Terminal Connections for Communication Self-Diagnostics

4. With the power off, wire the drive as shown in the following diagram, connecting terminals R+ and S+, R- and S-, and S6 and SC.
5. Set jumper S3 to source mode (internal power supply).
6. Turn the power to the drive back on.
7. During normal operation, the drive will display "PASS". This indicates that the communications test mode is operating normally.
When a fault occurs, the drive will display "EE" on the keypad display.
8. Turn off the power supply.
9. Remove the wire jumpers from terminal R+, R-, S+, S-, and S6-SC. Set back jumper S3 to its original position. Set terminal S6 to its original function.
10. Return to normal operation.



Appendix: D

Standards Compliance

This appendix explains the guidelines and criteria for maintaining CE and UL standards.

D.1 SECTION SAFETY	370
D.2 EUROPEAN STANDARDS	372
D.3 UL STANDARDS	376
D.4 SAFE DISABLE INPUT FUNCTION	380

D.1 Section Safety

DANGER

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 any 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.

The internal capacitor remains charged even after the power supply is turned off.

Failure to comply can result in serious electric shock.

WARNING

Electrical Shock Hazard

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.

Always ground the motor-side grounding terminal.

Improper equipment grounding could result in death or serious injury by contacting the motor case.

Do not allow unqualified personnel to use 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.

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.

Do not remove covers or touch circuit boards while the power is on.

Failure to comply could result in death or serious injury.

⚠ 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.

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.

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**

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.

Never connect or disconnect the motor from the drive while the drive is outputting voltage.

Improper equipment sequencing could result in damage to the drive.

Do not use unshielded wire 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.

Do not carelessly connect parts or devices to the drives braking transistor terminals.

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

Carefully review instruction manual TOBPC72060000 when connecting a braking option to the drive.

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 modification of the product made by the user. This product must not be modified.

Check all the wiring to ensure that all connections are correct after installing the drive and connecting other devices.

Failure to comply could result in damage to the drive.

D.2 European Standards



Figure D.1 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.

◆ CE Low Voltage Directive Compliance

This drive has been tested according to European standard IEC61800-5-1, 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 IEC664.

■ Installing Fuses on the Input Side

Always install input fuses. Select fuses according to [Table D.1](#).

Table D.1 Recommended Input Fuse Selection

Model CIMR-L□	Fuse Type	
	Manufacturer: Bussmann	
	Model	Fuse Ampere Rating (A)
Three-Phase 200 V Class		
2A0018	FWH-90B	90
2A0025	FWH-100B	100
2A0033	FWH-200B	200
2A0047	FWH-200B	200
2A0060	FWH-200B	200
2A0075	FWH-300A	300
2A0085	FWH-300A	300
2A0115	FWH-350A	350
2A0145	FWH-400A	400
2A0180	FWH-400A	400

Model CIMR-L□	Fuse Type	
	Manufacturer: Bussmann	
	Model	Fuse Ampere Rating (A)
Three-Phase 400 V Class		
4A0009	FWH-90B	90
4A0015	FWH-80B	80
4A0018	FWH-100B	100
4A0024	FWH-125B	125
4A0031	FWH-200B	200
4A0039	FWH-250A	250
4A0045	FWH-250A	250
4A0060	FWH-250A	250
4A0075	FWH-250A	250
4A0091	FWH-250A	250
4A0112	FWH-350A	350
4A0150	FWH-400A	400

■ 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.

■ Wiring

All wire ends should use ring terminals for UL/cUL compliance. Use only the tools recommended by the terminal manufacturer for crimping.

◆ EMC Guidelines Compliance

This drive is tested according to European standards EN61800-3: 2004, and complies with the European standards EN12015 (requires an optional AC reactor) or EN12016.

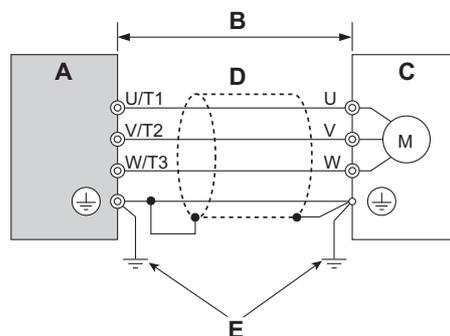
■ EMC Filter Installation

The following conditions must be met to ensure continued compliance with European standards EN12015 or EN12016. [Refer to EMC Filters on page 375](#) 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.

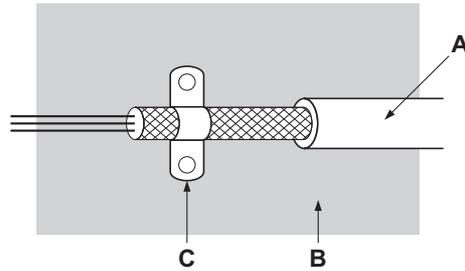


- A – Drive
- B – 10 m max cable length between drive and motor
- C – Motor
- D – Metal conduit
- E – Ground wire should be as short as possible.

Figure D.2 Installation Method

D.2 European Standards

- Ground the largest possible surface area of the shield to the metal conduit when using braided shield cable. Yaskawa recommends using a cable clamp.



A – Braided shield cable **C – Cable clamp (conductive)**
B – Metal panel

Figure D.3 Ground Area

- Connect a AC or DC reactor to minimize harmonic distortion.

Three-Phase 200 V / 400 V Class

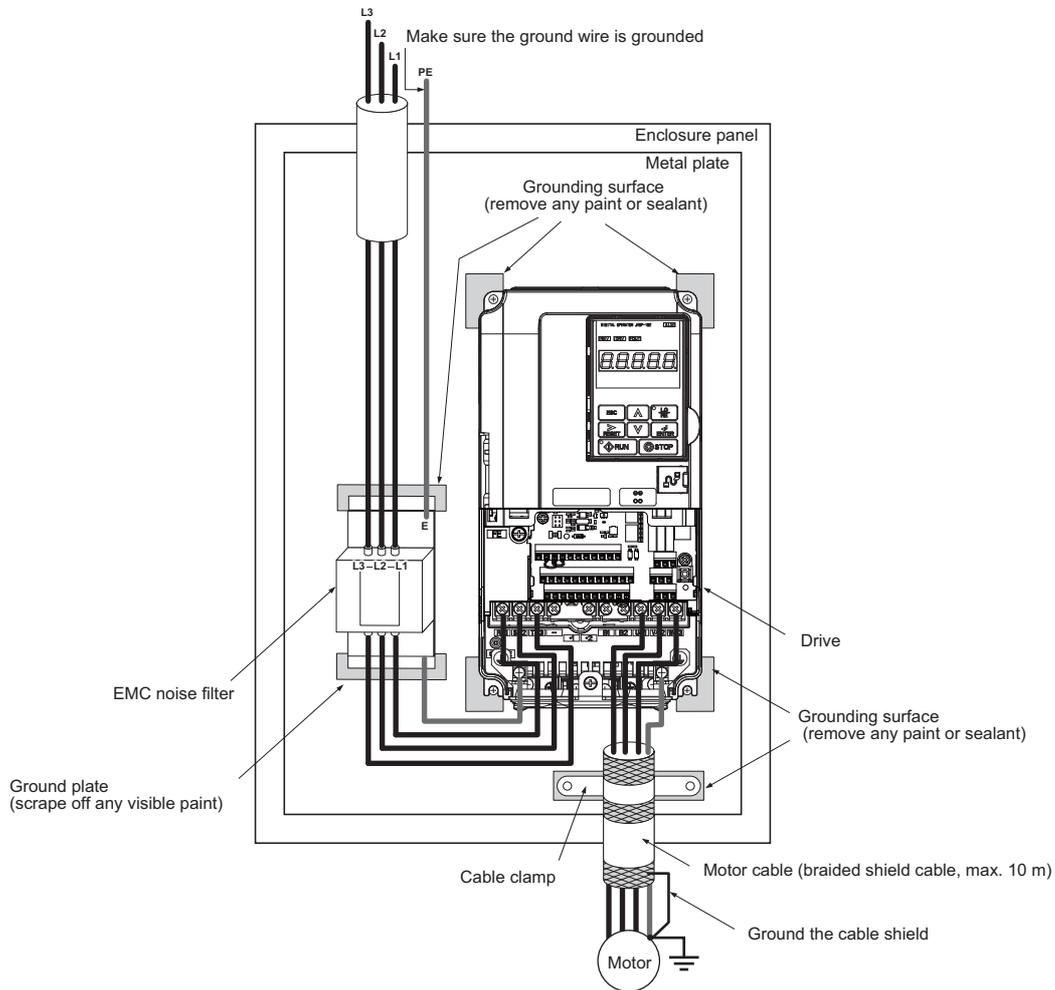


Figure D.4 EMC Filter and Drive Installation for CE Compliance (Three-Phase 200 V / 400 V Class)

■ EMC Filters

The drive should be installed with the EMC filters listed below in order to comply with the EN61800-3/EN12015 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 EN60204-1, stop category 0, use only filters manufactured by Schaffner as listed below. This also applies when using the safe disable function in one motor contactor installations as described in *Safe Disable Input Function on page 380*.

Table D.2 EN61800-3 Filters

Model CIMR-L□	Filter Data (Manufacturer: Schaffner)					Figure
	Type	Rated Current (A)	Weight (kg)	Dimensions [W x H x D] (mm)	Y x X	
Three-Phase 200 V Class						
2A0018	FS5972-35-07	35	2.1	206 x 355 x 50	175 x 336	1
2A0025						
2A0033						
2A0047	FS5972-60-07	60	4.0	236 x 408 x 65	205 x 390	2
2A0060						
2A0075	FS5972-100-35	100	3.4	90 x 330 x 150	65 x 255	2
2A0085						
2A0115	FS5972-170-40	170	6.0	120 x 451 x 170	102 x 365	2
2A0145						
2A0180	FS5972-250-37	250	11.7	130 x 610 x 240	90 x 498	2
Three-Phase 400 V Class						
4A0009	FS5972-18-07	18	1.7	141 x 330 x 46	115 x 313	1
4A0015						
4A0018						
4A0024	FS5972-35-07	35	2.1	206 x 355 x 50	175 x 336	1
4A0031						
4A0039	FS5972-60-07	60	4	236 x 408 x 65	202 x 390	2
4A0045						
4A0060						
4A0075	FS5972-100-35	100	3.4	90 x 330 x 150	65 x 255	2
4A0091						
4A0112	FS5972-170-40	170	4.7	120 x 451 x 170	102 x 365	2
4A0150						

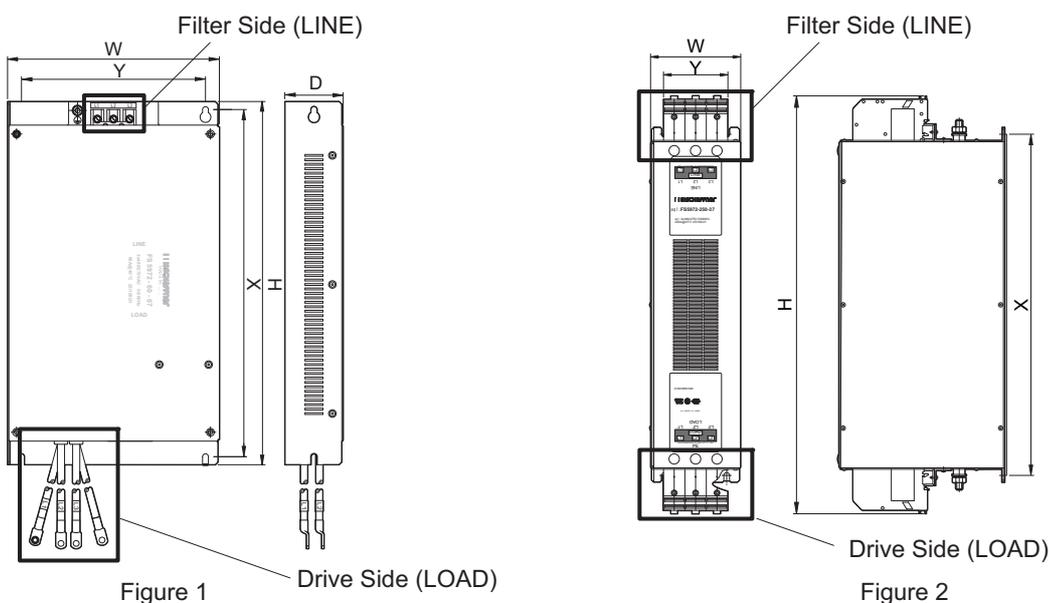


Figure D.5 EMC Filter Dimensions

■ AC Reactors for EN 12015 Compliance

Contact Yaskawa for information about reactors.

D.3 UL Standards

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 D.6 UL/cUL Mark

◆ UL Standards Compliance

This drive is tested in accordance with UL standard UL508C and complies with UL requirements. The conditions described below must be met to maintain compliance when using this drive in combination with other equipment:

■ Installation Area

Do not install the drive to an area greater than pollution severity 2 (UL standard).

■ Main Circuit Terminal Wiring

Cable Connectors

Yaskawa recommends using UL-listed copper wires (rated at 75°C), and closed-loop connectors or CSA-certified ring connectors sized for the selected wire gauge to maintain proper clearances when wiring the drive. Use the correct crimp tool to install connectors per manufacturer recommendation. [Table D.3](#) lists a suitable closed-loop connector manufactured by JST Corporation.

Table D.3 Closed-Loop Crimp Terminal Size (JIS C 2805) (same for 200 V and 400 V)

Wire Gauge mm ² (AWG)	Terminal Screws	Crimp Terminal Model Numbers	Tightening Torque N m (lb to in.)
0.75 (18)	M3.5	R1.25-3.5	0.8 to 1.0 (7.1 to 8.9)
	M4	R1.25-4	1.2 to 1.5 (10.6 to 13.3)
1.25 (16)	M3.5	R1.25-3.5	0.8 to 1.0 (7.1 to 8.9)
	M4	R1.25-4	1.2 to 1.5 (10.6 to 13.3)
2 (14)	M3.5	R2-3.5	0.8 to 1.0 (7.1 to 8.9)
	M4	R2-4	1.2 to 1.5 (10.6 to 13.3)
	M5	R2-5	2.0 to 2.5 (17.7 to 22.1)
	M6	R2-6	4.0 to 5.0 (35.4 to 44.3)
3.5/5.5 (12/10)	M4	R5.5-4	1.2 to 1.5 (10.6 to 13.3)
	M5	R5.5-5	2.0 to 2.5 (17.7 to 22.1)
	M6	R5.5-6	4.0 to 5.0 (35.4 to 44.3)
	M8	R5.5-8	9.0 to 11.0 (79.7 to 97.4)
8 (8)	M4	8-4	1.2 to 1.5 (10.6 to 13.3)
	M5	R8-5	2.0 to 2.5 (17.7 to 22.1)
	M6	R8-6	4.0 to 5.0 (35.4 to 44.3)
	M8	R8-8	9.0 to 11.0 (79.7 to 97.4)
14 (6)	M4	14-4 <1>	1.2 to 1.5 (10.6 to 13.3)
	M5	R14-5	2.0 to 2.5 (17.7 to 22.1)
	M6	R14-6	4.0 to 5.0 (35.4 to 44.3)
	M8	R14-8	9.0 to 11.0 (79.7 to 97.4)
22 (4)	M10	R22-10	18.0 to 23.0 (159.0 to 204.0)
	M12	R22-12	32.0 to 40.0 (284.0 to 354.0)
30/38 (3/2)	M12	R38-12	32.0 to 40.0 (284.0 to 354.0)
50/60 (1/ 1/0)	M12	R60-12	32.0 to 40.0 (284.0 to 354.0)
80 (2/0)	M12	R80-12	32.0 to 40.0 (284.0 to 354.0)
100 (4/0)	M12	R100-12	32.0 to 40.0 (284.0 to 354.0)
150 (250/300MCM)	M10	150-10	18.0 to 23.0 (159.0 to 204.0)
	M12	150-12	32.0 to 40.0 (284.0 to 354.0)
200 (400MCM)	M10	200-10	18.0 to 23.0 (159.0 to 204.0)
	M12	R200-12	32.0 to 40.0 (284.0 to 354.0)
325 (600/650MCM)	M12	325-12	32.0 to 40.0 (284.0 to 354.0)

<1> Use the specified crimp terminals (Model 14-NK4) when using CIMR-L□2A0025, 2A0033, 4A0015, and 4A0018 with 14 mm² (6 AWG).

- Note:**
1. Use crimp insulated terminals or insulated shrink tubing for wiring connections. Wires should have a continuous maximum allowable temperature of 75°C 600 Vac UL-approved vinyl-sheathed insulation.
 2. In the drives CIMR-L□2A0145, -0180, and CIMR-L□4A0112, -0150, the wire bending space (space between terminals and cable entry point) provided is smaller than recommended in the IEC61800-5-1.

Input Fuse Installation

The installation manual specifies that branch circuit protection should be provided by any of the following:

- Non-time delay Class J, T, or CC fuses sized at 300% of the drive input rating
- Time delay Class J, T, or CC fuses sized at 175% of the drive input rating
- Time-delay Class RK5 fuses sized at 225% of the drive input rating

Table D.4 Recommended Input Fuse Selection

Model CIMR-L□	Fuse Type	
	Manufacturer: Bussmann	
	Model	Fuse Ampere Rating (A)
Three-Phase 200 V Class		
2A0018	FWH-90B	90
2A0025	FWH-100B	100
2A0033	FWH-200B	200
2A0047	FWH-200B	200
2A0060	FWH-200B	200
2A0075	FWH-300A	300
2A0085	FWH-300A	300
2A0115	FWH-350A	350
2A0145	FWH-400A	400
2A0180	FWH-400A	400
Three-Phase 400 V Class		
4A0009	FWH-90B	90
4A0015	FWH-80B	80
4A0018	FWH-100B	100
4A0024	FWH-125B	125
4A0031	FWH-200B	200
4A0039	FWH-250A	250
4A0045	FWH-250A	250
4A0060	FWH-250A	250
4A0075	FWH-250A	250
4A0091	FWH-250A	250
4A0112	FWH-350A	350
4A0150	FWH-400A	400

■ 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. Use a class 2 (UL regulations) power supply for the control circuit terminal when not using the drives internal control power supply.

Table D.5 Control Circuit Terminal Power Supply

Input / Output	Terminal Signal	Power Supply Specifications
Multi-function photocoupler output	P1-C1, P2-C2	Requires class 2 power supply
Digital inputs	S1, S2, S3, S4, S5, S6, S7, S8, SC	Use the internal control power supply of the drive or an external class 2 power supply.
Analog inputs	A1, A2, AC	

■ Drive Short-Circuit Rating

This drive has undergone the UL short-circuit test, which certifies that during a short circuit in the power supply, the current flow will not rise above 100,000 amps at 240 V for 200 V class drives and 480 V for 400 V class drives.

- The MCCB, breaker protection, and fuse ratings shall be equal to or greater than the short-circuit tolerance of the power supply being used.

With the drives motor protection function, it is recommended to use a circuit that can handle a power supply with 100,000 amps or less at 240 V for 200 V class drives or 480 V for 400 V class drives.

◆ **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 D.6 Overload Protection Settings

Setting	Description	
0	Disabled	Disabled the drive's internal motor overload protection.
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 reduces 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.

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 as long as 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.

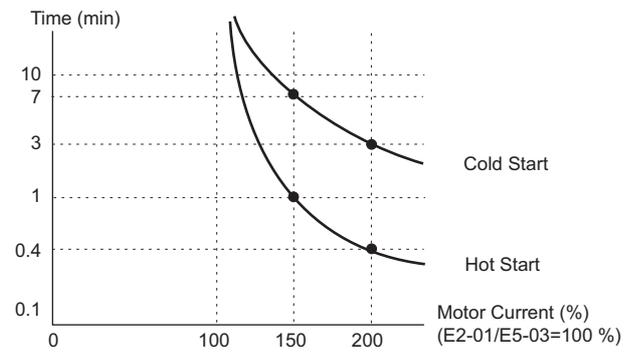


Figure D.7 Motor Overload Protection Time

D.4 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 Stop Category 0 as defined in the EN60204-1 (uncontrolled stop by power removal), and “Safe Torque Off” as defined in the IEC61800-5-2. Safe Disable inputs have been designed to meet the requirements of the EN954-1/ISO13849-1, Category 3 and IEC61508, SIL2.

A Safe Disable Status Monitor for error detection in the safety circuit is also provided.

Note: The function safety approval of the drives CIMR-L□2A0145, -0180, and CIMR-L□4A0112, -0150 is pending. The Safe Disable input function of these drives should not be used for safety relevant circuits (EN81-1 conform circuit with one motor contactor).

Inputs / Outputs		Two Safe Disable inputs and 1 EDM output according to EN61800-5-1, EN954-1/ISO13849 Cat. 3, IEC/EN61508 SIL2, Insulation coordination: class 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 feature satisfies all requirements of performance level d (PLd) as defined by ISO13849-1 (this includes DC from EDM).

◆ Precautions

DANGER! *Improper use of the Safe Disable function can result in serious injury or even death. Make sure the whole system or machinery that the Safe Disable function is used in complies with safety requirements.*

DANGER! *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 degree (electrically). Make sure such a situation would have no effect on the safety of the application when using the Safe Disable function. This is not a concern with induction motors.*

DANGER! *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.*

DANGER! *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.*

DANGER! *All safety features (including Safe Disable) should be inspected periodically. If the system is not operating normally, there is a risk of serious personal injury.*

DANGER! *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.*

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.*

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 373](#).*

◆ Using the Safe Disable Function

■ Safe Disable Circuit

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 65](#) for signal specifications when using this output.

Additionally a Safe Disable monitor function can be assigned to one of the digital outputs (H2-□□ = 58).

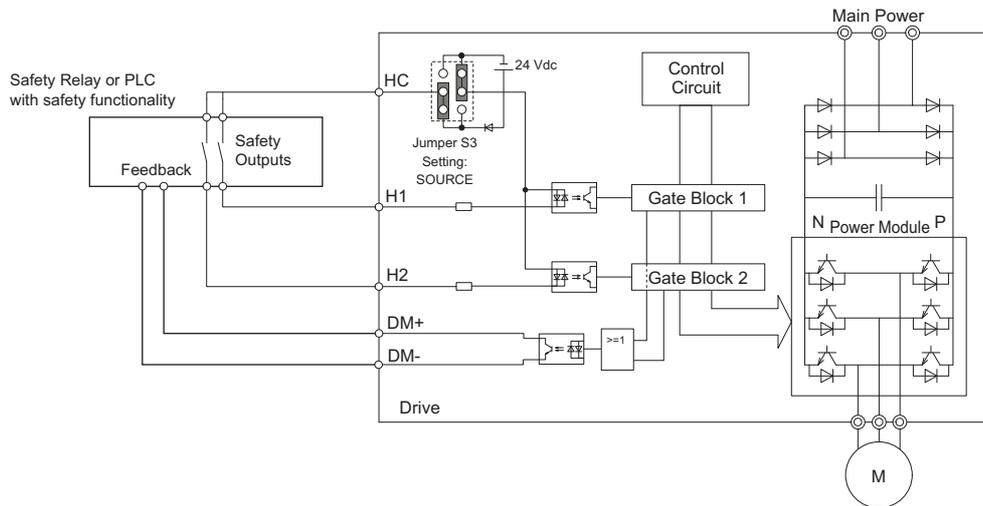


Figure D.8 Safe Disable Function Wiring Example (Source Mode)

■ Disabling and Enabling the Drive Output (“Safe Torque Off”)

The diagram below illustrates a Safe Disable input operation example.

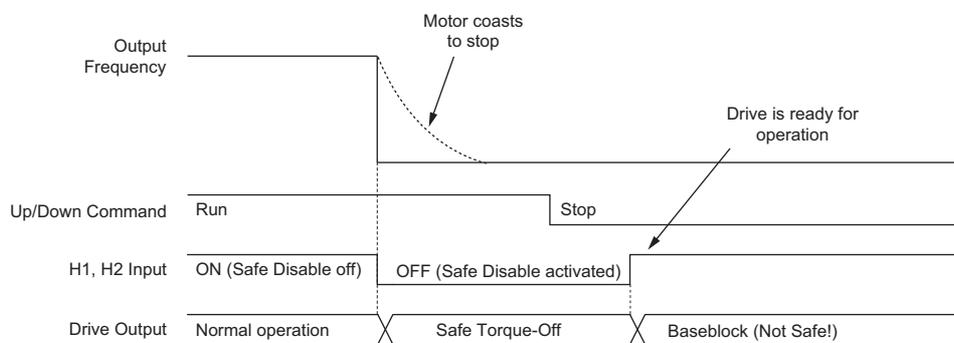


Figure D.9 Safe Disable Operation

Entering the “Safe Torque Off” State

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 were opened, then 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

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.

D.4 Safe Disable Input Function

■ Safe Disable Monitor Output Function and Digital Operator Display

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

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

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 EN61800-5-1.

When both Safe Disable inputs are open, Hbb will flash in the digital operator display.

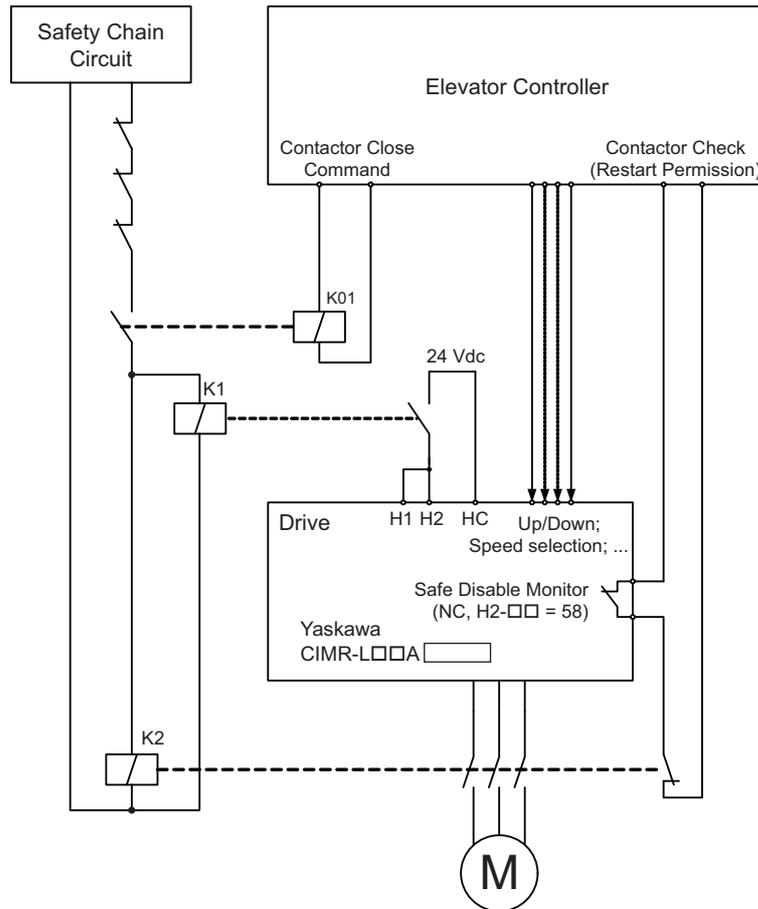
Should only one of the Safe Disable channels be on while the other is off, HbbF will flash in the display to indicate that there is a problem in the safety circuit or in the drive. This display should not appear under normal conditions if the Safe Disable circuit is utilized properly. [Refer to Alarm Codes, Causes, and Possible Solutions on page 240](#) 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 must be 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 (Terminals DM+ and DM- can not be used).
- 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 69](#) 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.



Appendix: E

Quick Reference Sheet

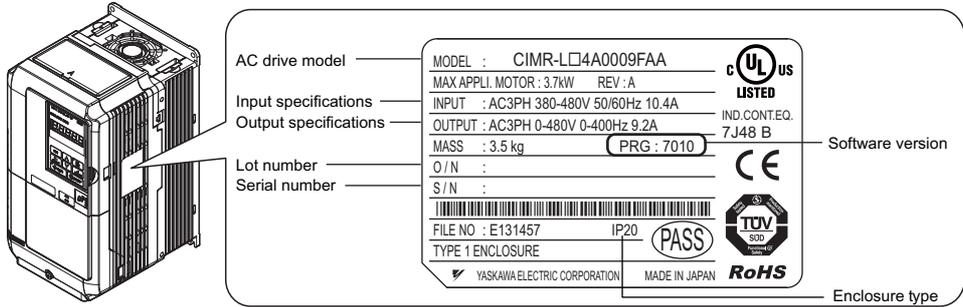
The following tables have been provided for the user's convenience. Fill in the cells that have been left blank as is appropriate for your drive, and keep this information as a quick reference guide to drive and motor data as well as parameter settings

E.1 DRIVE AND MOTOR SPECIFICATIONS	386
E.2 MULTI-FUNCTION I/O TERMINAL SETTINGS RECORD	387
E.3 USER SETTING TABLE	388

E.1 Drive and Motor Specifications

◆ Drive

A separate record should be kept that lists drive specifications and motor specifications.



Items	Description
Model	CIMR-L□
Serial Number	
Date of Usage	

◆ Motor

■ Induction Motor

Items	Description	Items	Description
Manufacturer		Motor Rated Current (T1-04)	A
Model		Motor Base Frequency (T1-05)	Hz
Motor Rated Power (T1-02)	kW	Number of Motor Poles (T1-06)	
Motor Rated Voltage (T1-03)	V	Motor Base Speed	r/min

Note: These values must be entered as part of the Auto-Tuning process.

■ Permanent Magnet Motor

Items	Description	Items	Description
Manufacturer		Induction Voltage Constant	mVs/rad
Model		Induction Voltage Constant	mV/(r/min)
PM Motor Rated Power (T2-04)	kW	PM Motor Rated Current (T2-06)	A
PM Motor Rated Voltage (T2-05)	V	Number of PM Motor Poles (T2-08)	
d-Axis Inductance	mH	PM Motor Base Speed (T2-09)	r/min
q-Axis Inductance	mH	Encoder Offset	

Note: These values must be entered as part of the Auto-Tuning process.

■ Motor Speed Encoder (if used)

Items	Value	Items	Value
Manufacturer		Resolution	
Interface			

E.2 Multi-Function I/O Terminal Settings Record

These tables have been provided for the customer to keep a record of the functions assigned to each multi-function terminal.

◆ Multi-Function Digital Inputs (SC Common)

Terminal	Used/Reserved	Setting Value and Function Name	Memo
S3		H1-03=	
S4		H1-04=	
S5		H1-05=	
S6		H1-06=	
S7		H1-07=	
S8		H1-08=	

◆ Analog Inputs (AC Common)

Terminal	Used/Reserved	Setting Value and Function Name	Memo
A1		H3-02=	
A2		H3-10=	

◆ Multi-Function Relay Outputs

Terminal	Used/Reserved	Setting Value and Function Name	Memo
M1-M2		H2-01=	
M3-M4		H2-02=	
M5-M6		H2-03=	

◆ Multi-Function Photocoupler Outputs (P1-C1, P2-C2)

Terminal	Used/Reserved	Setting Value and Function Name	Memo
P1-C1		H2-04=	
P2-C2		H2-05=	

◆ Monitor Outputs (AC Common)

Terminal	Used/Reserved	Setting Value and Function Name	Memo
FM		H4-01=	
AM		H4-04=	

E.3 User Setting Table

Use the Verify Menu to see which parameters have been changed from their original default settings.

- The diamond below the parameter number indicates that the parameter setting can be changed during run.
- Parameter names in boldface type are included in the Setup Group of parameters.

No.	Name	User Setting
A1-00 ◆	Language Selection	
A1-01 ◆	Access Level Selection	
A1-02	Control Method Selection	
A1-03	Initialize Parameters	
A1-04	Password	
A1-05	Password Setting	
A2-01 to A2-32	User Parameters, 1 to 32	
A2-33	User Parameter Automatic Selection	
b1-01	Speed Reference Selection	
b1-02	Up/Down Command Selection	
b1-03	Stopping Method Selection	
b1-06	Digital Input Reading	
b1-08	Up/Down Command Selection while in Programming Mode	
b1-14	Phase Order Selection	
b2-08	Magnetic Flux Compensation Value	
b4-01	Timer Function On-Delay Time	
b4-02	Timer Function Off-Delay Time	
b6-01	Dwell Speed at Start	
b6-02	Dwell Time at Start	
b6-03	Dwell Speed at Stop	
b6-04	Dwell Time at Stop	
b7-01 ◆	Droop Control Gain	
b7-02 ◆	Droop Control Delay Time.	
b8-01	Energy Saving Control Selection	
b8-16	Energy Saving Control Constant (Ki)	
b8-17	Energy Saving Control Constant (Kt)	
C1-01 ◆	Acceleration Ramp 1	
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	Emergency Stop Ramp	
C1-10	Accel/Decel Setting Resolution	
C1-11	Accel/Decel Switching Speed	
C1-15	Inspection Deceleration Ramp	
C2-01	Jerk at Accel Start	
C2-02	Jerk at Accel End	
C2-03	Jerk at Decel Start	
C2-04	Jerk at Decel End	
C2-05	Jerk below Leveling Speed	
C3-01 ◆	Slip Compensation Gain	
C3-02 ◆	Slip Compensation Primary Delay Time	

No.	Name	User Setting
C3-03	Slip Compensation Limit	
C3-04	Slip Compensation Selection during Regeneration	
C3-05	Output Voltage Limit Operation Selection	
C4-01 ◆	Torque Compensation Gain	
C4-02 ◆	Torque Compensation Primary Delay Time	
C4-03	Torque Compensation at Forward Start	
C4-04	Torque Compensation at Reverse Start	
C4-05	Torque Compensation Time Constant	
C5-01 ◆	Speed Control Loop Proportional Gain 1	
C5-02 ◆	Speed Control Loop Integral Time 1	
C5-03 ◆	Speed Control Loop Proportional Gain 2	
C5-04 ◆	Speed Control Loop Integral Time 2	
C5-06	Speed Control Loop Primary Delay Time Constant	
C5-07	Speed Control Loop Settings Switching Speed	
C5-08	Speed Control Loop Integral Limit	
C5-13 ◆	Speed Control Loop Proportional Gain 3	
C5-14	Speed Control Loop Integral Time 3	
C5-16	Speed Control Loop Delay Time during Position Lock	
C5-19 ◆	Speed Control Loop Proportional Gain Time during Position Lock	
C5-20 ◆	Speed Control Loop Integral Time during Position Lock	
C6-03	Carrier Frequency	
C6-06	PWM Method	
C6-09	Carrier Frequency during Rotational Auto-Tuning	
C6-21	Inspection Operation Carrier Frequency	
C6-23	Carrier Frequency during Initial Motor Pole Search	
d1-01 ◆	Speed Reference 1	
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	
d1-18	Speed Reference Selection Mode	
d1-19 ◆	Nominal Speed	
d1-20 ◆	Intermediate Speed 1	
d1-21 ◆	Intermediate Speed 2	
d1-22 ◆	Intermediate Speed 3	
d1-23 ◆	Releveling Speed	

No.	Name	User Setting
d1-24 ◆	Inspection Operation Speed	
d1-25 ◆	Rescue Operation Speed	
d1-26 ◆	Leveling Speed	
d1-28	Leveling Speed Detection Level	
d1-29	Inspection Speed Detection Level	
d6-03	Field Forcing Selection	
d6-06	Field Forcing Limit	
E1-01	Input Voltage Setting	
E1-03	V/f Pattern Selection	
E1-04	Maximum output speed	
E1-05	Maximum Voltage	
E1-06	Base Frequency	
E1-07	Middle Output Frequency	
E1-08	Middle Output Frequency Voltage	
E1-09	Minimum Output Frequency	
E1-10	Minimum Output Frequency Voltage	
E1-11	Middle Output Frequency 2	
E1-12	Middle Output Frequency Voltage 2	
E1-13	Base Voltage	
E2-01	Motor Rated Current	
E2-02	Motor Rated Slip	
E2-03	Motor No-Load Current	
E2-04	Number of Motor Poles	
E2-05	Motor Line-to-Line Resistance	
E2-06	Motor Leakage Inductance	
E2-07	Motor Iron-Core Saturation Coefficient 1	
E2-08	Motor Iron-Core Saturation Coefficient 2	
E2-09	Motor Mechanical Loss	
E2-10	Motor Iron Loss for Torque Compensation	
E2-11	Motor Rated Power	
E5-02	Motor Rated Power	
E5-03	Motor Rated Current	
E5-04	Motor Poles	
E5-05	Motor Stator Resistance (Single Phase)	
E5-06	Motor d-Axis Inductance	
E5-07	Motor q-Axis Inductance	
E5-09	Motor Induction Voltage Constant 1	
E5-11	Encoder Offset	
E5-24	Motor Induction Voltage Constant 2	
F1-01	Encoder 1 Resolution	
F1-02	Operation Selection at PG Open Circuit (PGo)	
F1-03	Operation Selection at Overspeed (oS)	
F1-04	Operation Selection at Deviation	
F1-05	Encoder 1 Rotation Direction Selection	
F1-06	PG 1 Pulse Monitor Output Division Ratio	
F1-08	Overspeed Detection Level	
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In the event that the end user of this product is to be the military and said product is to be employed in any weapons systems or the manufacture thereof, the export will fall under the relevant regulations as stipulated in the Foreign Exchange and Foreign Trade Regulations. Therefore, be sure to follow all procedures and submit all relevant documentation according to any and all rules, regulations and laws that may apply.

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