YASKAWA

HV600 DRIVE

MAINTENANCE & TROUBLESHOOTING MANUAL

AC DRIVE FOR HVAC FAN AND PUMP APPLICATIONS

CATALOG CODE:

HV60Uxxxxxxx

CAPACITIES:

208 V class: 2.2 to 75 kW (3 to 100 HP)
480 V class: 2.2 to 186 kW (3 to 250 HP)

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Preface and General Precautions

This chapter gives information about important safety precautions for the use of this product. Failure to obey these precautions can cause serious injury or death, or damage to the product or related devices and systems. Yaskawa must not be held responsible for any injury or equipment damage as a result of the failure to observe these precautions and instructions.

i.1 Receiving

These instructions contain the information necessary to use the product correctly. Read and understand the safety information and precautions before you start to use the product.

◆ Glossary

Phrase	Definition
Drive	YASKAWA AC Drive HV600
EDM	External Device Monitor
EZOLV	EZ Open Loop Vector Control
IPM motor	Interior Permanent Magnet motors
MFAI	Multi-Function Analog Input
MFAO	Multi-Function Analog Output
MFDI	Multi-Function Digital Input
MFDO	Multi-Function Digital Output
OLV/PM	Open Loop Vector Control for Permanent Magnet Motors
PM motor	Permanent Magnet Synchronous motor (generic name for IPM motors and SPM motors)
SIL	Safety Integrity Level
SPM motor	Surface Permanent Magnet motors
V/f	V/f Control

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i.2 Using the Product Safely

◆ Explanation of Signal Words

⚠WARNING

Read and understand this manual before you install, operate, or do maintenance on the drive. Install the drive as specified by this manual and local codes.

The symbols in this section identify safety messages in this manual. If you do not obey these safety messages, the hazards can cause serious injury, death, or damage to the products and related equipment and systems.

These identifier words categorize and emphasize important safety precautions in these instructions.

⚠DANGER

This signal word identifies a hazard that will cause serious injury or death if you do not prevent it.

⚠WARNING

This signal word identifies a hazard that can cause death or serious injuries if you do not prevent it.

⚠CAUTION

Identifies a hazardous situation, which, if not avoided, can cause minor or moderate injury.

NOTICE

This signal word identifies a property damage message that is not related to personal injury.

◆ General Safety

General Precautions

- Some figures in the instructions include options and drives without covers or safety shields to more clearly show the inside of the drive. Replace covers and shields before operation. Use options and drives only as specified by the instructions.
- The figures in this manual are examples only. All figures do not apply to all products included in this manual.
- Yaskawa can change the products, specifications, and content of the instructions without notice to make the product and/or the instructions better.
- If you damage or lose these instructions, contact a Yaskawa representative or the nearest Yaskawa sales office on the rear cover of the manual, and tell them the document number on the front cover to order new copies.

⚠DANGER

Do not ignore the safety messages in this manual.

If you ignore the safety messages in this manual, it will cause serious injury or death. The manufacturer is not responsible for injuries or damage to equipment.

Electrical Shock Hazard

Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, remove the covers before measuring for dangerous voltages to make sure that the drive is safe.

If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.

⚠WARNING

Crush Hazard

Test the system to make sure that the drive operates safely after you wire the drive and set parameters.

If you do not test the system, it can cause damage to equipment or serious injury or death.

Sudden Movement Hazard

Before you do a test run, make sure that the setting values for virtual input and output function parameters are correct. Virtual input and output functions can have different default settings and operation than wired input and output functions.

Incorrect function settings can cause serious injury or death.

Remove all personnel and objects from the area around the drive, motor, and machine and attach covers, couplings, shaft keys, and machine loads before you energize the drive.

If personnel are too close or if there are missing parts, it can cause serious injury or death.

Examine the I/O signals and internal sequence with the engineer who made the DriveWorksEZ program before you operate the drive.

If you do not know how the drive will operate, it can cause serious injury or death. When you use DriveWorksEZ to make custom programming, the drive I/O terminal functions change from factory settings and the drive will not operate as written in this manual.

Electrical Shock Hazard

Do not modify the drive body or drive circuitry.

Modifications to drive body and circuitry can cause serious injury or death, will cause damage to the drive, and will void the warranty. Yaskawa is not responsible for modifications of the product made by the user.

Only let approved personnel install, wire, maintain, examine, replace parts, and repair the drive.

If personnel are not approved, it can cause serious injury or death.

Do not remove covers or touch circuit boards while the drive is energized.

If you touch the internal components of an energized drive, it can cause serious injury or death.

After the drive blows a fuse or trips a GFCI, do not immediately energize the drive or operate peripheral devices. Wait for the time specified on the warning label at a minimum and make sure that all indicators are OFF. Then check the wiring and peripheral device ratings to find the cause of the problem. If you do not know the cause of the problem, contact Yaskawa before you energize the drive or peripheral devices.

If you do not fix the problem before you operate the drive or peripheral devices, it can cause serious injury or death.

Damage to Equipment

Do not apply incorrect voltage to the main circuit of the drive. Operate the drive in the specified range of the input voltage on the drive nameplate.

Voltages that are higher than the permitted nameplate tolerance can cause damage to the drive.

Fire Hazard

Install sufficient branch circuit short circuit protection as specified by applicable codes and this manual. The drive is suitable for circuits that supply not more than 100,000 RMS symmetrical amperes, 240 Vac maximum (208 V Class), 480 Vac maximum (480 V Class).

Incorrect branch circuit short circuit protection can cause serious injury or death.

⚠CAUTION

Crush Hazard

Tighten terminal cover screws and hold the case safely when you move the drive.

If the drive or covers fall, it can cause moderate injury.

NOTICE

Use an inverter-duty motor or vector-duty motor with reinforced insulation and windings applicable for use with an AC drive.

If the motor does not have the correct insulation, it can cause a short circuit or ground fault from insulation deterioration.

Damage to Equipment

When you touch the drive and circuit boards, make sure that you observe correct electrostatic discharge (ESD) procedures.

If you do not follow procedures, it can cause ESD damage to the drive circuitry.

Do not do a withstand voltage test or use a megohmmeter or megger insulation tester on the drive.

These tests can cause damage to the drive.

Do not operate a drive or connected equipment that has damaged or missing parts.

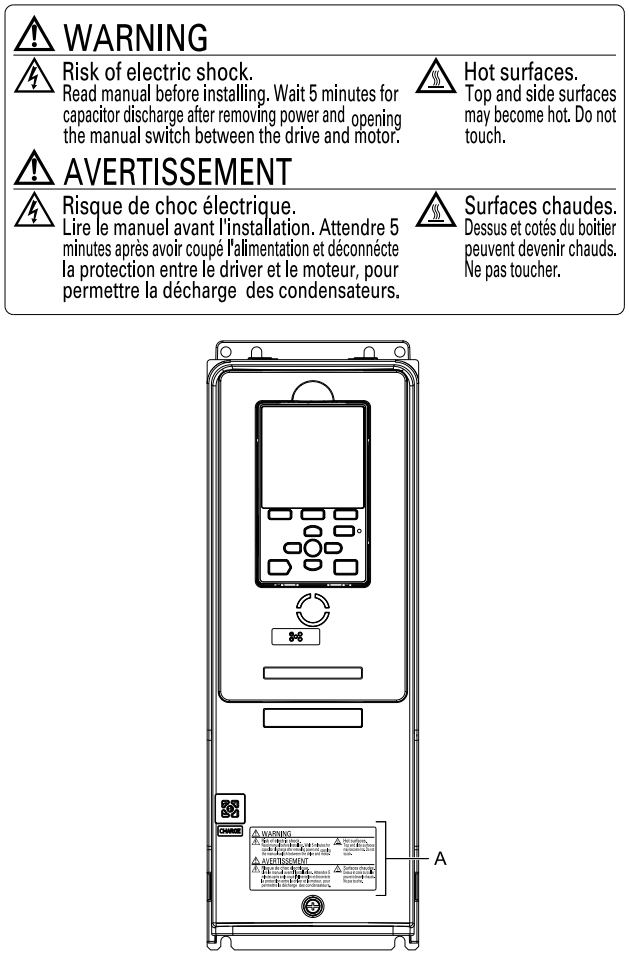
You can cause damage to the drive and connected equipment.

Do not use steam or other disinfectants to fumigate wood for packaging the drive. Use alternative methods, for example heat treatment, before you package the components.

Gas from wood packaging fumigated with halogen disinfectants, for example fluorine, chlorine, bromine, iodine or DOP gas (phthalic acid ester), can cause damage to the drive.

◆ Warning Label Content and Location

The drive warning label is in the location shown in Figure i.1. Use the drive as specified by this information.



A - Warning label

Figure i.1 Warning Label Content and Location

◆ Cybersecurity

This product is designed to connect and communicate information and data through a network interface. It is the sole responsibility of the customer to provide and continuously guarantee a secure connection between the product and the customer's network or if applicable, any other network. The customer must establish and maintain the appropriate measures (such as, but not limited to, the installation of firewalls, the application of authentication measures, the encryption of data, the installation of antivirus programs, etc.) to protect the product, the network, its system and the interface against all types of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. Yaskawa and its affiliates are not responsible for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

i.3 Warranty Information

◆ Exclusion of Liability

- This product is not designed and manufactured for use in life-support machines or systems.
- Contact a Yaskawa representative or your Yaskawa sales representative if you are considering the application of this product for special purposes, such as machines or systems used for passenger cars, medicine, airplanes and aerospace, nuclear power, electric power, or undersea relaying.

⚠WARNING

Injury to Personnel

When you use this product in applications where its failure could cause the loss of human life, a serious accident, or physical injury, you must install applicable safety devices.

If you do not correctly install safety devices, it can cause serious injury or death.

1

Periodic Inspection and Maintenance

This chapter gives information about how to examine and maintain drives in use, how to replace cooling fans and other parts, and how to store drives.

1.1 Section Safety

⚠DANGER

Electrical Shock Hazard

Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, remove the covers before measuring for dangerous voltages to make sure that the drive is safe.

If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.

Disconnect all power to the drive and wait for the time specified on the warning label before you remove covers. Check the drive for dangerous voltages before servicing or repair work.

If you do work on the drive when it is energized and there is no cover over the electronic circuits, it will cause serious injury or death from electrical shock. The drive has internal capacitors that stay charged after you de-energize the drive.

⚠WARNING

Electrical Shock Hazard

The motor will run after you de-energize the drive. PM motors can generate induced voltage to the terminal of the motor after you de-energize the drive.

If you touch a motor that is moving or energized, it can cause serious injury or death.

Do not operate the drive when covers are missing. Replace covers and shields before you operate the drive. Use the drive only as specified by the instructions.

Some figures in this section include drives without covers or safety shields to more clearly show the inside of the drive. If covers or safety shields are missing from the drive, it can cause serious injury or death.

Always ground the motor-side grounding terminal.

If you do not ground the equipment correctly, it can cause serious injury or death if you touch the motor case.

Only let approved personnel install, wire, maintain, examine, replace parts, and repair the drive.

If personnel are not approved, it can cause serious injury or death.

Do not wear loose clothing or jewelry when you do work on the drive. Tighten loose clothing and remove all metal objects, for example watches or rings.

Loose clothing can catch on the drive and jewelry can conduct electricity and cause serious injury or death.

Fire Hazard

Tighten all terminal screws to the correct tightening torque.

Connections that are too loose or too tight can cause incorrect operation and damage to the drive. Incorrect connections can also cause death or serious injury from fire.

Damage to Equipment

Do not apply incorrect voltage to the main circuit of the drive. Operate the drive in the specified range of the input voltage on the drive nameplate.

Voltages that are higher than the permitted nameplate tolerance can cause damage to the drive.

Fire Hazard

Do not put flammable or combustible materials on top of the drive and do not install the drive near flammable or combustible materials. Attach the drive to metal or other noncombustible material.

Flammable and combustible materials can start a fire and cause serious injury or death.

⚠WARNING

Electrical Shock Hazard

Do not modify the drive body or drive circuitry.

Modifications to drive body and circuitry can cause serious injury or death, will cause damage to the drive, and will void the warranty. Yaskawa is not responsible for modifications of the product made by the user.

Sudden Movement Hazard

Make sure that you align the phase order for the drive and motor when you connect the motor to drive output terminals U/T1, V/T2, and W/T3.

If the phase order is incorrect, it can cause the motor to run in reverse. If the motor accidentally runs in reverse, it can cause serious injury or death.

⚠CAUTION

Burn Hazard

Do not touch a hot drive heatsink. De-energize the drive, wait for a minimum of 15 minutes, then make sure that the heatsink is cool before you replace the cooling fans.

If you touch a hot drive heatsink, it can burn you.

NOTICE

Damage to Equipment

When you touch the drive and circuit boards, make sure that you observe correct electrostatic discharge (ESD) procedures.

If you do not follow procedures, it can cause ESD damage to the drive circuitry.

Use the instructions in this manual to replace the cooling fans. When you do maintenance on the fans, replace all the fans to increase product life.

If you install the fans incorrectly, it can cause damage to the drive.

Make sure that all connections are correct after you install the drive and connect peripheral devices.

Incorrect connections can cause damage to the drive.

Do not energize and de-energize the drive more frequently than one time each 30 minutes.

If you frequently energize and de-energize the drive, it can cause drive failure.

Do not operate a drive or connected equipment that has damaged or missing parts.

You can cause damage to the drive and connected equipment.

Note:

Do not use unshielded cable for control wiring. Use shielded, twisted-pair wires and ground the shield to the ground terminal of the drive. Incorrect wiring can cause electrical interference and unsatisfactory system performance.

1.2 Inspection

Power electronics have limited life and can show changes in performance and deterioration of performance after years of use in usual conditions. To help prevent these problems, it is important to do preventive maintenance and regular inspection, and replace parts on the drive.

Drives contain different types of power electronics, for example power transistors, semiconductors, capacitors, resistors, fans, and relays. The electronics in the drive are necessary for correct motor control.

Follow the inspection lists in this chapter as a part of a regular maintenance program.

Note:

Examine the drive one time each year at a minimum.

The operating conditions, environmental conditions, and use conditions will have an effect on the examination frequency for connected equipment.

Examine the drive more frequently if you use the drive in bad conditions or in these conditions:

- High ambient temperatures
- Frequent starting and stopping
- Changes in the AC power supply or load
- Too much vibration or shock loading
- Dust, metal dust, salt, sulfuric acid, or chlorine atmospheres
- Unsatisfactory storage conditions.

◆ Recommended Daily Inspection

Table 1.1 gives information about the recommended daily inspection for Yaskawa drives. Examine the items in Table 1.1 each day to make sure that the components do not become unserviceable or fail. Make a copy of this checklist and put a check mark in the “Checked” column after each inspection.

Table 1.1 Daily Inspection Checklist

Inspection Area	Inspection Points	Corrective Action	Checked
Motor	Examine for unusual oscillation or noise coming from the motor.	• Check the load coupling. • Measure motor vibration. • Tighten all loose components.	
Cooling System	Examine for unusual heat from the drive or motor and visible discoloration.	• Check for a load that is too heavy. • Tighten loose screws. • Check for a dirty heatsink or motor. • Measure the ambient temperature.	
	Examine the cooling fans, circulation fans, and circuit board cooling fans.	• Check for a clogged or dirty fan. • Use the performance life monitor to check for correct fan operation.	
Surrounding Environment	Make sure that the installation environment is applicable.	Remove the source of contamination or correct unsatisfactory environment.	
Load	Make sure that the drive output current is not more than the motor or drive rating for an extended period of time.	• Check for a load that is too heavy. • Check the correct motor parameter settings.	
Power Supply Voltage	Examine main power supply and control voltages.	• Correct the voltage or power supply to agree with nameplate specifications. • Verify all main circuit phases.	

◆ Recommended Periodic Inspection

Table 1.2 to Table 1.6 give information about the recommended periodic inspections for Yaskawa drives. Examine the drive one time each year at a minimum. The operating conditions, environmental conditions, and use conditions will have an effect on the examination frequency for connected equipment. You must use your experience with the application to select the correct inspection frequency for each drive installation. Periodic inspections will help to prevent performance deterioration and product failure. Make a copy of this checklist and put a check mark in the “Checked” column after each inspection.

DANGER! *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, remove the covers before measuring for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

Table 1.2 Main Circuit Periodic Inspection Checklist

Inspection Area	Inspection Points	Corrective Action	Checked
General	• Examine equipment for discoloration from too much heat or deterioration. • Examine for damaged parts.	• Replace damaged components as necessary. • The drive does not have many serviceable parts and it could be necessary to replace the drive.	
	Examine for dirt, unwanted particles, or dust on components.	• Examine enclosure door seal. • Use a vacuum cleaner to remove unwanted particles and dust without touching the components. • If you cannot remove unwanted particles and dust with a vacuum cleaner, replace the components.	
Conductors and Wiring	• Examine wiring and connections for discoloration or damage. Examine wiring and connections for discoloration from too much heat. • Examine wire insulation and shielding for discoloration and wear.	Repair or replace damaged wiring.	
Terminal Block	Examine terminals for stripped, damaged, or loose connections.	• Tighten loose screws. • Replace damaged screws or terminals.	
Electromagnetic Contactors and Relays	• Examine contactors and relays for too much noise during operation. • Examine coils for signs of too much heat, such as melted or broken insulation.	• Check coil voltage for overvoltage or undervoltage conditions. • Replace broken relays, contactors, or circuit boards that you can remove.	
Electrolytic capacitor	• Examine for leaks, discoloration, or cracks. • Examine if the cap has come off, if there is swelling, or if there are leaks from broken sides.	The drive does not have many serviceable parts and it could be necessary to replace the drive.	
Diodes, IGBT (Power Transistor)	Examine for dust or other unwanted material collected on the surface.	Use a vacuum cleaner to remove unwanted particles and dust without touching the components.	

Table 1.3 Motor Periodic Inspection Checklist

Inspection Area	Inspection Points	Corrective Action	Checked
Operation Check	Check for increased vibration or unusual noise.	Stop the motor and contact approved maintenance personnel as necessary.	

Table 1.4 Control Circuit Periodic Inspection Checklist

Inspection Area	Inspection Points	Corrective Action	Checked
General	• Examine terminals for stripped, damaged, or loose connections. • Make sure that all terminals have been correctly tightened.	• Tighten loose screws. • Replace damaged screws or terminals. • If terminals are integral to a circuit board, it could be necessary to replace the control board or the drive.	
Circuit Boards	• Check for odor, discoloration, or rust. • Make sure that all connections are correctly fastened. • Make sure that the surface of the circuit board does not have dust or oil mist.	• Tighten loose connections. • Use a vacuum cleaner to remove unwanted particles and dust without touching the components. • If you cannot remove unwanted particles and dust with a vacuum cleaner, replace the components. • Do not use solvents to clean the board. • The drive does not have many serviceable parts and it could be necessary to replace the drive.	

Table 1.5 Cooling System Periodic Inspection Checklist

Inspection Area	Inspection Points	Corrective Action	Checked
Cooling fan	• Check for unusual oscillation or unusual noise. • Check for damaged or missing fan blades.	Clean or replace the fans as necessary.	
Heatsink	• Examine for dust or other unwanted material collected on the surface. • Examine for dirt.	Use a vacuum cleaner to remove unwanted particles and dust without touching the components.	
Air Duct	Examine air intake, exhaust openings and make sure that there are no unwanted materials on the surface.	Clear blockages and clean air duct as necessary.	

Table 1.6 Keypad Periodic Inspection Checklist

Inspection Area	Inspection Points	Corrective Action	Checked
General	• Make sure that the keypad shows the data correctly. • Examine for dust or other unwanted material that collected on components in the area. • Examine if the clock battery is expired.	• If you have problems with the display or the keys, contact Yaskawa or your nearest sales representative. • Clean the keypad. • Replace the battery.	

1.3 Maintenance

The drive Maintenance Monitors keep track of component wear and tell the user when the end of the estimated performance life is approaching. The Maintenance Monitors prevent the need to shut down the full system for unexpected problems. Users can set alarm notifications for the maintenance periods for these drive components:

- Cooling fan
- Electrolytic capacitor
- Soft charge bypass relay
- IGBT

Contact Yaskawa or your nearest sales representative for more information about part replacement.

◆ Replaceable Parts

You can replace these parts of the drive:

- Control circuit terminal board
- Cooling fan, circulation fan
- Keypad

Note:

Make sure that you use a keypad with FLASH number 1004 or later. Keypads with FLASH numbers 1003 and earlier will not show characters correctly.

If there is a failure in the main circuit, replace the drive.

If the drive is in the warranty period, contact Yaskawa or your nearest sales representative before you replace parts. Yaskawa reserves the right to replace or repair the drive as specified by the Yaskawa warranty policy.

DANGER! *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, remove the covers before measuring for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

◆ Part Replacement Guidelines

Table 1.7 shows the standard replacement period for replacement parts. When you replace these parts, make sure that you use Yaskawa replacement parts for the applicable model and design revision number of your drive.

Table 1.7 Standard Replacement Period

Parts	Standard Replacement Period
Cooling fan	10 years
Electrolytic capacitor *1	10 years

*1 If there is damage to parts that you cannot repair or replace, replace the drive.

Note:

The performance life estimate uses these operating conditions. Yaskawa provides these conditions so you can replace parts to maintain performance. Unsatisfactory conditions or heavy use will make it necessary for you to replace some parts more frequently than other parts.
Operating conditions for performance life estimate:

- Yearly average
  - –IP20/Open Type enclosure: 40 °C (104 °F)
  - –IP20/UL Type 1 and External Heatsink Installation of IP55/UL Type 12: 30 °C (86 °F)
- Load factor
  80% maximum
- Operation time
  24 hours a day

◆ Monitors that Show the Lifespan of Drive Components

The drive keypad shows percentage values for the replacement parts to help you know when you must replace those components. Use the monitors in Table 1.8 to see how close you are to the end of the useful life of a component.

When the monitor value is 100%, the component is at the end of its useful life and there is an increased risk of drive malfunction. Yaskawa recommends that you check the maintenance period regularly to make sure that you get the maximum performance life.

Table 1.8 Performance Life Monitors

Monitor No.	Parts	Description
U4-03	Cooling fan	Shows the total operation time of fans as 0 to 99999 hours. After this value is 99999, the drive automatically resets it to 0.
U4-04		Shows the total fan operation time as a percentage of the specified maintenance period.
U4-05	Electrolytic capacitor	Shows the total capacitor usage time as a percentage of the specified maintenance period.
U4-06	Soft charge bypass relay	Shows the number of times the drive is energized as a percentage of the performance life of the inrush circuit.
U4-07	IGBT	Shows the percentage of the maintenance period reached by the IGBTs.

◆ Alarm Outputs for Maintenance Monitors

You can use *H2-xx [Multi-Function Digital Out]* to send a message that tells you when a specified component is near the end of its performance life estimate. Set *H2-xx* to the applicable value for your component as shown in Table 1.9.

When the specified component is near the end of its performance life estimate, the MFDO terminals set for *H2-xx = 2F [Maintenance Notification]* will turn ON, and the keypad will show an alarm that identifies the component to replace.

Table 1.9 Maintenance Period Alarms

Display	Alarm Name	Cause	Possible Solutions	Digital Outputs (Setting Value in H2-xx)
LT-1	Cooling Fan Maintenance Time	The cooling fan is at 90% of its expected performance life.	Replace the cooling fan, then set *o4-03 = 0 [Fan Operation Time Setting = 0 h]* to reset the cooling fan operation time.	2F
LT-2	Capacitor Maintenance Time	The capacitors for the main circuit and control circuit are at 90% of expected performance life.	Replace the board or the drive. Contact Yaskawa or your nearest sales representative to replace the board.	
LT-3	SoftChargeBypassRelay MainteTime	The soft charge bypass relay is at 90% of its performance life estimate.	Replace the board or the drive. Contact Yaskawa or your nearest sales representative to replace the board.	
LT-4	IGBT Maintenance Time (50%)	The IGBT is at 50% of its expected performance life.	Check the load, carrier frequency, and output frequency.	
TrPC	IGBT Maintenance Time (90%)	The IGBT is at 90% of its expected performance life.	Replace the IGBT or the drive.	10

◆ Related Parameters

Replace the component, then set *o4-03, o4-05, o4-07, and o4-09 [Maintenance Setting] = 0* to reset the Maintenance Monitor. If you do not reset these parameters after you replace the parts, the Maintenance Monitor function will continue to count down the performance life from the value from the previous part. If you do not reset the Maintenance Monitor, the drive will not have the correct value of the performance life for the new part.

Note:

The maintenance period is different for different operating environments.

Table 1.10 Maintenance Setting Parameters

No.	Name	Function
o4-03	Fan Operation Time Setting	Sets the value from which to start the cumulative drive cooling fan operation time in 10-hour units. **Note:** When *o4-03 = 30* has been set, the drive will count the operation time for the cooling fan from 300 hours and *U4-03 [Cooling Fan Ope Time]* will show *300 h*.
o4-05	Capacitor Maintenance Setting	Sets the value from which to start the count for the main circuit capacitor maintenance period as a percentage.
o4-07	Softcharge Relay Maintenance Set	Sets as a percentage the value from which to start the count for the soft charge bypass relay maintenance time.
o4-09	IGBT Maintenance Setting	Sets the value from which to start the count for the IGBT maintenance period as a percentage.

1.4 Replace Cooling Fans and Circulation Fans

CAUTION! *Injury to Personnel. Some fan units are not easily accessible from a standing position. Make sure that you can safely and comfortably remove and replace the fan. If you try to remove a fan that you cannot easily access, the fan unit can fall and cause minor to moderate injury.*

NOTICE: *Use the instructions in this manual to replace the cooling fans. When you do maintenance on the fans, replace all the fans to increase product life. If you install the fans incorrectly, it can cause damage to the drive.*

◆ Cooling Fans and Circulation Fans by Drive Model

Table 1.11 Cooling Fans and Circulation Fans for IP20/UL Open Type and IP20/UL Type 1 Drives

Model	Cooling Fan	Circulation Fan	Replacement Procedure	Reference
4005, 4008	-	-	-	-
2011 - 2031 4011 - 4034	1	-	Procedure A	25
2046, 2059 4040 - 4052	1	-	Procedure B	30
4065	1	1		
2075 - 2114 4077 - 4124	2	-	Procedure C	36
2143 - 2273 4156 - 4240	2	-	Procedure D	41
4302	2	1	Procedure E	44

Table 1.12 Cooling Fans and Circulation Fans for IP55/UL Type 12 Drives

Model	Cooling Fan	Circulation Fan	Replacement Procedure	Reference
4005, 4008	-	-	-	-
2011, 2017 4011, 4014	1	-	Procedure A	25
2024, 2031 4021 - 4034	1	1		
2046, 2059 4040 - 4065	1	1	Procedure B	30
2075 - 2114 4077 - 4124	2	1	Procedure C	36

◆ Replace a Fan (Procedure A)

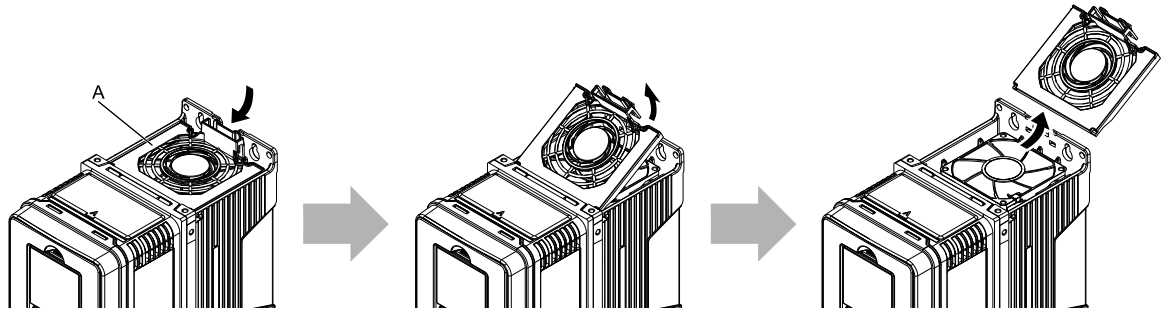
DANGER! *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, remove the covers before measuring for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

CAUTION! *Burn Hazard. Do not touch a hot drive heatsink. De-energize the drive, wait for a minimum of 15 minutes, then make sure that the heatsink is cool before you replace the cooling fans. If you touch a hot drive heatsink, it can burn you.*

NOTICE: *Use the instructions in this manual to replace the cooling fans. When you do maintenance on the fans, replace all the fans to increase product life. If you install the fans incorrectly, it can cause damage to the drive.*

■ Remove a Cooling Fan

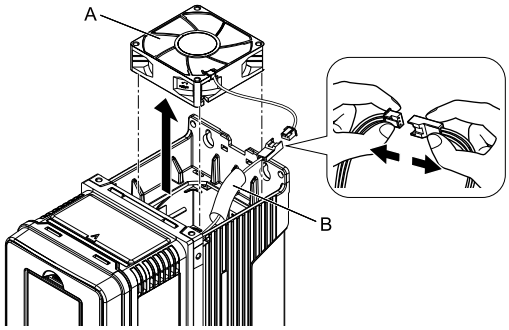
1. Push the tab on the back side of the fan finger guard and pull up to remove the fan finger guard from the drive.



A - Fan finger guard

Figure 1.1 Remove the Fan Finger Guard

2. Pull the cooling fan straight up from the drive. Remove the protective tube on the power supply connector and disconnect the connector to remove the fan from the drive.



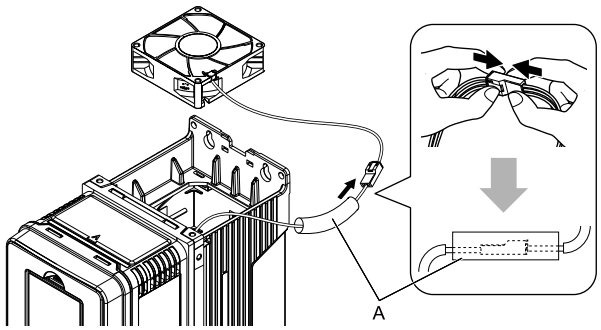
A - Cooling fan **B - Protective tube**

Figure 1.2 Remove the Cooling Fan

■ Install a Cooling Fan

Reverse the removal procedure to install a cooling fan.

1. Connect the drive and the fan connectors, and attach the protective tube.

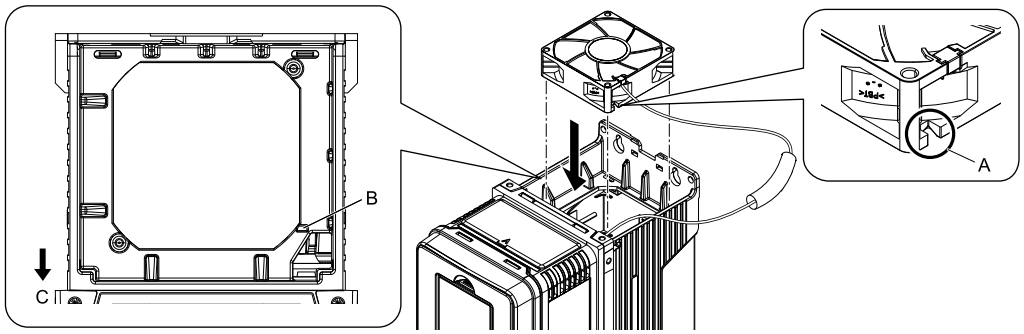


A - Protective tube

Figure 1.3 Connect the Power Supply Connector

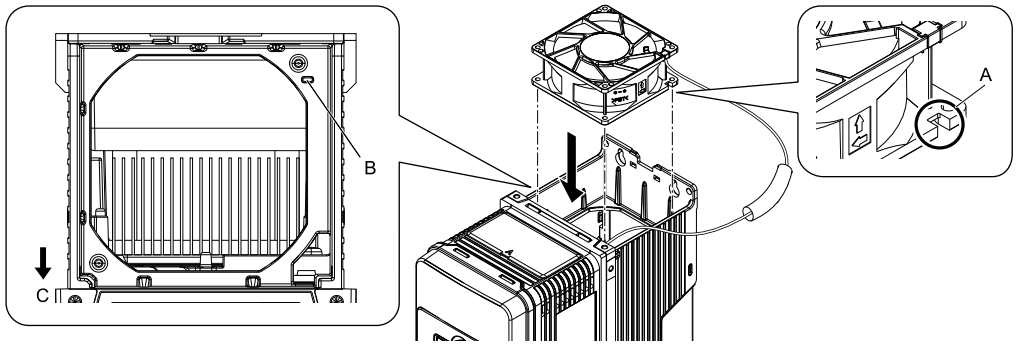
2. Align the notches on the fan with the pin on the drive and install the cooling fan in the drive.

Note:
The positions of notch on the fan and alignment pin on the drive are different for different drive models. Use these figures to make sure that you use correct positions for your drive.



A - Notch on fan
B - Alignment pin on drive
C - Front of drive

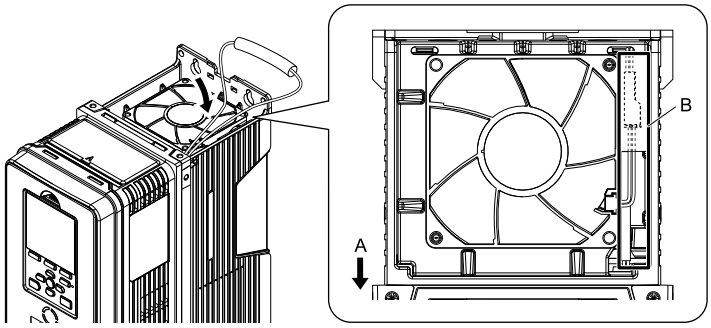
Figure 1.4 Install the Cooling Fan (Drive Models: 2011, 2017, 4011, 4014)



A - Notch on fan
B - Alignment pin on drive
C - Front of drive

Figure 1.5 Install the Cooling Fan (Drive Models: 2024, 2031, 4021 to 4034)

3. Put the cable and connector in the recess of the drive.

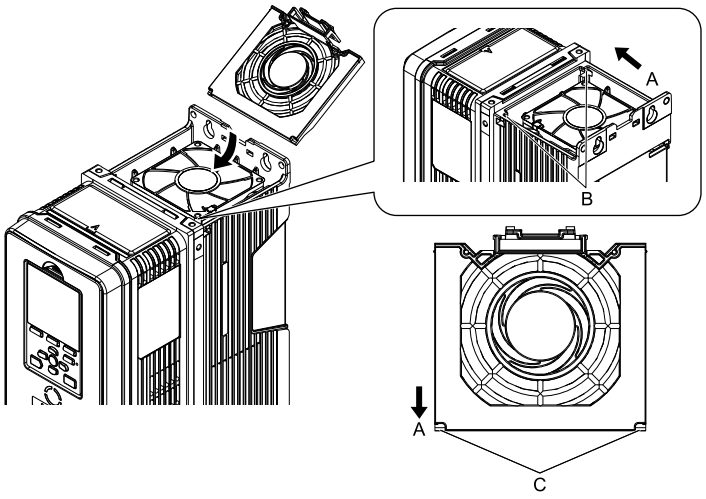


A - Front of drive
B - Recess for cable and connector *1

Figure 1.6 Put the Cable in the Drive Recess

*1 Make sure that the cable and connector are in the correct space.

4. Hold the fan finger guard at an angle and put the connector tabs on the fan finger guard into the holes on the drive.



A - Front of drive
B - Drive holes
C - Tabs

Figure 1.7 Install the Fan Finger Guard

5. Push the tab on the back side of the fan finger guard and click it into place on the drive.

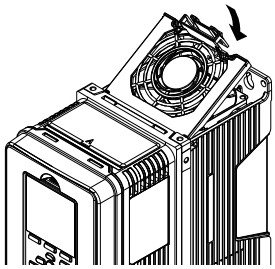


Figure 1.8 Install the Fan Finger Guard

6. Energize the drive and set *o4-03 = 0 [Fan Operation Time Setting = 0 h]* to reset the cooling fan operation time.

■ Remove a Circulation Fan

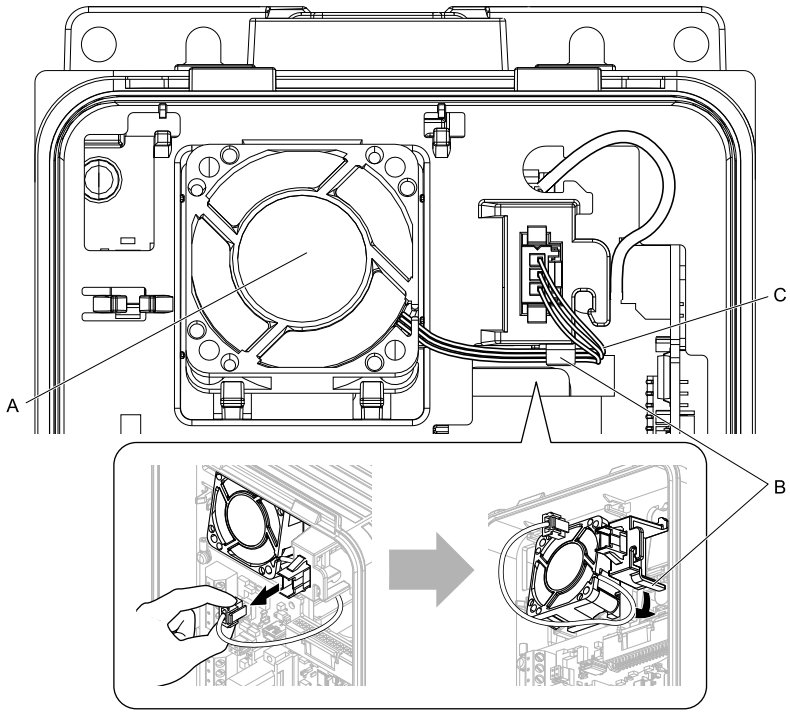
Note:

Use this procedure only when you use one of these drive models:
- 2024CVx, 2031CVx
- 4021CVx to 4034CVx

Remove the drive cover before you start this procedure.

CAUTION! *Crush Hazard. Loosen the cover screws. Do not fully remove them. If you fully remove the cover screws, the terminal cover can fall and cause moderate injury.*

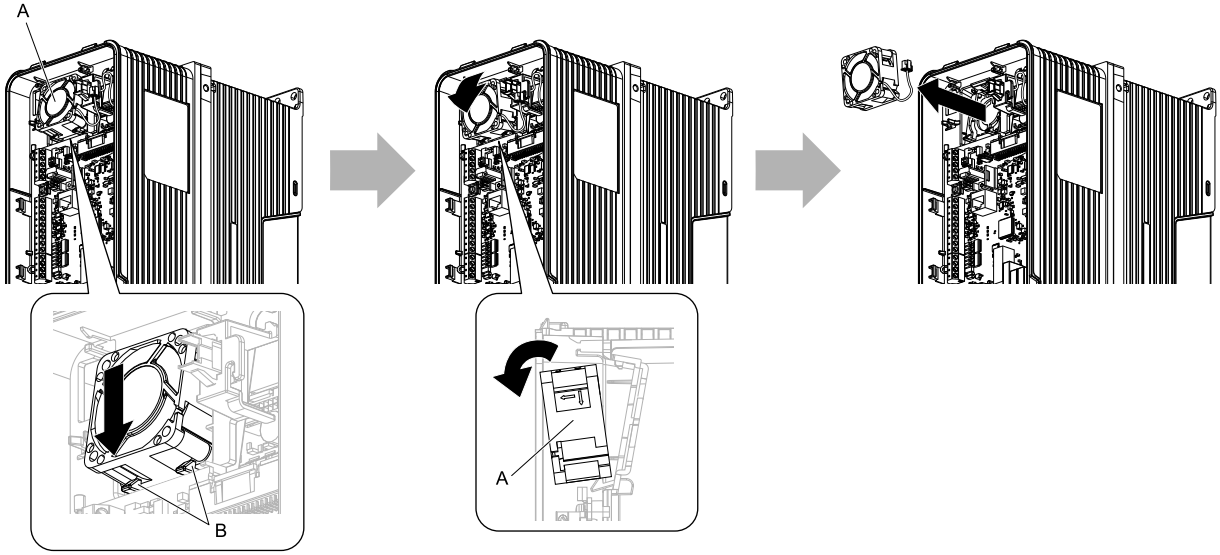
1. Disconnect the connector and remove the cable from the hook.



A - Circulation fan
C - Fan cable
B - Hook

Figure 1.9 Disconnect the Connector and Remove the Cable

2. Push the fan toward the bottom of the drive to push on the tabs at the bottom of the fan, then pull the fan forward to remove it from the drive.



A - Circulation fan
B - Tabs

Figure 1.10 Remove the Circulation Fan

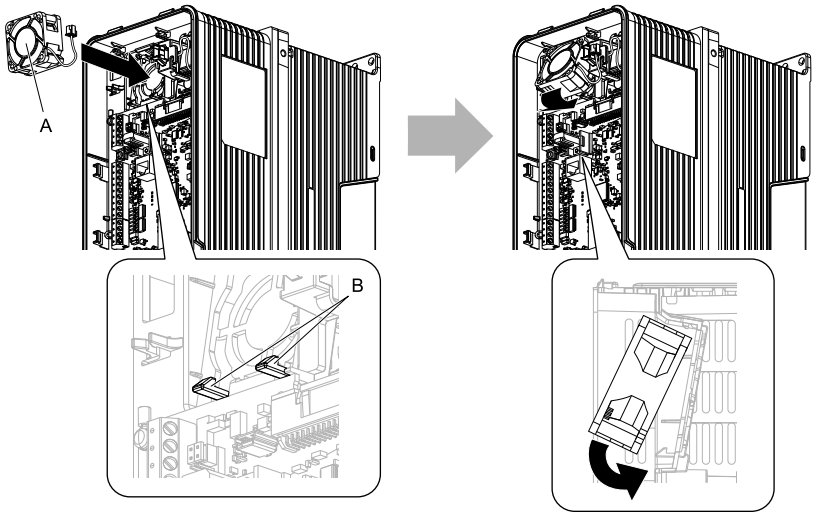
■ Install a Circulation Fan

Note:

Use this procedure only when you use one of these drive models:
- 2024CVx, 2031CVx
- 4021CVx to 4034CVx

Reverse the removal procedure to install a circulation fan.

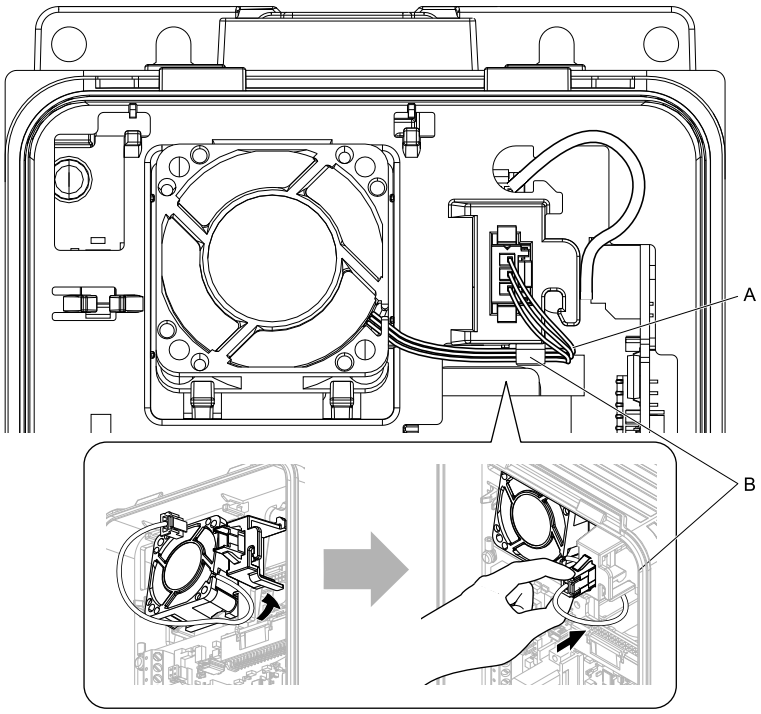
1. Put the side of the fan nearest to the top of the drive in first, and push it until the tabs click into position.



A - Circulation fan **B - Tabs**

Figure 1.11 Install the Circulation Fan

2. Put the cable back into its initial position and connect the power supply connector.



A - Fan cable **B - Hook**

Figure 1.12 Put the Cable Back into the Drive and Connect the Power Supply Connector

◆ Replace a Fan (Procedure B)

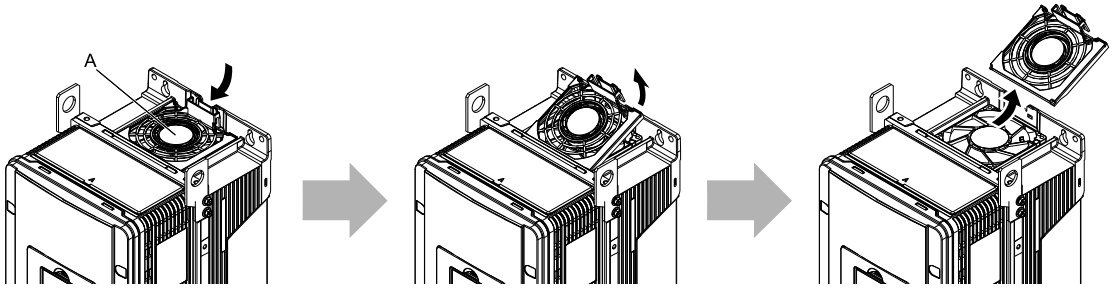
DANGER! *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, remove the covers before measuring for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

CAUTION! *Burn Hazard. Do not touch a hot drive heatsink. De-energize the drive, wait for a minimum of 15 minutes, then make sure that the heatsink is cool before you replace the cooling fans. If you touch a hot drive heatsink, it can burn you.*

NOTICE: *Use the instructions in this manual to replace the cooling fans. When you do maintenance on the fans, replace all the fans to increase product life. If you install the fans incorrectly, it can cause damage to the drive.*

■ Remove a Cooling Fan

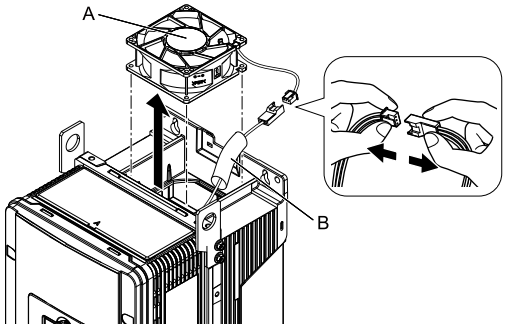
1. Push the tab on the back side of the fan finger guard and pull up to remove the fan finger guard from the drive.



A - Fan finger guard

Figure 1.13 Remove the Fan Finger Guard

2. Pull the cooling fan straight up from the drive. Remove the protective tube on the power supply connector and disconnect the connector to remove the fan from the drive.



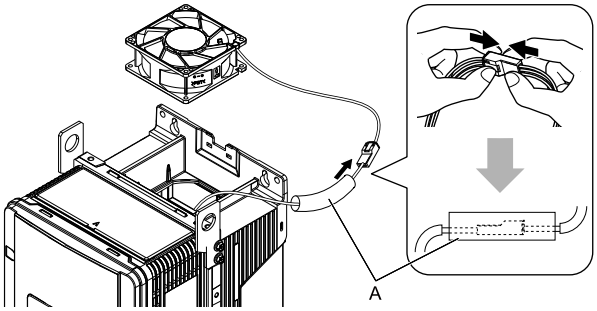
A - Cooling fan **B - Protective tube**

Figure 1.14 Remove the Cooling Fans

■ Install a Cooling Fan

Reverse the removal procedure to install a cooling fan.

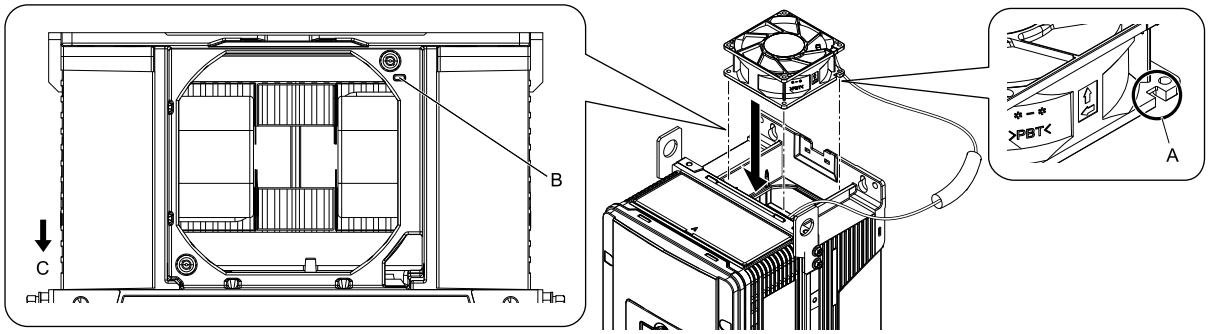
1. Connect the drive and the fan connectors, and attach the protective tube.



A - Protective tube

Figure 1.15 Connect the Power Supply Connector

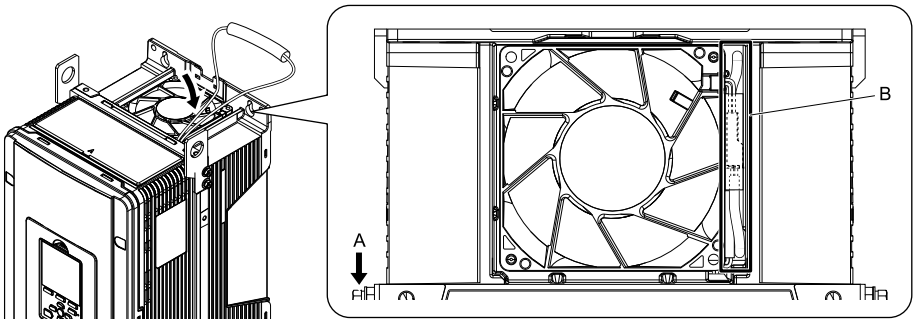
2. Align the notch on the fan with the pin on the drive and install the cooling fan in the drive.



A - Notch on fan
B - Alignment pin on drive
C - Front of drive

Figure 1.16 Install the Cooling Fan

3. Put the cable and connector in the recess of the drive.

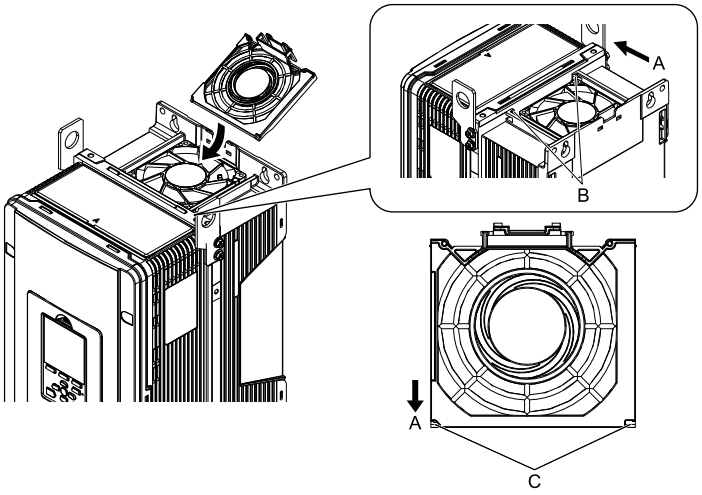


A - Front of drive
B - Recess for cable and connector *1

Figure 1.17 Put the Cable in the Drive Recess

*1 Make sure that the cable and connector are in the correct space.

4. Hold the fan finger guard at an angle and put the connector tabs on the fan finger guard into the holes on the drive.



A - Front of drive
B - Drive holes
C - Tabs

Figure 1.18 Install the Fan Finger Guard

5. Push the tab on the back side of the fan finger guard and click it into place on the drive.

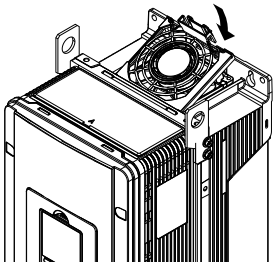


Figure 1.19 Install the Fan Finger Guard

6. Energize the drive and set *o4-03 = 0 [Fan Operation Time Setting = 0 h]* to reset the cooling fan operation time.

■ Remove a Circulation Fan

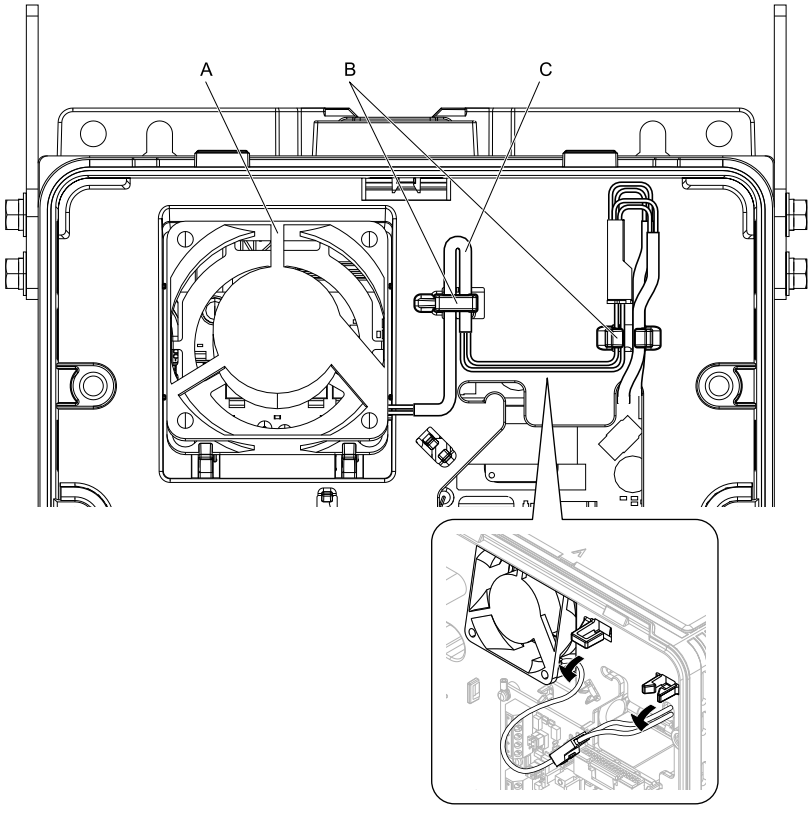
Note:

Use this procedure only when you use one of these drive models:
- 2046CVx, 2059CVx
- 4065CFx, 4040CVx to 4065CVx

Remove the drive cover before you start this procedure.

CAUTION! *Crush Hazard. Loosen the cover screws. Do not fully remove them. If you fully remove the cover screws, the terminal cover can fall and cause moderate injury.*

1. Remove the cable from the hooks.



A - Circulation fan
B - Hooks
C - Fan cable

Figure 1.20 Remove the Cable

2. Disconnect the power supply connector.

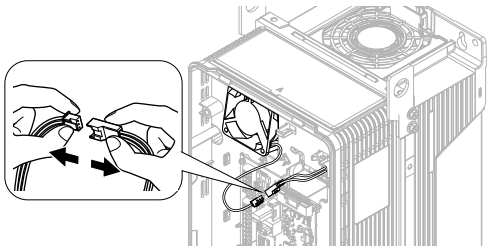
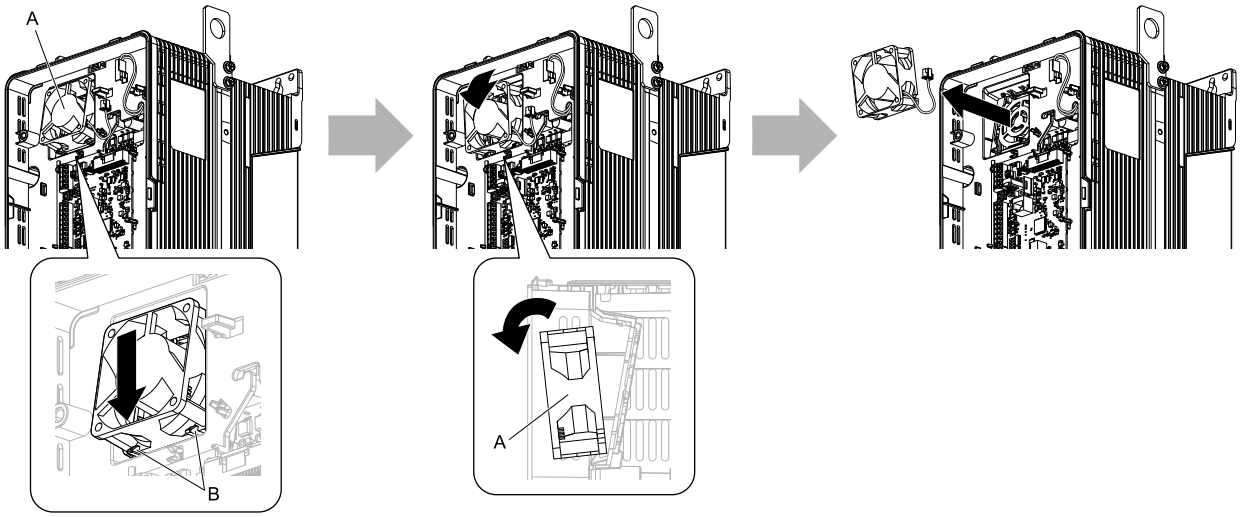


Figure 1.21 Disconnect the Power Supply Connector

3. Push the fan toward the bottom of the drive to push on the tabs at the bottom of the fan, then pull the fan forward to remove it from the drive.



A - Circulation fan **B - Tabs**

Figure 1.22 Remove the Circulation Fan

■ Install a Circulation Fan

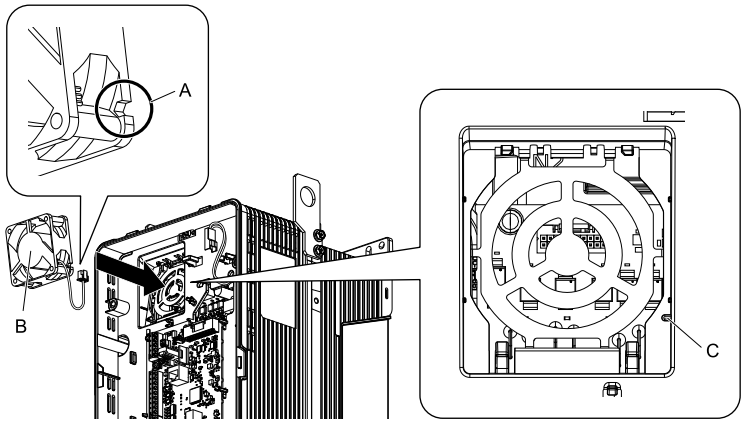
Note:

Use this procedure only when you use one of these drive models:

- 2046CVx, 2059CVx
- 4065CFx, 4040CVx to 4065CVx

Reverse the removal procedure to install a circulation fan.

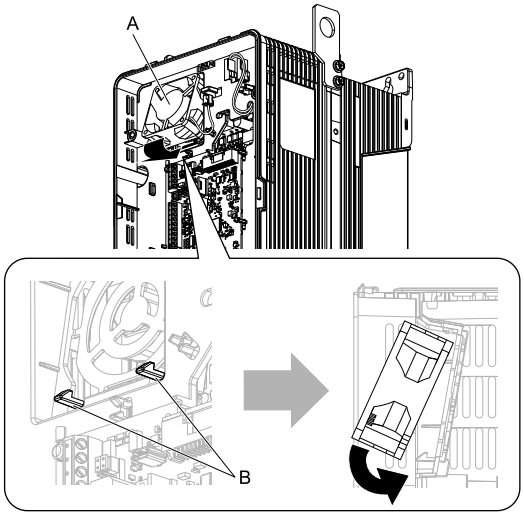
1. Align the notch on the fan with the pin on the drive and install the fan in the drive.



A - Notch on fan
B - Circulation fan
C - Alignment pin on drive

Figure 1.23 Install the Circulation Fan

2. Put the side of the fan nearest to the top of the drive in first, and push it until the tabs click into position.



A - Circulation fan
B - Tabs

Figure 1.24 Install the Circulation Fan

3. Connect the power supply connector.

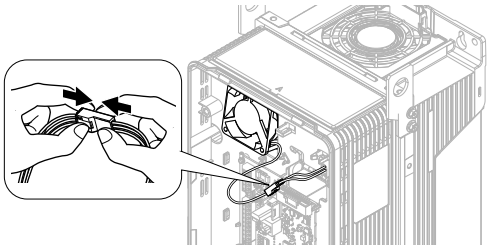
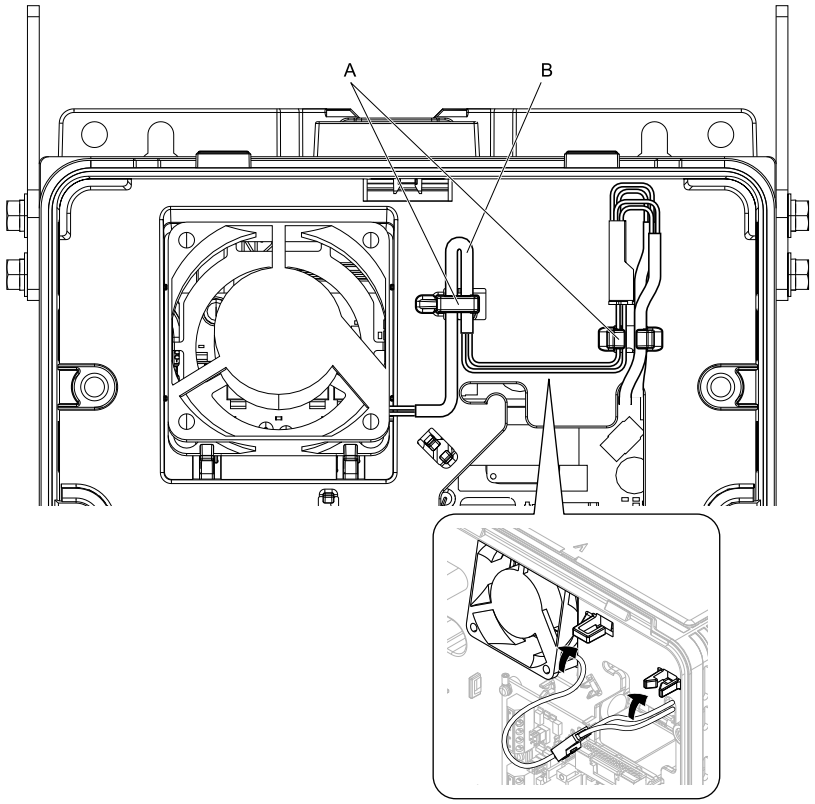


Figure 1.25 Connect the Power Supply Connector

4. Put the cables and connector back into their initial positions.



A - Hooks **B - Fan cable**

Figure 1.26 Put the Cables Back into the Drive

◆ Replace a Fan (Procedure C)

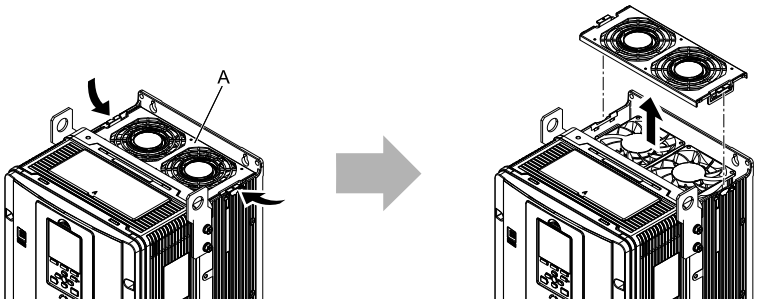
DANGER! *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, remove the covers before measuring for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

CAUTION! *Burn Hazard. Do not touch a hot drive heatsink. De-energize the drive, wait for a minimum of 15 minutes, then make sure that the heatsink is cool before you replace the cooling fans. If you touch a hot drive heatsink, it can burn you.*

NOTICE: *Use the instructions in this manual to replace the cooling fans. When you do maintenance on the fans, replace all the fans to increase product life. If you install the fans incorrectly, it can cause damage to the drive.*

■ Remove the Cooling Fans

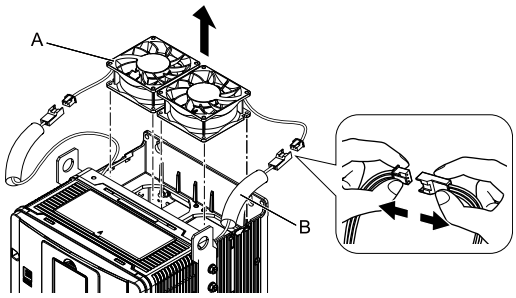
1. Push the tabs on the left and right sides of the fan finger guard and pull up to remove the fan finger guard from the drive.



A - Fan finger guard

Figure 1.27 Remove the Fan Finger Guard

2. Pull the cooling fans straight up from the drive. Remove the protective tubes on the power supply connectors and disconnect the connectors to remove the fans from the drive.



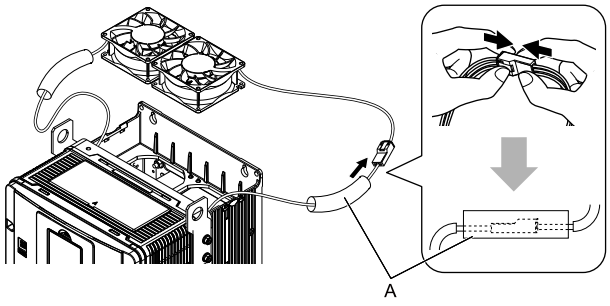
A - Cooling fan **B - Protective tube**

Figure 1.28 Remove the Cooling Fans

■ Install the Cooling Fans

Reverse the removal procedure to install the cooling fans.

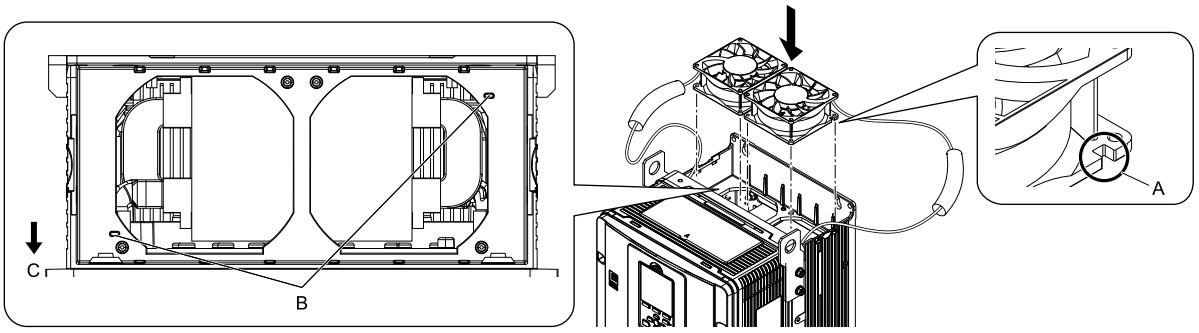
1. Connect the drive and the fan connectors, and attach the protective tubes.



A - Protective tube

Figure 1.29 Connect the Power Supply Connectors

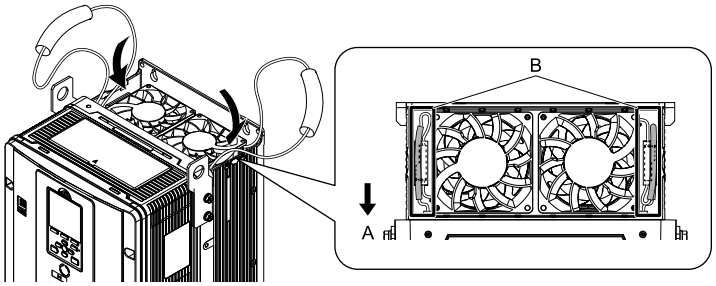
2. Align the notches on the fan with the pins on the drive and install the cooling fans in the drive.



A - Notch on fan
B - Alignment pins on drive
C - Front of drive

Figure 1.30 Install the Cooling Fans

3. Put the cables and connectors in the recess of the drive.



A - Front of drive
B - Recess for cable and connector *1

Figure 1.31 Put the Cables and Connectors in the Drive Recess

*1 Make sure that the cable and connector are in the correct space.

4. Install the fan finger guard straight until the tabs click into place.

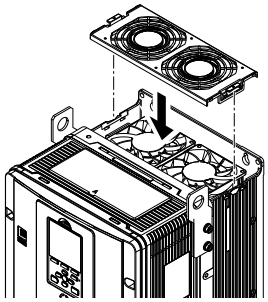


Figure 1.32 Install the Fan Finger Guard

5. Energize the drive and set *o4-03 = 0 [Fan Operation Time Setting = 0 h]* to reset the cooling fan operation time.

■ Remove a Circulation Fan

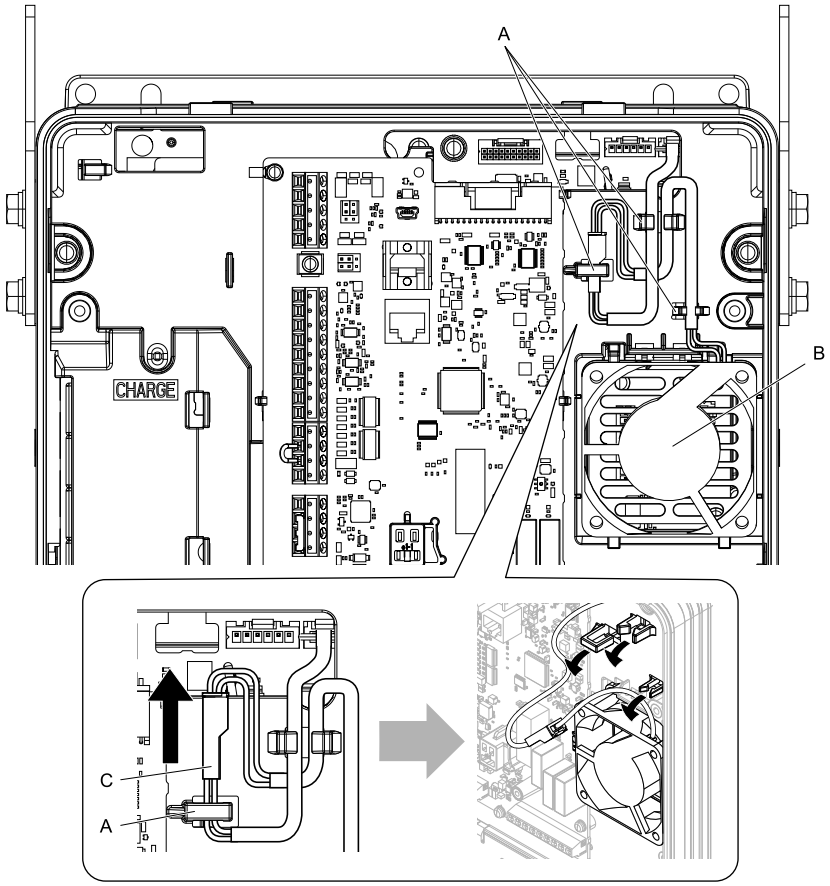
Note:

Use this procedure only when you use one of these drive models:
- 2075CVx to 2114CVx
- 4077CVx to 4124CVx

Remove the drive cover before you start this procedure.

CAUTION! *Crush Hazard. Loosen the cover screws. Do not fully remove them. If you fully remove the cover screws, the terminal cover can fall and cause moderate injury.*

1. Pull the connector toward the top of the drive to remove from the hook then remove the cables from the hooks.



A - Hooks
B - Circulation fan
C - Power supply connector

Figure 1.33 Remove the Cables

2. Disconnect the power supply connector.

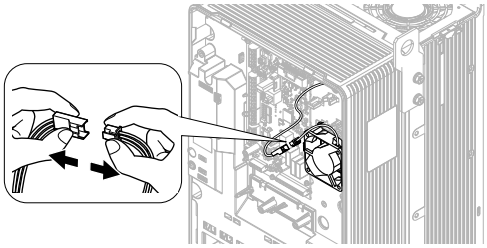
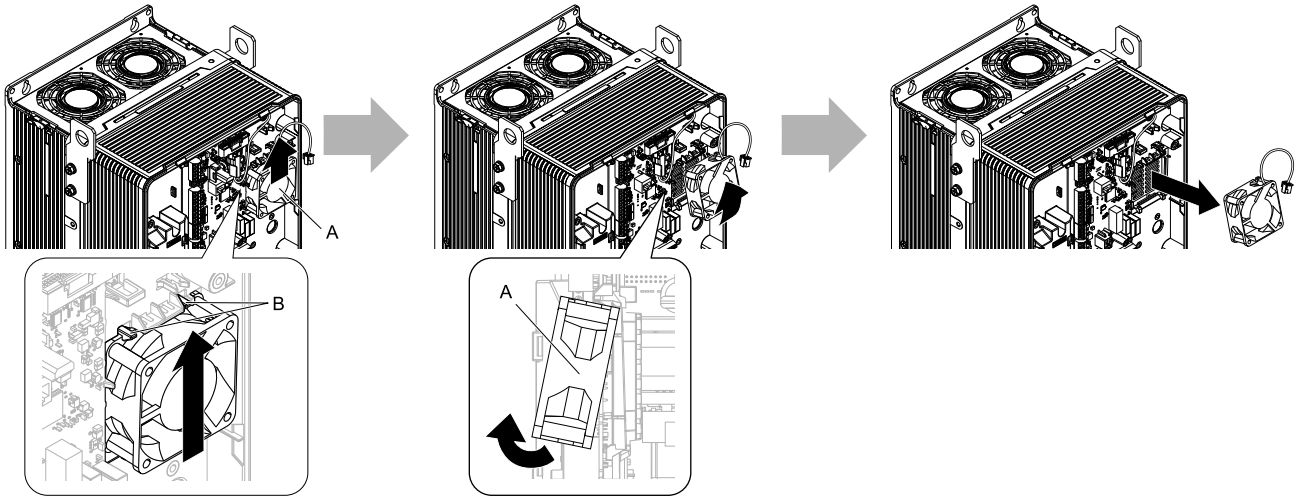


Figure 1.34 Disconnect the Connector

3. Push the fan toward the top of the drive to push on the tabs at the top of the fan, then pull the bottom of the fan forward to remove it from the drive.



A - Circulation fan **B - Tabs**

Figure 1.35 Remove the Circulation Fan

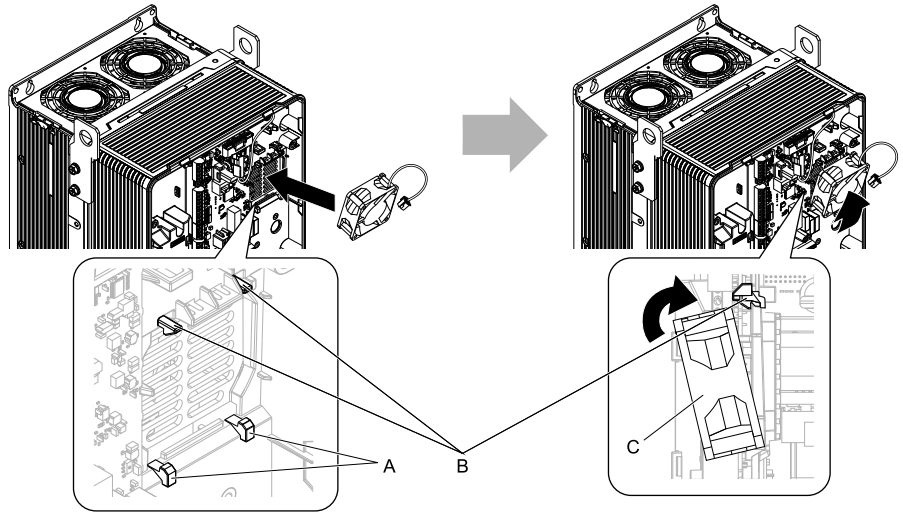
■ Install a Circulation Fan

Note:

Use this procedure only when you use one of these drive models:
- 2075CVx to 2114CVx
- 4077CVx to 4124CVx

Reverse the removal procedure to install a circulation fan.

1. Put the bottom of the fan on the tabs in position A then push the fan until the tabs in position B click into position to put the fan back into the drive.



A - Tabs at the bottom of the fan
B - Tabs at the top of the fan
C - Circulation fan

Figure 1.36 Install the Circulation Fan

2. Connect the power supply connector.

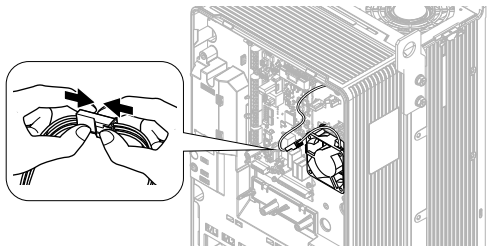
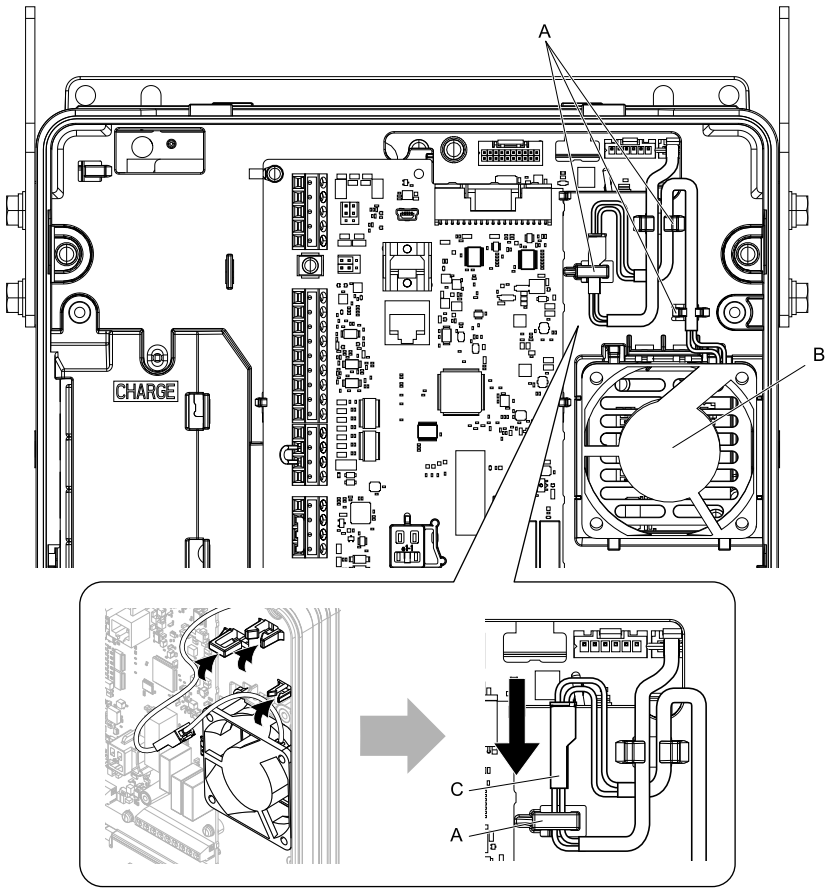


Figure 1.37 Connect the Power Supply Connector

3. Put the cables and connector back into their initial position.



A - Hooks
B - Circulation fan
C - Cable connector

Figure 1.38 Put the Cable and Connector Back into the Drive

◆ Replace a Fan (Procedure D)

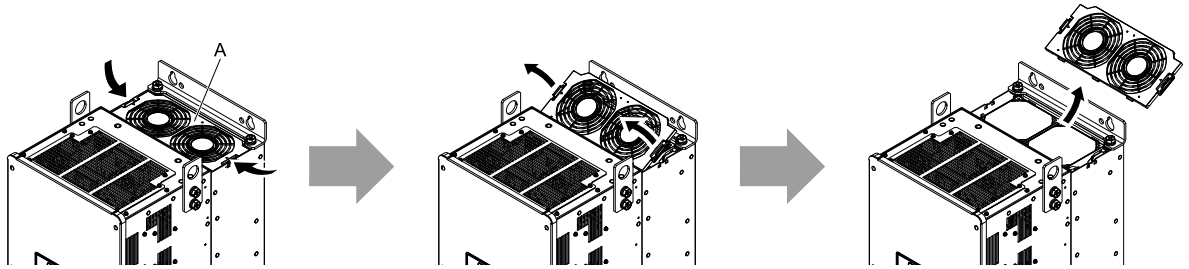
DANGER! *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, remove the covers before measuring for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

CAUTION! *Burn Hazard. Do not touch a hot drive heatsink. De-energize the drive, wait for a minimum of 15 minutes, then make sure that the heatsink is cool before you replace the cooling fans. If you touch a hot drive heatsink, it can burn you.*

NOTICE: *Use the instructions in this manual to replace the cooling fans. When you do maintenance on the fans, replace all the fans to increase product life. If you install the fans incorrectly, it can cause damage to the drive.*

■ Remove the Cooling Fans

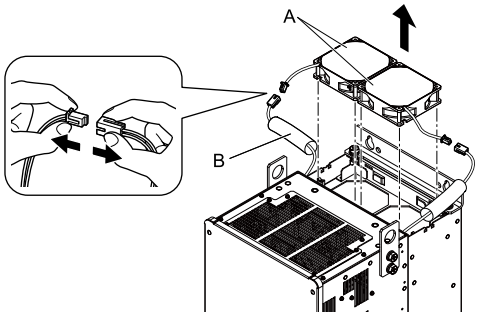
1. Push the tabs on the left and right sides of the fan finger guard and pull up to remove the fan finger guard from the drive.



A - Fan finger guard

Figure 1.39 Remove the Fan Finger Guard

2. Pull the cooling fans straight up from the drive. Remove the protective tubes on the power supply connectors and disconnect the connectors to remove the fans from the drive.



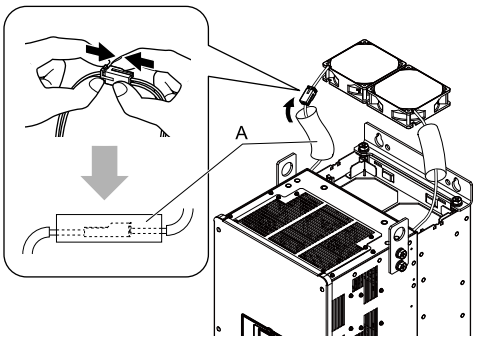
A - Cooling fans **B - Protective tubes**

Figure 1.40 Remove the Cooling Fans

■ Install the Cooling Fans

Reverse the removal procedure to install the cooling fans.

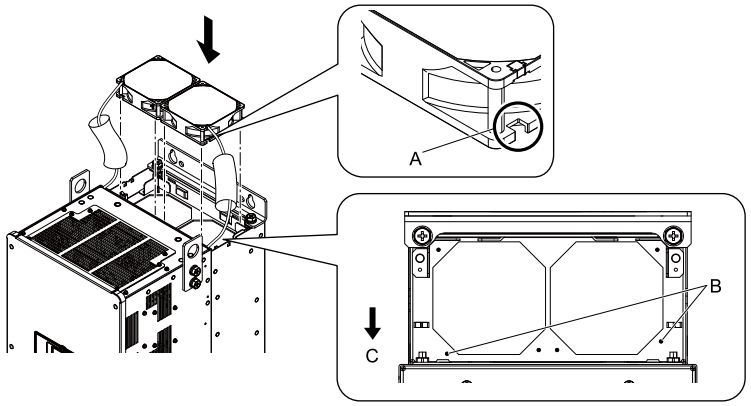
1. Connect the power supply connectors, and attach the protective tubes.



A - Protective tube

Figure 1.41 Connect the Power Supply Connectors

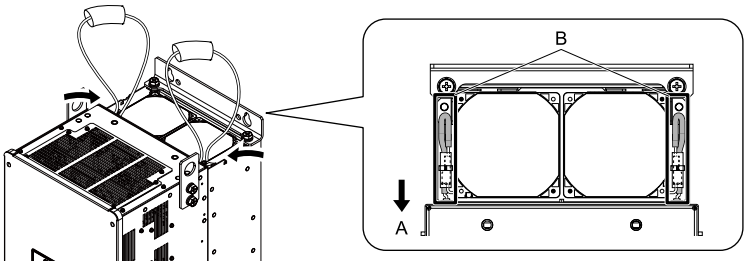
2. Align the notches on the fan with the pins on the drive and install the cooling fan in the drive.



A - Notch on fan
B - Alignment pins on drive
C - Front of drive

Figure 1.42 Install the Cooling Fans

3. Put the cables and connectors in the recess of the drive.

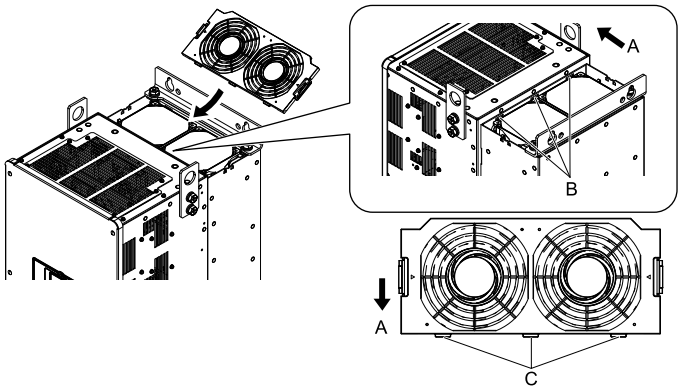


A - Front of drive
B - Recess for cable and connector *1

Figure 1.43 Put the Cables and Connectors in the Drive Recess

*1 Make sure that the cable and connector are in the correct space.

4. Hold the fan finger guard at an angle and put the connector tabs on the fan finger guard into the holes on the drive.



A - Front of drive
B - Drive holes
C - Tabs

Figure 1.44 Install the Fan Finger Guard

5. Push the tabs on the left and right sides of the fan finger guard and click it into place on the drive.

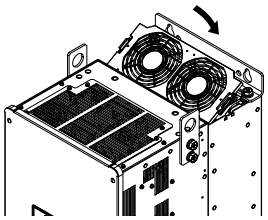


Figure 1.45 Install the Fan Finger Guard

6. Energize the drive and set *o4-03 = 0 [Fan Operation Time Setting = 0 h]* to reset the cooling fan operation time.

◆ Replace a Fan (Procedure E)

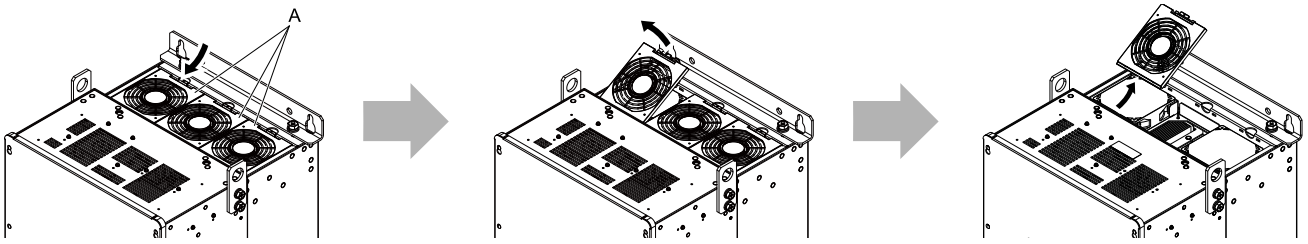
DANGER! *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, remove the covers before measuring for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

CAUTION! *Burn Hazard. Do not touch a hot drive heatsink. De-energize the drive, wait for a minimum of 15 minutes, then make sure that the heatsink is cool before you replace the cooling fans. If you touch a hot drive heatsink, it can burn you.*

NOTICE: *Use the instructions in this manual to replace the cooling fans. When you do maintenance on the fans, replace all the fans to increase product life. If you install the fans incorrectly, it can cause damage to the drive.*

■ Remove the Cooling Fans

1. Push the tabs on the back side of each fan finger guard and pull up to remove the fan finger guards from the drive.

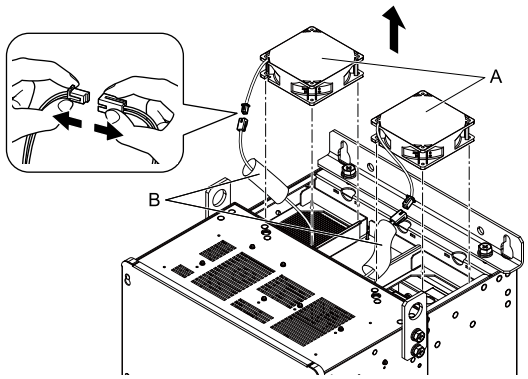


A - Fan finger guard

Figure 1.46 Remove the Fan Finger Guard

2. Pull the cooling fans straight up from the drive. Remove the protective tubes on the power supply connectors and disconnect the connectors to remove the fans from the drive.

Note:
The number of fans is different for different drive models.



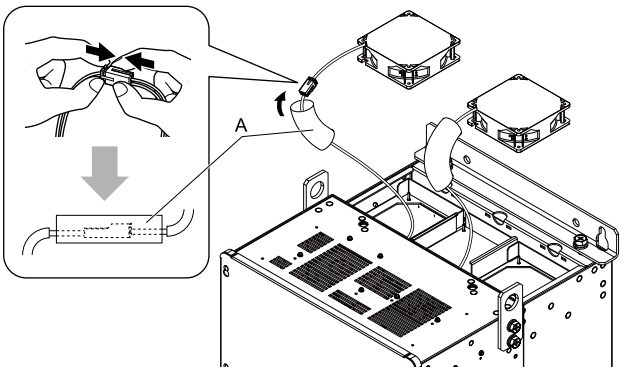
A - Cooling fans **B - Protective tubes**

Figure 1.47 Remove the Cooling Fans

■ Install the Cooling Fans

Reverse the removal procedure to install the fan units.

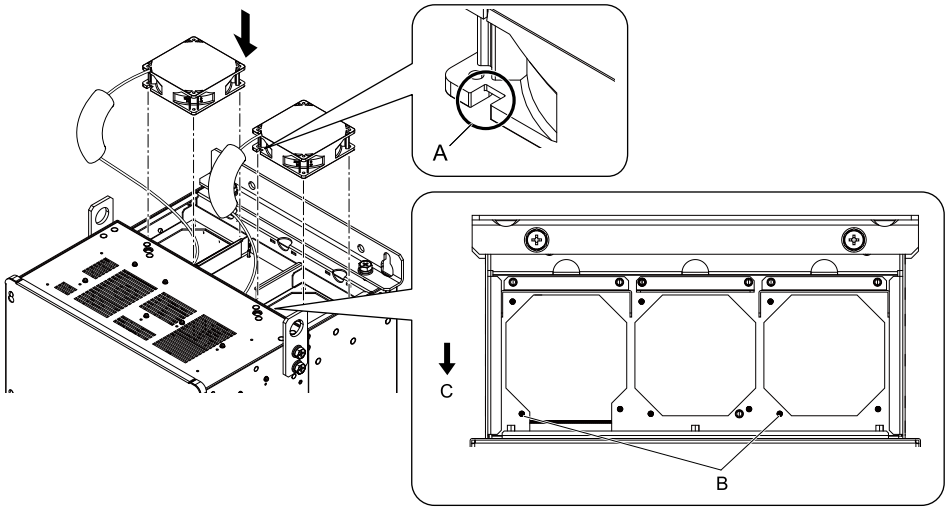
1. Connect the power supply connectors, and attach the protective tube.



A - Protective tubes

Figure 1.48 Connect the Power Supply Connectors

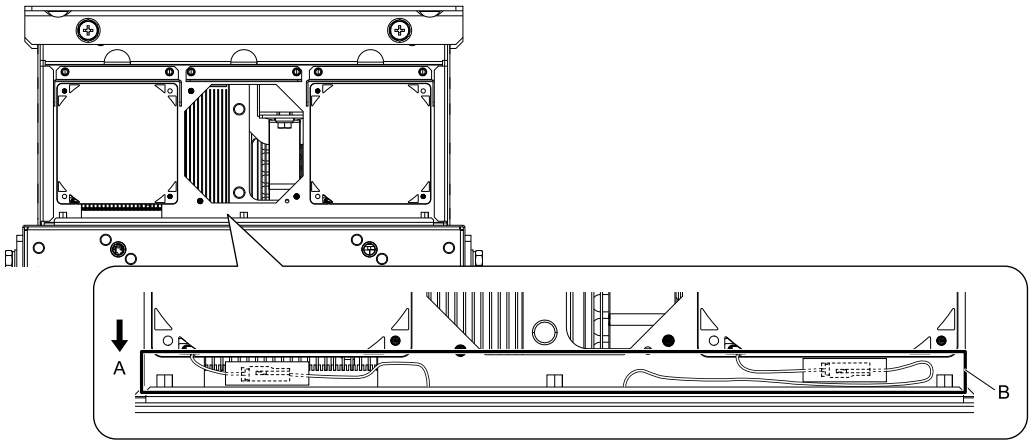
2. Align the notches on the fan with the pins on the drive and install the cooling fan in the drive.



A - Notch on fan **C - Front of drive**
B - Alignment pins on drive

Figure 1.49 Install the Cooling Fans

3. Put the cables and connectors in the recess of the drive.



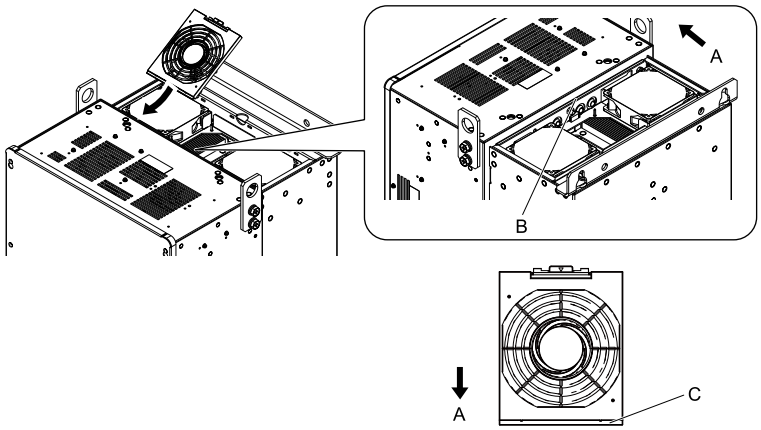
A - Front of drive **B - Recess for the cable and connector** *1

Figure 1.50 Put the Cables and Connectors in the Drive Recess

*1 Make sure that the cable and connector are in the correct space.

4. Hold the fan finger guard at an angle and put the connector tabs on the fan finger guard into the receiving areas on the drive.

Note:
When you install the cooling fan, make sure that you do not pinch cables between the fan finger guard and the drive.



A - Front of drive
B - Receiving area
C - Tab

Figure 1.51 Install the Fan Finger Guard

5. Push the tab on the back side of the fan finger guard and click it into place on the drive.

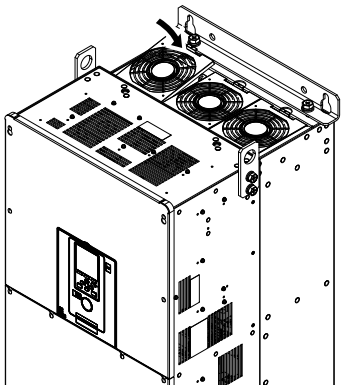


Figure 1.52 Install the Fan Finger Guard

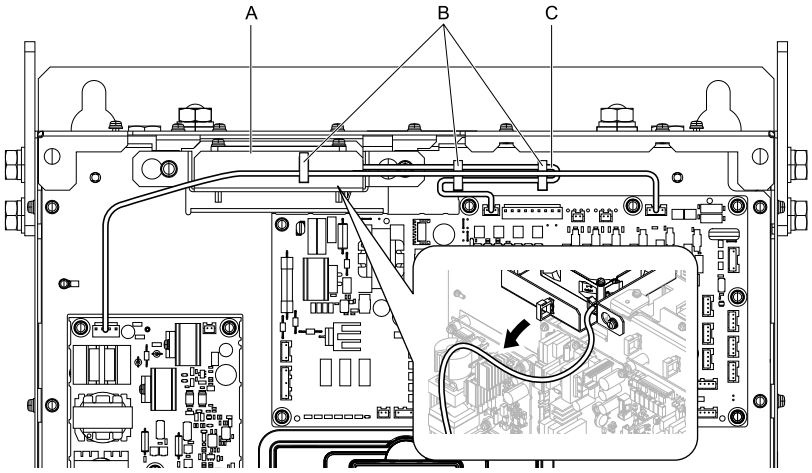
6. Energize the drive and set *o4-03 = 0 [Fan Operation Time Setting = 0 h]* to reset the cooling fan operation time.

■ Remove a Circulation Fan

Remove the drive cover before you start this procedure.

CAUTION! *Crush Hazard. Loosen the cover screws. Do not fully remove them. If you fully remove the cover screws, the terminal cover can fall and cause moderate injury.*

1. Remove the cables from the clamps.

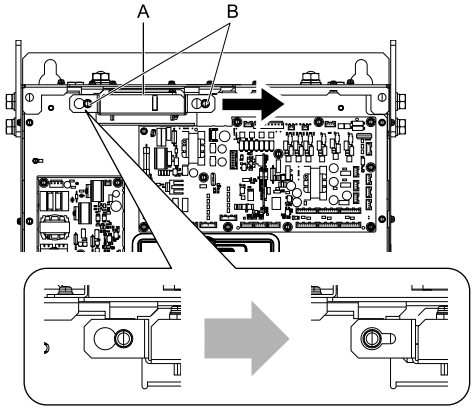


A - Fan unit
B - Clamps
C - Fan cable

Figure 1.53 Remove the Fan Cables

2. Loosen the fan unit screws and slide the fan unit to the right.

Note:
To remove the fan unit, it is only necessary to loosen the screws.



A - Fan unit **B - Screws**

Figure 1.54 Slide the Fan Unit

3. Disconnect the relay connector and remove the fan unit.

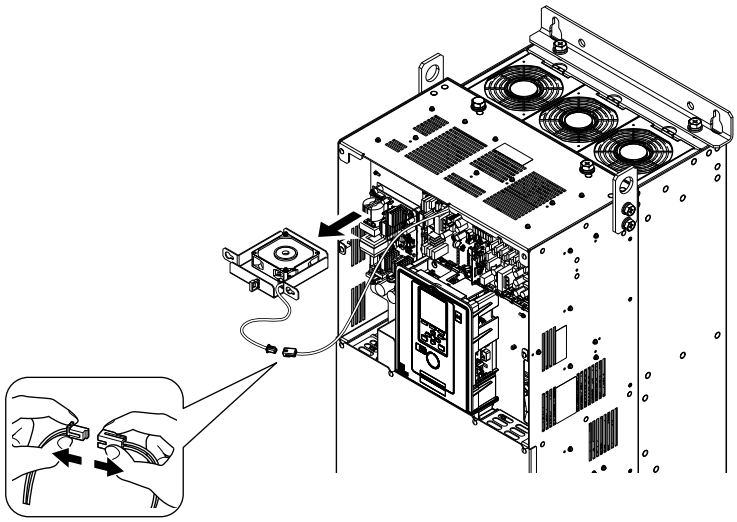
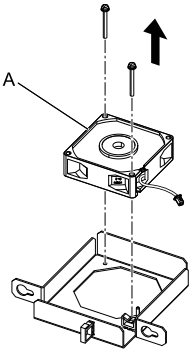


Figure 1.55 Remove the Fan Unit

4. Remove the screws that safety the cooling fan and remove the fan.



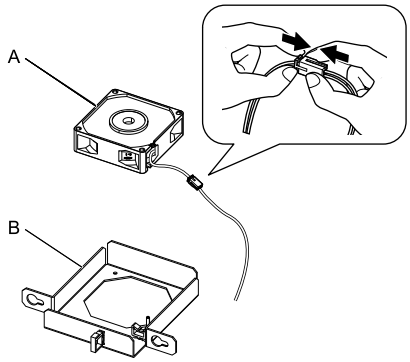
A - Cooling fan

Figure 1.56 Remove the Cooling Fan

■ Install a Circulation Fan

Reverse the removal procedure to install a circulation fan.

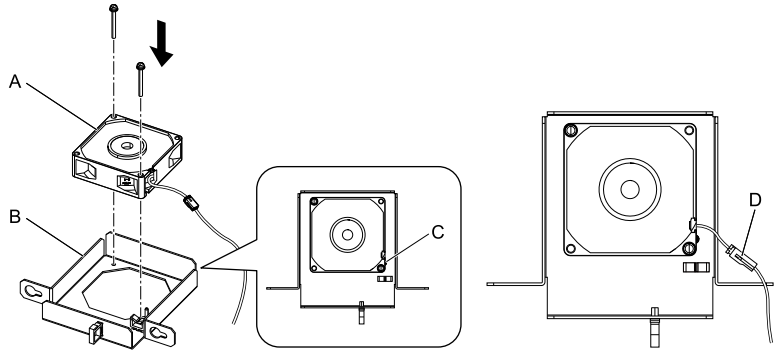
1. Connect the power supply connector.



A - Cooling fan **B - Fan unit base**

Figure 1.57 Connect the Power Supply Connector

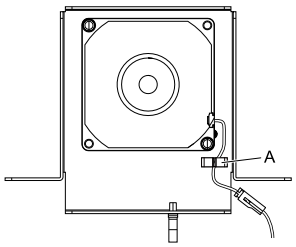
2. Align the pins on the fan unit base with the notches on the fan and put the fan unit base in the fan unit, then use the screws to safety it.
   Tighten the screws to a correct tightening torque:
   • 0.98 N·m to 1.33 N·m (8.67 in·lb to 11.77 in·lb)



A - Cooling fan
B - Fan unit base
C - Alignment pin on fan unit base
D - Circulation fan connector

Figure 1.58 Install the Cooling Fan

3. Safety the fan cable through the clamp.



A - Clamp

Figure 1.59 Safety the Fan Cable

4. Put the fan unit into the specified location and slide it to the left, then use screws to safety it to the drive.
   Tighten the screws to a correct tightening torque:
   • 0.98 N·m to 1.33 N·m (8.67 in·lb to 11.77 in·lb)

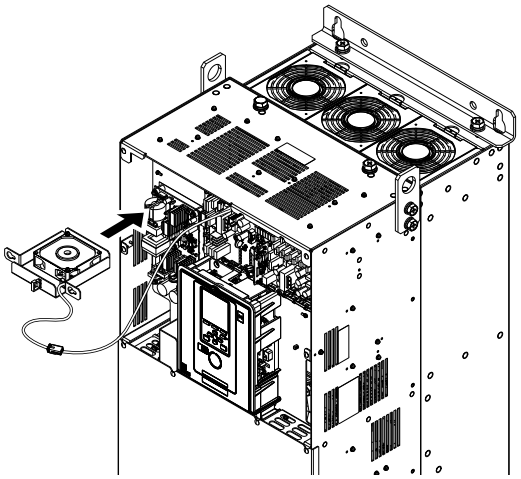
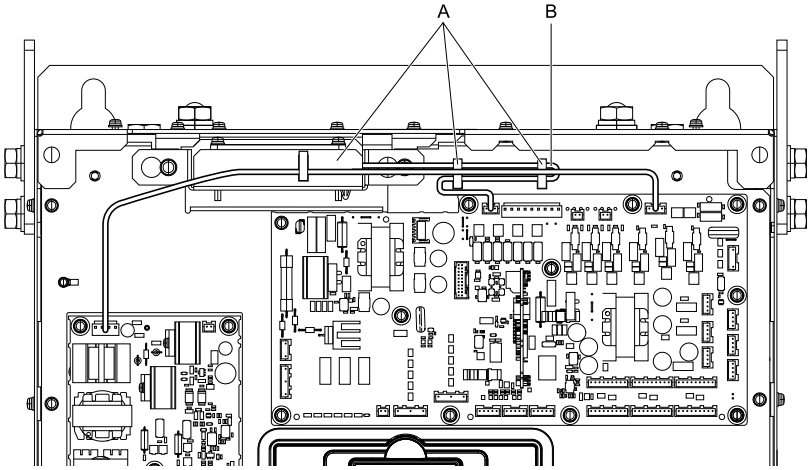


Figure 1.60 Install the Fan Unit

5. Safety the cables through the clamps.



A - Clamps **B - Fan cable**

Figure 1.61 Safety the fan cable through the clamps.

6. Install the drive cover.
7. Energize the drive and set *o4-03 = 0 [Fan Operation Time Setting = 0 h]* to reset the cooling fan operation time.

1.5 Replace the Keypad Battery

When the keypad battery is expired, the date and time go back to the default settings. Use this procedure to replace the battery.

WARNING! *Fire Hazard. Handle keypad batteries properly. Do not charge the battery or disassemble the keypad. If the battery explodes, it can cause a fire.*

To replace the battery, use a Hitachi Maxell "CR2016 Lithium Manganese Dioxide Lithium Battery" or an equivalent battery with these properties:

- Nominal voltage: 3 V
- Operating temperature range: -20 °C to + 85°C (-4 °F to +185 °F)

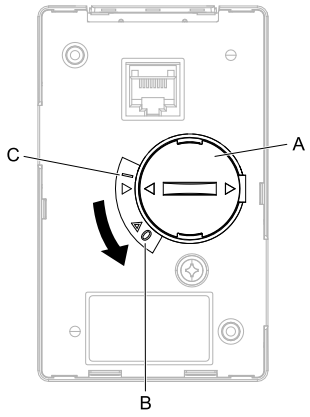
WARNING! *Fire Hazard. Do not disassemble batteries. Do not expose batteries to heat or fire. If the battery explodes, it can cause a fire.*

NOTICE: *Damage to Equipment. The keypad battery stays in use after you de-energize the drive. When you will keep the drive de-energized for long periods of time, remove the battery from the keypad. When the expected life of the battery is complete, replace the battery immediately. A dead battery in the keypad can leak and cause damage to the keypad and drive.*

The performance life estimate of a new battery is:

- Ambient temperature 20 °C (68 °F): 5 years
- Ambient temperature -10 °C to +50 °C (14 °F to 122 °F): 3.5 years

1. De-energize the drive and remove the keypad.
2. Use a slotted screwdriver or other tool to turn the battery cover counterclockwise and remove the cover.

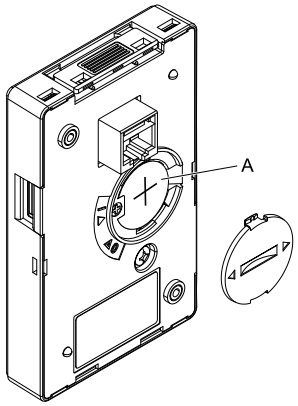


A - Battery cover
B - Opened
C - Closed

Figure 1.62 Remove the Battery Cover

3. Remove the used battery from the keypad.
4. Insert the new battery.

Note:
- The battery cover side is the positive pole. Make sure that the polarity is correct when you put the battery in the keypad.
- Discard the used battery as specified by local regulations.



A - Battery

Figure 1.63 Insert the New Battery

5. Put the battery cover on the keypad and use a slotted screwdriver to turn the battery cover clockwise to close it.
6. Install the keypad on the drive.

1.6 Storage Guidelines

The chemicals in the electrolytic capacitors and other electronic parts of the drive change over time. When you store the drive for long periods of time, use the information in this section to help keep the performance life estimates.

◆ Storage Location

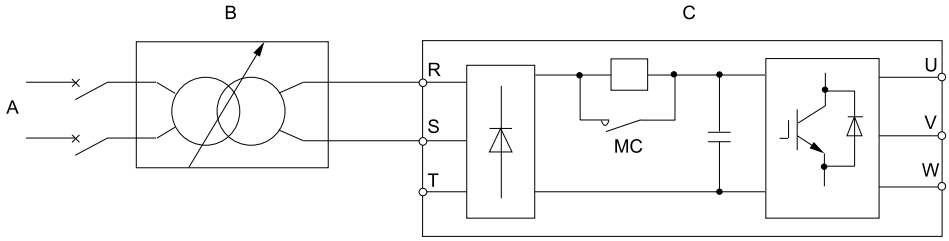
- Temperature and Humidity
  When you store the drive for approximately one month, for example during shipping, you can put the drive in a location where the temperature is -20 °C to +70 °C (-4 °F to +158 °F). Correctly package and store the drive during shipping to prevent vibration and impact damage.
  Do not put the drive in direct sunlight or where there will be condensation or ice. Put the drive in a location where the relative humidity is 95% or less.
- Dust and Oil Mist
  Do not keep the drive locations with dust or oil mist. For example, cement factories and cotton mills.
- Corrosive Gas
  Do not keep the drive in locations with corrosive gas. For example, chemical plants, refineries, and sewage plants.
- Salt Damage
  Do not keep the drive in salty locations. For example, locations near the ocean, and salt damage-designated locations.

Do not keep the drive in unsatisfactory locations. Keep all drives in storage rooms that are safe from unsatisfactory elements.

◆ Regular Application of Power

To prevent deterioration of the capacitors, Yaskawa recommends that you apply power to the drive a minimum of one time each year for a minimum of 30 minutes.

If you store the drive for longer than two years and do not apply power, Yaskawa recommends that you use a variable power source and gradually increase the power from 0 V to the rated drive voltage over a period of 2 to 3 minutes. Apply power for a minimum of 1 hour with no load to reform the main circuit electrolytic capacitor. When you operate the drive after you apply power, wire the drive correctly and check for drive faults, overcurrents, motor vibration, motor speed differences, and other defects during operation.



A - AC power supply
B - Variable power source
C - Drive

Figure 1.64 Power Distribution Method

2

Troubleshooting

2.1 Section Safety

⚠DANGER

Electrical Shock Hazard

Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, remove the covers before measuring for dangerous voltages to make sure that the drive is safe.

If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.

⚠WARNING

Electrical Shock Hazard

Do not operate the drive when covers are missing. Replace covers and shields before you operate the drive. Use the drive only as specified by the instructions.

Some figures in this section include drives without covers or safety shields to more clearly show the inside of the drive. If covers or safety shields are missing from the drive, it can cause serious injury or death.

Always ground the motor-side grounding terminal.

If you do not ground the equipment correctly, it can cause serious injury or death if you touch the motor case.

After the drive blows a fuse or trips a GFCI, do not immediately energize the drive or operate peripheral devices. Wait for the time specified on the warning label at a minimum and make sure that all indicators are OFF. Then check the wiring and peripheral device ratings to find the cause of the problem. If you do not know the cause of the problem, contact Yaskawa before you energize the drive or peripheral devices.

If you do not fix the problem before you operate the drive or peripheral devices, it can cause serious injury or death.

Only let approved personnel install, wire, maintain, examine, replace parts, and repair the drive.

If personnel are not approved, it can cause serious injury or death.

Do not wear loose clothing or jewelry when you do work on the drive. Tighten loose clothing and remove all metal objects, for example watches or rings.

Loose clothing can catch on the drive and jewelry can conduct electricity and cause serious injury or death.

Do not remove covers or touch circuit boards while the drive is energized.

If you touch the internal components of an energized drive, it can cause serious injury or death.

Do not modify the drive body or drive circuitry.

Modifications to drive body and circuitry can cause serious injury or death, will cause damage to the drive, and will void the warranty. Yaskawa is not responsible for modifications of the product made by the user.

Fire Hazard

Tighten all terminal screws to the correct tightening torque.

Connections that are too loose or too tight can cause incorrect operation and damage to the drive. Incorrect connections can also cause death or serious injury from fire.

Tighten screws at an angle in the specified range shown in this manual.

If you tighten the screws at an angle not in the specified range, you can have loose connections that can cause damage to the terminal block or start a fire and cause serious injury or death.

Damage to Equipment

Do not apply incorrect voltage to the main circuit of the drive. Operate the drive in the specified range of the input voltage on the drive nameplate.

Voltages that are higher than the permitted nameplate tolerance can cause damage to the drive.

⚠WARNING

Fire Hazard

Do not put flammable or combustible materials on top of the drive and do not install the drive near flammable or combustible materials. Attach the drive to metal or other noncombustible material.

Flammable and combustible materials can start a fire and cause serious injury or death.

Crush Hazard

Wear eye protection when you do work on the drive.

If you do not use correct safety equipment, it can cause serious injury or death.

Use a crane or hoist to move large drives when necessary.

If you try to move a large drive without a crane or hoist, it can cause serious injury or death.

NOTICE

Damage to Equipment

When you touch the drive and circuit boards, make sure that you observe correct electrostatic discharge (ESD) procedures.

If you do not follow procedures, it can cause ESD damage to the drive circuitry.

Do not break the electrical connection between the drive and the motor when the drive is outputting voltage.

Incorrect equipment sequencing can cause damage to the drive.

Make sure that all connections are correct after you install the drive and connect peripheral devices.

Incorrect connections can cause damage to the drive.

Note:

Do not use unshielded wire for control wiring. Use shielded, twisted-pair wires and ground the shield to the ground terminal of the drive. Unshielded wire can cause electrical interference and unsatisfactory system performance.

2.2 Types of Faults, Minor Faults, Alarms, and Errors

If the drive or motor do not operate correctly, check the drive keypad for a code or message.

If problems occur that are not identified in this manual, contact the nearest Yaskawa representative with this information:

- Drive model
- Drive software version
- Date of purchase
- Description of the problem (such as failure conditions)

Table 2.1 contains descriptions of the different types of faults, minor faults, alarms, and errors that can occur during drive operation.

Contact Yaskawa if there is damage to the drive. Contact information is on the back cover of the manual.

Table 2.1 Types of Faults, Minor Faults, Alarms, and Errors

Type	Drive Response
Faults	When the drive detects a fault, it will cause these conditions: • The keypad shows the fault code and  and ALM/ERR of the LED Status Ring illuminate continuously. • The keypad shows the fault code and  and ALM/ERR on the LED Status Ring illuminate continuously when *o2-24 = 0 or 1 [LED Light Function Selection = Enable Status Ring & Keypad LED or LED Status Ring Disable]*. • The drive shuts off output, and the motor coasts to a stop. Some faults let the user select a motor stopping method. • Fault relay output MA-MC will turn ON, and MB-MC will turn OFF. The drive will not operate until you clear the fault with a Fault Reset and the drive goes back to usual status.
Minor Faults/Alarms	When the drive detects a minor fault or an alarm, it will cause these conditions: • The keypad shows the alarm code and  and ALM/ERR on the LED Status Ring flash when *o2-24 = 0 or 1*. • The drive will continue to operate the motor. Some alarms let the user select a motor stopping method. • If the drive detects a minor fault, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will switch ON. If you do not set parameters *H2-01 to H2-03* , the drive will not trigger MFDO terminals when it detects a minor fault. • The drive will not output a minor fault signal when it detects an alarm. It is not necessary to do Fault Reset.
Operation Errors	An error occurs when parameter settings do not agree or a parameter combination is incorrect. The drive will not operate until you set the parameters correctly. When the drive detects an operation error, these conditions will result: • The keypad shows the error code. • Multi-function outputs do not output an alarm signal. Find the parameters that caused the error and correct the settings.
Auto-Tuning Errors	An error occurs during Auto-Tuning. When the drive detects a tuning error, it will cause these conditions: • The keypad shows the error code. • Multi-function outputs do not output an alarm signal. • The motor coasts to stop. Remove the cause of the error and do Auto-Tuning again.
Copy Function Errors	An error occurs when you use the keypad for a backup, restore, or verify operation. When the drive detects a copy function error, it will cause these conditions: • The keypad shows the error code. • Multi-function outputs do not output an alarm signal. Push a key on the keypad to clear the error. Remove the cause of the error and try the backup, restore, or verify operation again.

2.3 List of Fault, Minor Fault, Alarm, and Error Codes

Table 2.2 shows the possible fault, minor fault, alarm, and error codes.

The display codes are in alphabetical order. Search the table for the code shown on the keypad, and identify its causes and possible solutions.

Note:

The number in parentheses adjacent to the code in the table identifies the fault code or minor fault code (hex. number) that was read during MEMOBUS/Modbus communications.

Example: AFBL (00A2)

Table 2.2 List of Fault, Minor Fault, Alarm, and Error Codes

Display (Hex.)	Name	ALM LED	Type	Ref.
AFBL (00A2)	Analog Fbk Lost, Switched to Net	Flashing	Alarm	87
AuDis (00A3)	Low PI Aux Fdbk Drive Disabled	Flashing	Alarm	87
AuFbl (00A5)	PI Aux Fdbk Lost Switched to Net	Flashing	Alarm	87
AUXFB (00A4)	PI Aux Feedback Level Loss	Flashing	Alarm	87
AUXFB (0420)	PI Aux Feedback Level Loss	Illuminated	Fault	65
bAT (0085)	Keypad Battery Low Voltage	Flashing	Alarm	87
bAT (0402)	Keypad Battery Low Voltage	Illuminated	Fault	65
bb (0008)	Baseblock	Flashing	Alarm	87
bCE (008A)	Bluetooth Communication Error	Flashing	Alarm	87
BuDif (00A6)	Main Fdbk Lost, Using Diff Fdbk	Flashing	Alarm	88
Bu-Fb (0090)	Main Fdbk Lost Using Backup Fdbk	Flashing	Alarm	88
BuFbl (0091)	Backup Fdbk Lost Chk/Repl Xducer	Flashing	Alarm	88
bUS (0015)	Option Communication Error	Flashing	Alarm	88
bUS (0022)	Option Communication Error	Illuminated	Fault	65
bUSy	Busy	-	Not an alarm.	88
CALL (001D)	Serial Comm Transmission Error	Flashing	Alarm	88
CE (0092)	Run at H5-34 (CE Go-To-Freq)	Flashing	Alarm	89
CE (0014)	Modbus Communication Error	Flashing	Alarm	89
CE (0021)	Modbus Communication Error	Illuminated	Fault	65
CoF (0046)	Current Offset Fault	Illuminated	Fault	66
CPEr	Control Mode Mismatch	-	Backup Function Runtime Error	108
CPF00 (0081)	Control Circuit Error	Illuminated	Fault	66
CPF01 (0082)	Control Circuit Error	Illuminated	Fault	66
CPF02 (0083)	A/D Conversion Error	Illuminated	Fault	66
CPF03 (0084)	Control Board Connection Error	Illuminated	Fault	66
CPF06 (0087)	EEPROM Memory Data Error	Illuminated	Fault	67
CPF07 (0088)	Terminal Board Connection Error	Illuminated	Fault	67
CPF08 (0089)	Terminal Board Connection Error	Illuminated	Fault	67
CPF11 (008C)	RAM Fault	Illuminated	Fault	67
CPF12 (008D)	FLASH Memory Fault	Illuminated	Fault	67
CPF13 (008E)	Watchdog Circuit Exception	Illuminated	Fault	67
CPF14 (008F)	Control Circuit Fault	Illuminated	Fault	67
CPF16 (0091)	Clock Fault	Illuminated	Fault	68
CPF17 (0092)	Timing Fault	Illuminated	Fault	68

Display (Hex.)	Name	ALM LED	Type	Ref.
CPF18 (0093)	Control Circuit Fault	Illuminated	Fault	68
CPF19 (0094)	Control Circuit Fault	Illuminated	Fault	68
CPF20 (0095)	Control Circuit Error	Illuminated	Fault	68
CPF21 (0096)	Control Circuit Error	Illuminated	Fault	68
CPF22 (0097)	Hybrid IC Error	Illuminated	Fault	68
CPF23 (0098)	Control Board Connection Error	Illuminated	Fault	68
CPF24 (0099)	Drive Unit Signal Fault	Illuminated	Fault	69
CPF26 (009B)	BB Circuit Error	Illuminated	Fault	69
CPF27 (009C)	PWM Set Reg Error	Illuminated	Fault	69
CPF28 (009D)	PWM Pattern Error	Illuminated	Fault	69
CPF29 (009E)	On-Delay Error	Illuminated	Fault	69
CPF30 (009F)	BB On Error	Illuminated	Fault	69
CPF31 (00A0)	ASIC Code Error	Illuminated	Fault	69
CPF32 (00A1)	ASIC Startup Error	Illuminated	Fault	69
CPF33 (00A2)	Watch-dog Eror	Illuminated	Fault	70
CPF34 (00A3)	Power/Clock Eror	Illuminated	Fault	70
CPF35 (00A4)	Ext A/D Conv Error	Illuminated	Fault	70
CPF36 (00A5)	ASIC COM Error	Illuminated	Fault	70
CPF37 (00A6)	ASIC COM Error	Illuminated	Fault	70
CPF38 (00A7)	EEPROM Data Error	Illuminated	Fault	70
CPF39 (00A8)	CPU-ASIC Communication Error	Illuminated	Fault	70
CPyE	Error Writing Data	-	Backup Function Runtime Error	108
CrST	Cannot Reset	Flashing	Not an alarm.	90
CSEr	Control Mode Mismatch	-	Backup Function Runtime Error	108
CyPo (0029)	Cycle Power to Accept Changes	Flashing	Alarm	90
dEv (0011)	Speed Deviation	Flashing	Alarm	90
dEv (0019)	Speed Deviation	Illuminated	Fault	70
dFPS	Drive Model Mismatch	-	Backup Function Runtime Error	108
DIFF (0093)	Differential Feedback Exceeded	Flashing	Alarm	90
DIFF (0421)	Differential Feedback Exceeded	Illuminated	Fault	71
dnE (002A)	Drive Disabled	Flashing	Alarm	90
dv7 (005B)	Polarity Judge Timeout	Illuminated	Fault	71
dWA2 (004A)	DriveWorksEZ Alarm 2	Flashing	Alarm	90
dWA3 (004B)	DriveWorksEZ Alarm 3	Flashing	Alarm	90
dWAL (0049)	DriveWorksEZ Alarm	Flashing	Alarm	90
dWF1 (004A)	EEPROM Memory DWEZ Data Error	Illuminated	Fault	71
dWF2 (004B)	DriveWorksEZ Fault 2	Illuminated	Fault	71
dWF3 (004C)	DriveWorksEZ Fault 3	Illuminated	Fault	71
dWFL (0049)	DriveWorksEZ Fault	Illuminated	Fault	71
EF (0007)	FWD/REV Run Command Input Error	Flashing	Alarm	91
EF0 (001A)	Option Card External Fault	Flashing	Alarm	91
EF0 (0027)	Option Card External Fault	Illuminated	Fault	71
EF1 (0039)	External Fault (Terminal S1)	Flashing	Alarm	91

Display (Hex.)	Name	ALM LED	Type	Ref.
EF1 (0042)	External Fault (Terminal S1)	Illuminated	Faults	71
EF2 (003A)	External Fault (Terminal S2)	Flashing	Alarm	91
EF2 (0043)	External Fault (Terminal S2)	Illuminated	Faults	72
EF3 (0009)	External Fault (Terminal S3)	Flashing	Alarm	91
EF3 (0011)	External Fault (Terminal S3)	Illuminated	Faults	72
EF4 (000A)	External Fault (Terminal S4)	Flashing	Alarm	91
EF4 (0012)	External Fault (Terminal S4)	Illuminated	Faults	72
EF5 (000B)	External Fault (Terminal S5)	Flashing	Alarm	91
EF5 (0013)	External Fault (Terminal S5)	Illuminated	Faults	72
EF6 (000C)	External Fault (Terminal S6)	Flashing	Alarm	91
EF6 (0014)	External Fault (Terminal S6)	Illuminated	Faults	72
EF7 (000D)	External Fault (Terminal S7)	Flashing	Alarm	92
EF7 (0015)	External Fault (Terminal S7)	Illuminated	Faults	72
End1	Excessive Rated Voltage Setting	Flashing	An Auto-Tuning Error	105
End2	Iron Core Saturation Coefficient	Flashing	An Auto-Tuning Error	105
End3	Rated Current Setting Alarm	Flashing	An Auto-Tuning Error	105
End4	Adjusted Slip Calculation Error	Flashing	An Auto-Tuning Error	105
End5	Resistance Tuning Error	Flashing	An Auto-Tuning Error	105
End6	Leakage Inductance Alarm	Flashing	An Auto-Tuning Error	105
End7	No-Load Current Alarm	Flashing	An Auto-Tuning Error	105
End8	HFI Alarm	Flashing	An Auto-Tuning Error	105
End9	Initial Pole Detection Alarm	Flashing	An Auto-Tuning Error	106
EOF (0067)	Emergency Override FWD	Flashing	Alarm	92
EOR (0068)	Emergency Override REV	Flashing	Alarm	92
EP24v (0081)	External Power 24V Supply	Flashing	Alarm	92
Er-01	Motor Data Error	Flashing	An Auto-Tuning Error	106
Er-02	Drive in an Alarm State	Flashing	An Auto-Tuning Error	106
Er-03	STOP Button was Pressed	Flashing	An Auto-Tuning Error	106
Er-04	Line-to-Line Resistance Error	Flashing	An Auto-Tuning Error	106
Er-05	No-Load Current Error	Flashing	An Auto-Tuning Error	106
Er-08	Rated Slip Error	Flashing	An Auto-Tuning Error	107
Er-09	Acceleration Error	Flashing	An Auto-Tuning Error	107
Er-12	Current Detection Error	Flashing	An Auto-Tuning Error	107
Er-13	Leakage Inductance Error	Flashing	An Auto-Tuning Error	107
Er-18	Back EMF Error	Flashing	An Auto-Tuning Error	107
Er-19	PM Inductance Error	Flashing	An Auto-Tuning Error	107
Er-20	Stator Resistance Error	Flashing	An Auto-Tuning Error	107
Er-25	HighFreq Inject Param Tuning Err	Flashing	An Auto-Tuning Error	107
Err (001F)	EEPROM Write Error	Illuminated	Fault	73
FAn1 (0413)	Drive Cooling Fan Fault	Illuminated	Fault	73
FDBKL (0094)	Feedback Loss Wire Break	Flashing	Alarm	92
FDBKL (0422)	WIRE Break	Illuminated	Fault	73
FLGT (0095)	Feedback Loss, Go To Freq b5-83	Flashing	Alarm	92

Display (Hex.)	Name	ALM LED	Type	Ref.
FR<MS (009E)	Freq Ref < Minimum Speed (Y1-06)	Flashing	Alarm	93
FR<TH (009F)	Freq. Reference < Thrust (Y4-12)	Flashing	Alarm	93
GF (0006)	Ground Fault	Illuminated	Fault	73
HCA (0034)	High Current Alarm	Flashing	Alarm	93
HFB (0423)	High Feedback Sensed	Illuminated	Fault	73
HIAUX (0096)	High PI Aux Feedback Level	Flashing	Alarm	93
HIAUX (0424)	High PI Aux Feedback Level	Illuminated	Fault	74
HIFB (0097)	High Feedback Sensed	Flashing	Alarm	93
HLCE (0411)	High Level Communication Errors	Illuminated	Fault	74
iFEr	Communication Err	-	Backup Function Runtime Error	108
INTLK (0069)	BAS Interlock	Flashing	Alarm	94
L24v (0021)	Loss of External Power 24 Supply	Flashing	Alarm	94
LCP (00A7)	Low City Pressure	Flashing	Alarm	94
LF (001C)	Output Phase Loss	Illuminated	Fault	74
LF2 (0036)	Output Current Imbalance	Illuminated	Fault	74
LFB (0425)	Low Feedback Sensed	Illuminated	Fault	74
LOAUX (0099)	Low PI Aux Feedback Level	Flashing	Alarm	94
LOAUX (0426)	Low PI Aux Feedback Level	Illuminated	Fault	75
LoG	Com Error / Abnormal SD Card	Flashing	Alarm	94
LOFB (009A)	Low Feedback Sensed	Flashing	Alarm	94
LOP (009B)	Loss of Prime	Flashing	Alarm	94
LOP (0427)	Loss of Prime	Illuminated	Fault	75
LSP (00A8)	Low Suction Pressure	Flashing	Alarm	95
LT-1 (0035)	Cooling Fan Maintenance Time	Flashing	Alarm	95
LT-2 (0036)	Capacitor Maintenance Time	Flashing	Alarm	95
LT-3 (0043)	SoftChargeBypassRelay MainteTime	Flashing	Alarm	95
LT-4 (0044)	IGBT Maintenance Time (50%)	Flashing	Alarm	95
LWT (00A9)	Low Water In Tank	Flashing	Alarm	95
MSL (0428)	Net Master Lost	Illuminated	Fault	75
ndAT	Model,VolClass,Capacity Mismatch	-	Backup Function Runtime Error	108
NETSC (00A1)	NETSCAN Waiting for Master	Flashing	Alarm	95
NMS (009C)	Setpoint Not Met	Flashing	Alarm	95
NMS (0429)	Setpoint Not Met	Illuminated	Fault	75
nSE (0052)	Node Setup Error	Illuminated	Fault	75
oC (0007)	Overcurrent	Illuminated	Fault	75
OD (009D)	Output Disconnect	Flashing	Alarm	96
OD (042A)	Output Disconnect	Illuminated	Fault	76
oFA00 (0101)	Option Not Compatible with Port	Illuminated	Fault	76
oFA01 (0102)	Option Fault/Connection Error	Illuminated	Fault	76
oFA05 (0106)	Option A/D Error	Illuminated	Fault	77
oFA06 (0107)	Option Communication Error	Illuminated	Fault	77
oFA10 (0111)	Option RAM Error	Illuminated	Fault	77
oFA11 (0112)	Option Ope Mode Error	Illuminated	Fault	77

Display (Hex.)	Name	ALM LED	Type	Ref.
oFA12 (0113)	Drive Receive CRC Error	Illuminated	Fault	77
oFA13 (0114)	Drive Receive Frame Error	Illuminated	Fault	77
oFA14 (0115)	Drive Receive Abort Error	Illuminated	Fault	77
oFA15 (0116)	Option Receive CRC Error	Illuminated	Fault	77
oFA16 (0117)	Option Receive Frame Error	Illuminated	Fault	78
oFA17 (0118)	Option Receive Abort Error	Illuminated	Fault	78
oFA30 (0131)	COM ID Error	Illuminated	Fault	78
oFA31 (0132)	Type Code Error	Illuminated	Fault	78
oFA32 (0133)	SUM Check Error	Illuminated	Fault	78
oFA33 (0134)	Option Receive Time Over	Illuminated	Fault	78
oFA34 (0135)	Memobus Time Over	Illuminated	Fault	78
oFA35 (0136)	Drive Receive Time Over 1	Illuminated	Fault	78
oFA36 (0137)	CI Check Error	Illuminated	Fault	79
oFA37 (0138)	Drive Receive Time Over 2	Illuminated	Fault	79
oFA38 (0139)	Control Reference Error	Illuminated	Fault	79
oFA39 (013A)	Drive Receive Time Over 3	Illuminated	Fault	79
oFA40 (013B)	CtrlResSel 1Err	Illuminated	Fault	79
oFA41 (013C)	Drive Receive Time Over 4	Illuminated	Fault	79
oFA42 (013D)	CtrlResSel 2Err	Illuminated	Fault	79
oFA43 (013E)	Drive Receive Time Over 5	Illuminated	Fault	79
oH (0003)	Heatsink Overheat	Flashing	Alarm	96
oH (0009)	Heatsink Overheat	Illuminated	Fault	80
oH1 (000A)	Heatsink Overheat	Illuminated	Fault	80
oH2 (0004)	External Overheat (H1-XX=B)	Flashing	Alarm	96
oH3 (001D)	Motor Overheat (PTC Input)	Illuminated	Fault	80
oH3 (0022)	Motor Overheat (PTC Input)	Flashing	Alarm	96
oH4 (0020)	Motor Overheat Fault (PTC Input)	Illuminated	Fault	81
oL1 (000B)	Motor Overload	Illuminated	Fault	81
oL2 (000C)	Drive Overload	Illuminated	Fault	82
oL3 (0005)	Overtorque 1	Flashing	Alarm	97
oL3 (000D)	Overtorque Detection 1	Illuminated	Fault	82
oL4 (0006)	Overtorque 2	Flashing	Alarm	97
oL4 (000E)	Overtorque Detection 2	Illuminated	Fault	82
oL7 (002B)	High Slip Braking Overload	Illuminated	Fault	83
oPE01	Drive Capacity Setting Fault	Flashing	Parameter Setting Error	100
oPE02	Parameter Range Setting Error	Flashing	Parameter Setting Error	100
oPE03	Multi-Function Input Setting Err	Flashing	Parameter Setting Error	100
oPE05	Run Cmd/Freq Ref Source Sel Err	Flashing	Parameter Setting Error	102
oPE07	Analog Input Selection Error	Flashing	Parameter Setting Error	102
oPE08	Parameter Selection Error	Flashing	Parameter Setting Error	102
oPE09	PID Control Selection Fault	Flashing	Parameter Setting Error	103
oPE10	V/f Data Setting Error	Flashing	Parameter Setting Error	103
oPE11	Carrier Frequency Setting Error	Flashing	Parameter Setting Error	103

Display (Hex.)	Name	ALM LED	Type	Ref.
oPE16	Energy Saving Constants Error	Flashing	Parameter Setting Error	103
oPE33	Digital Output Selection Error	Flashing	Parameter Setting Error	103
oPE34	HAND/OFF/AUTO Input Setting	Flashing	Parameter Setting Error	104
oPE35	Network PI Aux Operation Mode	Flashing	Parameter Setting Error	104
oPr (001E)	Keypad Connection Fault	Illuminated	Fault	83
oS (0010)	Overspeed	Flashing	Alarm	97
oS (0018)	Overspeed	Illuminated	Fault	83
ov (0002)	DC Bus Overvoltage	Flashing	Alarm	97
ov (0008)	Overvoltage	Illuminated	Fault	83
ov2 (0405)	DC Bus Overvoltage 2	Illuminated	Fault	84
ovEr	Too Many Parameters Changed	-	Not an alarm.	97
PASS	Modbus Communication Test	Flashing	Not an alarm.	97
PE1 (0047) PE2 (0048)	PLC Faults	Illuminated	Fault	84
PF (0047)	Input Phase Loss	Flashing	Alarm	97
PF (001B)	Input Phase Loss	Illuminated	Fault	84
PWEr	DWEZ Password Mismatch	-	Backup Function Runtime Error	108
rdEr	Error Reading Data	-	Backup Function Runtime Error	109
rUn (001B)	Motor Switch during Run	Flashing	Alarm	98
SAFE (0062)	Customer Safeties	Flashing	Alarm	98
SC (0005)	Short Circuit/IGBT Failure	Illuminated	Fault	84
SCF (040F)	Safety Circuit Fault	Illuminated	Fault	85
SE (0020)	Modbus Test Mode Error	Flashing	Alarm	98
SEr (003B)	Speed Search Retries Exceeded	Illuminated	Fault	85
STo (003C)	Safe Torque OFF	-	Alarm	98
SToF (003B)	Safe Torque OFF	Flashing	Alarm	98
STPo (0037)	Motor Step-Out Detected	Illuminated	Fault	85
TiM (0089)	Keypad Time Not Set	Flashing	Alarm	98
TiM (0401)	Keypad Time Not Set	Illuminated	Fault	85
TrPC (0042)	IGBT Maintenance Time (90%)	Flashing	Alarm	98
UL3 (001E)	Undertorque Detection 1	Flashing	Alarm	99
UL3 (0029)	Undertorque Detection 1	Illuminated	Fault	85
UL4 (001F)	Undertorque Detection 2	Flashing	Alarm	99
UL4 (002A)	Undertorque Detection 2	Illuminated	Fault	85
UL6 (004E)	Underload or Belt Break Detected	Flashing	Alarm	99
UL6 (005A)	Underload or Belt Break Detected	Illuminated	Fault	86
Uv (0001)	DC Bus Undervoltage	Flashing	Alarm	99
Uv1 (0002)	DC Bus Undervoltage	Illuminated	Fault	86
Uv2 (0003)	Control Power Undervoltage	Illuminated	Fault	86
Uv3 (0004)	Soft Charge Answerback Fault	Illuminated	Fault	86
vAEr	Voltage Class, Capacity Mismatch	-	Backup Function Runtime Error	109
vFyE	Parameters do not Match	-	Backup Function Runtime Error	109
VLTS (042B)	Thermostat Fault	Illuminated	Fault	86

2.4 Fault

This section gives information about some of the causes and possible solutions of faults. You must use the Fault Reset operation to remove the fault before you can operate the drive. Use the information in this table to remove the cause of the fault.

Code	Name	Causes	Possible Solutions
AUXFB	PI Aux Feedback Level Loss	The analog input from the terminal set for *PI Auxiliary Control Feedback Level [H3-xx = 27]* is more than 21 mA or less than 3 mA for longer than 1 s.	Repair transducer or wiring.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
bAT	Keypad Battery Low Voltage	The keypad battery voltage is low.	Replace the keypad battery.
Note: Use *o4-24 [bAT Detection Selection]* to enable/disable *bAT* detection.			
Code	**Name**	**Causes**	**Possible Solutions**
bCE	Bluetooth Communication Fault	The smartphone or tablet with DriveWizard Mobile installed is too far from the keypad.	Use the smartphone or tablet 10 m (32.8 ft) or nearer to the keypad. **Note:** *bCE* can occur when the smartphone or tablet is 10 m (32.8 ft) or nearer to the keypad depending on the specifications of the smartphone or tablet.
		Radio waves from a different device are causing interference with communications between the smartphone or tablet and keypad.	Make sure that no device around the keypad uses the same radio bandwidth (2400 MHz to 2480 MHz), and prevent radio interference.
Note: • The drive detects this error when you use the Bluetooth LCD keypad and operate the drive with a smartphone or tablet. • Do a Fault Reset to clear the fault. • Set the stopping method for this fault in *o2-27 [bCE Detection Selection]*.			
Code	**Name**	**Causes**	**Possible Solutions**
bUS	Option Communication Error	The drive did not receive a signal from the controller.	Correct wiring errors.
		The communications cable wiring is incorrect.	
		There is a short-circuit in the communications cable or the communications cable is not connected.	• Repair short circuits and connect cables. • Replace the defective communications cable.
		Electrical interference caused a communication data error.	• Examine the control circuit lines, main circuit lines, and ground wiring, and decrease the effects of electrical interference. • Make sure that a magnetic contactor is not the source of the electrical interference, then use a Surge Protective Device if necessary. • Use only the recommended cables or other shielded line. Ground the shield on the controller side or the drive input power side. • Separate the communication wiring from drive power lines, and install a noise filter to the input side of the power supply for communication. • Decrease the effects of electrical interference from the controller.
		The option is incorrectly installed to the drive.	Correctly install the option to the drive.
		The option is damaged.	If the fault continues and the wiring is correct, replace the option.
Note: • The drive detects this error if the Run command or frequency reference is assigned to the option card. • Do a Fault Reset to clear the fault. • If the drive detects this error, the drive will operate the motor as specified by the stopping method set in *F6-01 [Communication Error Selection]*.			
Code	**Name**	**Causes**	**Possible Solutions**
CE	Modbus Communication Error	The communications cable wiring is incorrect.	Correct wiring errors.
		There is a short circuit in the communications cable or the communications cable is not connected.	• Repair short circuits and connect cables. • Replace the defective communications cable.

Code	Name	Causes	Possible Solutions
		Electrical interference caused a communication data error.	• Examine the control circuit lines, main circuit lines, and ground wiring, and decrease the effects of electrical interference. • Make sure that a magnetic contactor is not the source of the electrical interference, then use a Surge Protective Device if necessary. • Use only the recommended cables or other shielded line. Ground the shield on the controller side or the drive input power side. • Separate the communication wiring from drive power lines, and install a noise filter to the input side of the power supply for communication. • Decrease the effects of electrical interference from the controller.
Note: • The drive detects this error if it does not correctly receive control data for the *CE* detection time set to *H5-09 [CE Detection Time]*. • Do a Fault Reset to clear the fault. • If the drive detects this error, the drive will operate the motor as specified by the stopping method set in *H5-04 [Communication Error Stop Method]*.			
Code	**Name**	**Causes**	**Possible Solutions**
CoF	Current Offset Fault	The drive starts operation while the induced voltage stays in the motor (during coasting to a stop or after fast deceleration).	• Make a sequence that does not restart operation when induced voltage stays in the motor. • Set *b3-01 = 1 [Speed Search at Start Selection = Enabled]*. • Use *Speed Search from Fmax or Fref [H1-xx = 61, 62]* to do a speed search through one of the external terminals. **Note:** When controlling the PM motor, External Speed Search commands 1 and 2 operate the same.
		A drive hardware problem occurred.	Replace the drive.
Note: • The drive detects this error if the current offset value is more than the permitted setting range while the drive automatically adjusts the current offset. • Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
CPF00	Control Circuit Error	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			
Code	**Name**	**Causes**	**Possible Solutions**
CPF01	Control Circuit Error	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			
Code	**Name**	**Causes**	**Possible Solutions**
CPF02	A/D Conversion Error	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			
Code	**Name**	**Causes**	**Possible Solutions**
CPF03	Control Board Connection Error	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			

Code	Name	Causes	Possible Solutions
CPF06	EEPROM Memory Data Error	The drive power supply was de-energized while a communication option entered a parameter Write command.	Set *A1-03 = 2220, 3330 [Initialize Parameters = 2-Wire Initialization, 3-Wire Initialization]* and initialize the drive.
		An EEPROM peripheral circuit error occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about how to replace the control board, contact Yaskawa or your nearest sales representative.
Note: • The drive detects this error if there is an error in the data written to the drive EEPROM. • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			

Code	Name	Causes	Possible Solutions
CPF07	Terminal Board Connection Error	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			

Code	Name	Causes	Possible Solutions
CPF08	Terminal Board Connection Error	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			

Code	Name	Causes	Possible Solutions
CPF11	RAM Fault	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			

Code	Name	Causes	Possible Solutions
CPF12	FLASH Memory Fault	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			

Code	Name	Causes	Possible Solutions
CPF13	Watchdog Circuit Exception	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			

Code	Name	Causes	Possible Solutions
CPF14	Control Circuit Fault	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			

Code	Name	Causes	Possible Solutions
CPF16	Clock Fault	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			
Code	**Name**	**Causes**	**Possible Solutions**
CPF17	Timing Fault	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			
Code	**Name**	**Causes**	**Possible Solutions**
CPF18	Control Circuit Fault	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			
Code	**Name**	**Causes**	**Possible Solutions**
CPF19	Control Circuit Fault	A drive hardware problem occurred.	• Re-energize the drive and check if the fault still remains. • Replace the control board or the entire drive if the fault continues. Contact Yaskawa or your nearest sales representative for instructions on replacing the control board.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			
Code	**Name**	**Causes**	**Possible Solutions**
CPF20	Control Circuit Error	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			
Code	**Name**	**Causes**	**Possible Solutions**
CPF21	Control Circuit Error	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			
Code	**Name**	**Causes**	**Possible Solutions**
CPF22	Hybrid IC Error	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			
Code	**Name**	**Causes**	**Possible Solutions**
CPF23	Control Board Connection Error	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			

Code	Name	Causes	Possible Solutions
CPF24	Drive Unit Signal Fault	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			
Code	**Name**	**Causes**	**Possible Solutions**
CPF26	BB Circuit Error	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			
Code	**Name**	**Causes**	**Possible Solutions**
CPF27	PWM Set Reg Error	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			
Code	**Name**	**Causes**	**Possible Solutions**
CPF28	PWM Pattern Error	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			
Code	**Name**	**Causes**	**Possible Solutions**
CPF29	On-Delay Error	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			
Code	**Name**	**Causes**	**Possible Solutions**
CPF30	BB On Error	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			
Code	**Name**	**Causes**	**Possible Solutions**
CPF31	ASIC Code Error	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			
Code	**Name**	**Causes**	**Possible Solutions**
CPF32	ASIC Startup Error	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			

Code	Name	Causes	Possible Solutions
CPF33	Watch-dog Eror	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			
Code	**Name**	**Causes**	**Possible Solutions**
CPF34	Power/Clock Eror	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			
Code	**Name**	**Causes**	**Possible Solutions**
CPF35	Ext A/D Conv Error	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			
Code	**Name**	**Causes**	**Possible Solutions**
CPF36	ASIC COM Error	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			
Code	**Name**	**Causes**	**Possible Solutions**
CPF37	ASIC COM Error	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			
Code	**Name**	**Causes**	**Possible Solutions**
CPF38	EEPROM Memory Data Error	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			
Code	**Name**	**Causes**	**Possible Solutions**
CPF39	CPU-ASIC Communication Error	A drive hardware problem occurred.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for these faults.			
Code	**Name**	**Causes**	**Possible Solutions**
dEv	Speed Deviation	The load is too heavy.	Decrease the load.
		Acceleration and deceleration times are set too short.	Increase the values set in *C1-01 to C1-04 [Acceleration/ Deceleration Time]*.
		The *dEv* detection level settings are incorrect.	Adjust *F1-10 [Speed Deviation Detection Level]* and *F1-11 [Speed Deviation Detect DelayTime]*.
		The load is locked up.	Examine the machine.

Code	Name	Causes	Possible Solutions
		The holding brake is stopping the motor.	Release the holding brake.

Note:
• The drive detects this error if the difference between the detected speed and the speed reference is more than the setting of *F1-10* for longer than *F1-11*.
• Do a Fault Reset to clear the fault.
• If the drive detects this error, the drive will operate the motor as specified by the stopping method set in *F1-04 [Speed Deviation Detection Select]*.

Code	Name	Causes	Possible Solutions
DIFF	Differential Feedback Exceeded	The difference between the PID Feedback and *Differential Level Source [H3-xx = 2D]* is more than the level set in *Y4-18 [Differential Level]* for the time set in *Y4-19 [Differential Lvl Detection Time]*.	• Replace the feedback transducer or transducers. • Make sure that the settings of *Y4-18 [Differential Level] to Y4-20 [Differential Level Detection Sel]* are correct.

Note:
Do a Fault Reset to clear the fault.

Code	Name	Causes	Possible Solutions
dv7	Polarity Judge Timeout	There is a disconnection in the motor coil winding.	Measure the motor line-to-line resistance and replace the motor if a coil is disconnected.
		The screws on the drive output terminals are loose.	Tighten the terminal screws to the correct tightening torque.

Note:
• The drive detects this error if it cannot detect polarity in a pre-set length of time.
• Do a Fault Reset to clear the fault.

Code	Name	Causes	Possible Solutions
dWF1	EEPROM Memory DWEZ Data Error	There is an error in the EEPROM peripheral circuit.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
		There is a problem with the EEPROM data.	Set *A1-03 = 2220, 3330 [Initialize Parameters = 2-Wire Initialization, 3-Wire Initialization]* to initialize the drive, then upload the DriveWorksEZ project to the drive again.

Note:
• The drive detects this error if there is an error in the DriveWorksEZ program that was saved to EEPROM.
• Do a Fault Reset to clear the fault.

Code	Name	Causes	Possible Solutions
dWF2	DriveWorksEZ Fault 2	There was a fault in the DriveWorksEZ program.	Examine the DriveWorksEZ program and remove the cause of the fault. This is not a drive fault.

Note:
Do a Fault Reset to clear the fault.

Code	Name	Causes	Possible Solutions
dWF3	DriveWorksEZ Fault 3	There was a fault in the DriveWorksEZ program.	Examine the DriveWorksEZ program and remove the cause of the fault. This is not a drive fault.

Note:
Do a Fault Reset to clear the fault.

Code	Name	Causes	Possible Solutions
dWFL	DriveWorksEZ Fault	There was a fault in the DriveWorksEZ program.	Examine the DriveWorksEZ program and remove the cause of the fault. This is not a drive fault.

Note:
Do a Fault Reset to clear the fault.

Code	Name	Causes	Possible Solutions
EF0	Option Card External Fault	The communication option received an external fault from the controller.	1. Find the device that caused the external fault and remove the cause. 2. Clear the external fault input from the controller.
		A programming error occurred on the controller side.	Examine the operation of the controller program.

Note:
• The drive detects this fault if the alarm function on the external device side is operating.
• Do a Fault Reset to clear the fault.
• If the drive detects this fault, it will operate the motor as specified by the stop method set in *F6-03 [Comm External Fault (EF0) Select]*.

Code	Name	Causes	Possible Solutions
EF1	External Fault (Terminal S1)	MFDI terminal S1 caused an external fault through an external device.	1. Find the device that caused the external fault and remove the cause. 2. Clear the external fault input in the MFDI.
		The wiring is incorrect.	Correctly connect the signal line to MFDI terminal S1.

Code	Name	Causes	Possible Solutions
		External Fault [H1-01 = 20 to 2B] is set to MFDI terminal S1, but the terminal is not in use.	Correctly set the MFDI.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
EF2	External Fault (Terminal S2)	MFDI terminal S2 caused an external fault through an external device.	1. Find the device that caused the external fault and remove the cause. 2. Clear the external fault input in the MFDI.
		The wiring is incorrect.	Correctly connect the signal line to MFDI terminal S2.
		External Fault [H1-02 = 20 to 2B] is set to MFDI terminal S2, but the terminal is not in use.	Correctly set the MFDI.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
EF3	External Fault (Terminal S3)	MFDI terminal S3 caused an external fault through an external device.	1. Find the device that caused the external fault and remove the cause. 2. Clear the external fault input in the MFDI.
		The wiring is incorrect.	Correctly connect the signal line to MFDI terminal S3.
		External Fault [H1-03 = 20 to 2B] is set to MFDI terminal S3, but the terminal is not in use.	Correctly set the MFDI.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
EF4	External Fault (Terminal S4)	MFDI terminal S4 caused an external fault through an external device.	1. Find the device that caused the external fault and remove the cause. 2. Clear the external fault input in the MFDI.
		The wiring is incorrect.	Correctly connect the signal line to MFDI terminal S4.
		External Fault [H1-04 = 20 to 2B] is set to MFDI terminal S4, but the terminal is not in use.	Correctly set the MFDI.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
EF5	External Fault (Terminal S5)	MFDI terminal S5 caused an external fault through an external device.	1. Find the device that caused the external fault and remove the cause. 2. Clear the external fault input in the MFDI.
		The wiring is incorrect.	Correctly connect the signal line to MFDI terminal S5.
		External Fault [H1-05 = 20 to 2B] is set to MFDI terminal S5, but the terminal is not in use.	Correctly set the MFDI.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
EF6	External Fault (Terminal S6)	MFDI terminal S6 caused an external fault through an external device.	1. Find the device that caused the external fault and remove the cause. 2. Clear the external fault input in the MFDI.
		The wiring is incorrect.	Correctly connect the signal line to MFDI terminal S6.
		External Fault [H1-06 = 20 to 2B] is set to MFDI terminal S6, but the terminal is not in use.	Correctly set the MFDI.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
EF7	External Fault (Terminal S7)	MFDI terminal S7 caused an external fault through an external device.	1. Find the device that caused the external fault and remove the cause. 2. Clear the external fault input in the MFDI.
		The wiring is incorrect.	Correctly connect the signal line to MFDI terminal S7.
		External Fault [H1-07 = 20 to 2B] is set to MFDI terminal S7, but the terminal is not in use.	Correctly set the MFDI.
Note: Do a Fault Reset to clear the fault.			

Code	Name	Causes	Possible Solutions
Err	EEPROM Write Error	There was a problem with the EEPROM hardware.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. Contact Yaskawa or your nearest sales representative to replace the board.
		Electrical interference corrupted the data while it was writing to the EEPROM of the drive.	• Push ENTER Key. • Set the parameters again.

Note:
Do a Fault Reset to clear the fault.

Code	Name	Causes	Possible Solutions
FAn1	Drive Cooling Fan Fault	The cooling fan stopped operating correctly.	• Examine cooling fan operation. • Re-energize the drive. • Examine *U4-03 [Cooling Fan Ope Time]* and *U4-04 [Cool Fan Maintenance]*. If the performance life of the cooling fan is expired or if there is damage to the fan, replace the fan.
		The circulation fan is damaged.	• Examine circulation fan operation. • Re-energize the drive. • Examine *U4-03 [Cooling Fan Ope Time]* and *U4-04 [Cool Fan Maintenance]*. If there is damage to the circulation fan or if the performance life of the fan is expired, replace the fan.

Note:
Do a Fault Reset to clear the fault.

Code	Name	Causes	Possible Solutions
FDBKL	WIRE Break	The analog input from the terminal set for *PID Feedback [H3-xx = B]* is more than 21mA or less than 3mA for longer than 1 s in these conditions: • *b5-82 = 2 [Feedback Loss 4 ~ 20mA Detect Sel = Fault]* • *b5-01 ≠ 0 [PID Mode Setting ≠ Disabled]* • *H3-01 or H3-09 = 2 [Terminal A1/A2 Signal Level Selection = 4 to 20 mA]*	Make sure that you install the PID feedback source and it operates correctly.

Note:
• Do a Fault Reset to clear the fault.
• If the drive detects this fault, it will operate the motor as specified by the settings of *b5-82*.
• Parameter *L5-42 [Feedback Loss Fault Retry Select]* sets the Auto Restart function of this fault.

Code	Name	Causes	Possible Solutions
GF	Ground Fault	Overheating caused damage to the motor or the motor insulation is not satisfactory.	Measure the motor insulation resistance, and replace the motor if there is electrical conduction or unserviceable insulation.
		The motor main circuit cable is contacting ground to make a short circuit.	• Examine the motor main circuit cable for damage, and repair short circuits. • Measure the resistance between the motor main circuit cable and the ground terminal. If there is electrical conduction, replace the cable.
		An increase in the stray capacitance of the cable and the ground terminal caused an increase in the leakage current.	• If the wiring length of the cable is more than 100 m, decrease the carrier frequency. • Decrease the stray capacitance.
		There was a problem with the drive hardware.	Replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.

Note:
• The drive detects this fault if a current short to ground was more than 50% of rated current on the output side of the drive.
• Do a Fault Reset to clear the fault.
• *L5-08 [Fault Reset Enable Select Grp2]* disables the Auto Restart function.

Code	Name	Causes	Possible Solutions
HFB	High Feedback Sensed	The feedback level is more than the level set in *Y1-11 [High Feedback Level]* for the time set in *Y1-12 [High Feedback Lvl Fault Dly Time]*.	• Decrease the feedback level less than *Y1-11*. • Set *Y1-11* and *Y1-12* correctly.

Note:
• Do a Fault Reset to clear the fault.
• If the drive detects this fault, it will respond as specified by the setting of *Y1-13 [High Feedback Selection]*.
• Parameter *L5-41 [Hi Feedback Flt Retry Selection]* sets the Auto Restart function of this fault.

Code	Name	Causes	Possible Solutions
HIAUX	High PI Aux Feedback Level	PI Auxiliary Feedback is more than the level set in *YF-12 [PI Aux Control High Level Detect]* for the time set in *YF-13 [PI Aux High Level Detection Time]* in these conditions: • The drive operates in AUTO Mode. • The output frequency > 0.	• Decrease the PI Auxiliary Feedback level less than *YF-12*. • Set *YF-12* and *YF-13* correctly.
Note: • Do a Fault Reset to clear the fault. • Parameter *YF-14 [PI Aux Hi Level Detection Select]* sets the Auto Restart function of this fault.			
Code	**Name**	**Causes**	**Possible Solutions**
HLCE	High Level Communication Errors	Communication data error occurred between the option and the master drive when you use Gateway function. The master drive detects *oFxxx* and the slave drive detects *HLCE*.	Examine the wiring between the option and the master drive and remove the cause of the fault.
Note: This fault occurs when the drive is a slave drive in Gateway Mode *[F6-16 ≠ 0]* and communication is lost from the master.			
Code	**Name**	**Causes**	**Possible Solutions**
LF	Output Phase Loss	The motor main circuit cable is disconnected.	Connect motor main circuit cable wiring. Correct wiring errors in the main circuit drive input power.
		There is a disconnection in the motor coil winding.	If a coil is disconnected, measure the motor Line-to-Line Resistance and replace the motor.
		The screws on the drive output terminals are loose.	Tighten the terminal screws to the correct tightening torque.
		The rated output current of the motor is less than 5% of the drive rated current.	Examine the drive capacity or the motor output to be applied.
		You are trying to use a single-phase motor.	The drive cannot operate a single-phase motor.
		The output transistor in the drive is damaged.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • The drive detects this fault if phase loss occurs on the output side of the drive. • Do a Fault Reset to clear the fault. • Set *L8-07 [Output Phase Loss Protection Sel]* to enable and disable *LF* detection.			
Code	**Name**	**Causes**	**Possible Solutions**
LF2	Output Current Imbalance	Phase loss occurred in the wiring on the output side of the drive.	Examine for wiring errors or disconnected wires on the output side of the drive, and repair problems.
		The output terminal screws of the drive are loose.	Tighten the terminal screws to the correct tightening torque.
		There is not balance between the three phases of the PM motor impedance.	• Measure the Line-to-Line Resistance for each motor phase and make sure that resistance is equal in the three phases, and that all wires are connected correctly. • Replace the motor.
		The drive output circuit is broken.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • The drive detects this fault if there is not balance between the three phases of the output current from the PM motor. • Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
LFB	Low Feedback Sensed	The feedback level is less than the level set in *Y1-08 [Low Feedback Level]* for the time set in *Y1-09 [Low Feedback Lvl Fault Dly Time]*.	• Increase the feedback level to more than *Y1-08*. • Set *Y1-08* and *Y1-09* correctly.
Note: • Do a Fault Reset to clear the fault. • If the drive detects this fault, it will respond as specified by the setting of *Y1-10 [Low Feedback Selection]*. • Parameter *L5-40 [Low Feedback Flt Retry Selection]* sets the Auto Restart function of this fault.			

Code	Name	Causes	Possible Solutions
LOAUX	Low PI Aux Feedback Level	When the drive operates in AUTO Mode or HAND Mode, PI Auxiliary Feedback is less than the level set in *YF-09 [PI Aux Control Low Lvl Detection]* for the time set in *YF-10 [PI Aux Control Low Lvl Det Time]* and the drive is running.	• Increase the PI Auxiliary Feedback level to be more than *YF-09*. • Set *YF-09* and *YF-10* correctly.
Note: • Do a Fault Reset to clear the fault. • Parameter *YF-11 [PI Aux Control Low Level Det Sel]* sets the Auto Restart function of this fault.			
Code	**Name**	**Causes**	**Possible Solutions**
LOP	Loss of Prime	The drive used the *Y1-18 [Prime Loss Detection Method]* setting and measured a pump load that is less than the level set in *Y1-19 [Prime Loss Level]* for the time set in *Y1-20 [Prime Loss Time]*, and the output frequency is *Y1-21 [Prime Loss Activation Freq]* or more.	• Examine for a dry well, air in the system, or no water in the system. Use preferred priming method suggested by the pump manufacturer to restart the pump. • When there is resistance in the pump, let the system pump water again. • Set *Y1-18* to *Y1-21* correctly.
Note: • Do a Fault Reset to clear the fault. • If the drive detects this fault, it will respond as specified by the setting of *Y1-22 [Prime Loss Selection]*. • Parameters *L5-51 [Loss of Prime Fault Retry Select]* and *Y1-23 [Prime Loss Max Restart Time]* set the Auto Restart function of this fault.			
Code	**Name**	**Causes**	**Possible Solutions**
MSL	Net Master Lost	When *Y9-27 = 3 [Network Recovery = Fault MSL]* and the drive does not receive message from the master within the time set in *Y9-26 [Master Time-out]*.	• Increase *Y9-26* to account for network latency. • Make sure that there is a drive on the network with parameters set to *Y1-01 = 3 [Multiplex Mode = Memobus Network]* and *Y9-27 = 0 [Automatic]*. • Examine network connections and the settings of *H5-01 [Drive Node Address]* and *Y9-25 [Highest Node Address]* for all drives on the network.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
NMS	Setpoint Not Met	The feedback deviates from the setpoint at a level more than *Y1-15 [Maximum Setpoint Difference]* for the time set in *Y1-16 [Not Maintaining Setpoint Time]*.	• Examine for a blocked impeller, over cycling, or broken pipe. • Set *Y1-15* and *Y1-16* correctly.
Note: • Do a Fault Reset to clear the fault. • If the drive detects this fault, it will respond as specified by the setting of *Y1-17 [Not Maintaining Setpoint Sel]*. • Parameter *L5-50 [Setpoint Not Met Fault Retry Sel]* sets the Auto Restart function of this fault.			
Code	**Name**	**Causes**	**Possible Solutions**
nSE	Node Setup Error	The drive received a Run command while the Node Setup function was active.	Stop the drive when the Node Setup function is in use.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
oC	Overcurrent	The load is too large.	• Measure the current flowing into the motor. • Replace the drive with a larger capacity model if the current value is more than the drive rated current. • Decrease the load or replace with a larger drive to prevent sudden changes in the current level.
		Overheating caused damage to the motor or the motor insulation is not satisfactory.	Measure the motor insulation resistance, and replace the motor if there is electrical conduction or unserviceable insulation.
		The motor main circuit cable is contacting ground to make a short circuit.	• Examine the motor main circuit cable for damage, and repair short circuits. • Measure the resistance between the motor main circuit cable and the ground terminal. If there is electrical conduction, replace the cable.
		A short circuit or ground fault on the drive output side caused damage to the output transistor of the drive.	• Make sure that there is not a short circuit in terminals - and terminals U/T1, V/T2, and W/T3. • If there is a short circuit, contact Yaskawa or your nearest sales representative.
		The acceleration time is too short.	• Calculate the torque necessary during acceleration related to the load inertia and the specified acceleration time. • Increase the values set in *C1-01 or C1-03 [Acceleration Times]* to get the necessary torque. • Increase the values set in *C2-01 to C2-04 [S-Curve Characteristics]* to get the necessary torque. • Replace the drive with a larger capacity model.

Code	Name	Causes	Possible Solutions
		The drive is trying to operate a specialized motor or a motor that is larger than the maximum applicable motor output of the drive.	• Examine the motor nameplate, the motor, and the drive to make sure that the drive rated current is larger than the motor rated current. • Replace the drive with a larger capacity model.
		A magnetic contactor was switched at the output.	Set the operation sequence to not turn ON or OFF the magnetic contactor while the drive is outputting voltage.
		The V/f pattern settings are incorrect.	• Examine the ratios between the V/f pattern frequency and voltage. Decrease the voltage if it is too high compared to the frequency. • Adjust *E1-04 to E1-10 [V/f Pattern Parameters]*. For motor 2, adjust *E3-04 to E3-10*.
		The torque compensation gain is too large.	Decrease the value set in *C4-01 [Torque Compensation Gain]* to make sure that the motor does not stall.
		Electrical interference caused a problem.	Examine the control circuit lines, main circuit lines, and ground wiring, and decrease the effects of electrical interference.
		The gain during overexcitation operation is too large.	• Find the time when the fault occurs. • If the fault occurs at the same time as overexcitation operation, decrease the value set in *n3-13 [OverexcitationBraking (OEB) Gain]* and consider the motor flux saturation.
		The drive received a Run command while the motor was coasting.	• Examine the sequence and input the Run command after the motor fully stops. • Set *b3-01 = 1 [Speed Search at Start Selection = Enabled]* or set *H1-xx = 61, 62 [Speed Search from Fmax or Fref]* to input speed search commands from the MFDI terminals.
		The motor code setting is incorrect for PM Control Methods.	• Enter the correct motor code to *E5-01 [PM Motor Code Selection]* as specified by the PM motor. • For specialized motors, refer to the motor test report and set *E5-xx [PM Motor Settings]* correctly.
		The current flowing in the motor is more than the value set in *L8-27 [Overcurrent Detection Gain]* for PM Control Methods.	Correct the value set in *L8-27*.
		The control method is set incorrectly for the motor.	Set *A1-02 [Control Method Selection]* correctly.
		The motor main circuit cable is too long.	Replace the drive with a larger capacity model.
		Speed search does not complete at start when *A1-02 = 8 [EZ Vector Control]* and you use an induction motor.	When *E9-01 = 0 [Motor Type Selection = Induction (IM)]*, set *b3-24 = 2 [Speed Search Method Selection = Current Detection Speed Search]*.
		The relay or contactor on the soft-charge bypass relay is damaged.	• Re-energize the drive. • If the fault stays, replace the control board or the drive.
		An overcurrent condition occurred during overexcitation deceleration.	• Decrease the value set in *n3-13 [OverexcitationBraking (OEB) Gain]*. • Decrease the value set in *n3-21 [HSB Current Suppression Level]*.

Note:
• This fault occurs if the drive sensors detect a drive output current more than the specified overcurrent detection level.
• Do a Fault Reset to clear the fault.

Code	Name	Causes	Possible Solutions
OD	Output Disconnect	The output circuit between the drive and the motor is open, and the drive output current is less than 5% of *E2-01 [Motor Rated Current (FLA)]*.	Close the disconnected output circuit between the drive and the motor.

Note:
• Do a Fault Reset to clear the fault.
• If the drive detects this fault, it will respond as specified by the setting of *Y4-42 [Output Disconnect Detection Sel]*.

Code	Name	Causes	Possible Solutions
oFA00	Option Not Compatible with Port	The option card connected to connector CN5 is not compatible.	Connect the option card to the correct connector. **Note:** Encoder option cards are not compatible with connector CN5.

Note:
• Do a Fault Reset to clear the fault.
• Fault trace is not available for this fault.

Code	Name	Causes	Possible Solutions
oFA01	Option Fault/Connection Error	The option card connected to connector CN5 is not compatible.	1. De-energize the drive. 2. Refer to the option card manual and correctly connect the option card to the connector on the drive.

Note:
Do a Fault Reset to clear the fault.

Code	Name	Causes	Possible Solutions
oFA05	Option A/D Error	A fault occurred in the option card.	1. De-energize the drive. 2. Make sure that the option card is correctly connected to the connector. 3. If the problem continues, replace the option card.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
oFA06	Option Communication Error	A fault occurred in the option card.	1. De-energize the drive. 2. Make sure that the option card is correctly connected to the connector. 3. If the problem continues, replace the option card.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
oFA10	Option RAM Error	A fault occurred in the option card.	1. De-energize the drive. 2. Make sure that the option card is correctly connected to the connector. 3. If the problem continues, replace the option card.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
oFA11	Option Ope Mode Error	A fault occurred in the option card.	1. De-energize the drive. 2. Make sure that the option card is correctly connected to the connector. 3. If the problem continues, replace the option card.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
oFA12	Drive Receive CRC Error	A fault occurred in the option card.	1. De-energize the drive. 2. Make sure that the option card is correctly connected to the connector. 3. If the problem continues, replace the option card.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
oFA13	Drive Receive Frame Error	A fault occurred in the option card.	1. De-energize the drive. 2. Make sure that the option card is correctly connected to the connector. 3. If the problem continues, replace the option card.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
oFA14	Drive Receive Abort Error	A fault occurred in the option card.	1. De-energize the drive. 2. Make sure that the option card is correctly connected to the connector. 3. If the problem continues, replace the option card.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
oFA15	Option Receive CRC Error	A fault occurred in the option card.	1. De-energize the drive. 2. Make sure that the option card is correctly connected to the connector. 3. If the problem continues, replace the option card.
Note: Do a Fault Reset to clear the fault.			

Code	Name	Causes	Possible Solutions
oFA16	Option Receive Frame Error	A fault occurred in the option card.	1. De-energize the drive. 2. Make sure that the option card is correctly connected to the connector. 3. If the problem continues, replace the option card.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
oFA17	Option Receive Abort Error	A fault occurred in the option card.	1. De-energize the drive. 2. Make sure that the option card is correctly connected to the connector. 3. If the problem continues, replace the option card.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
oFA30	COM ID Error	A fault occurred in the option card.	1. De-energize the drive. 2. Make sure that the option card is correctly connected to the connector. 3. If the problem continues, replace the option card.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
oFA31	Type Code Error	A fault occurred in the option card.	1. De-energize the drive. 2. Make sure that the option card is correctly connected to the connector. 3. If the problem continues, replace the option card.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
oFA32	SUM Check Error	A fault occurred in the option card.	1. De-energize the drive. 2. Make sure that the option card is correctly connected to the connector. 3. If the problem continues, replace the option card.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
oFA33	Option Receive Time Over	A fault occurred in the option card.	1. De-energize the drive. 2. Make sure that the option card is correctly connected to the connector. 3. If the problem continues, replace the option card.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
oFA34	Memobus Time Over	A fault occurred in the option card.	1. De-energize the drive. 2. Make sure that the option card is correctly connected to the connector. 3. If the problem continues, replace the option card.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
oFA35	Drive Receive Time Over 1	A fault occurred in the option card.	1. De-energize the drive. 2. Make sure that the option card is correctly connected to the connector. 3. If the problem continues, replace the option card.
Note: Do a Fault Reset to clear the fault.			

Code	Name	Causes	Possible Solutions
oFA36	CI Check Error	A fault occurred in the option card.	1. De-energize the drive. 2. Make sure that the option card is correctly connected to the connector. 3. If the problem continues, replace the option card.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
oFA37	Drive Receive Time Over 2	A fault occurred in the option card.	1. De-energize the drive. 2. Make sure that the option card is correctly connected to the connector. 3. If the problem continues, replace the option card.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
oFA38	Control Reference Error	A fault occurred in the option card.	1. De-energize the drive. 2. Make sure that the option card is correctly connected to the connector. 3. If the problem continues, replace the option card.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
oFA39	Drive Receive Time Over 3	A fault occurred in the option card.	1. De-energize the drive. 2. Make sure that the option card is correctly connected to the connector. 3. If the problem continues, replace the option card.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
oFA40	CtrlResSel 1Err	A fault occurred in the option card.	1. De-energize the drive. 2. Make sure that the option card is correctly connected to the connector. 3. If the problem continues, replace the option card.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
oFA41	Drive Receive Time Over 4	A fault occurred in the option card.	1. De-energize the drive. 2. Make sure that the option card is correctly connected to the connector. 3. If the problem continues, replace the option card.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
oFA42	CtrlResSel 2Err	A fault occurred in the option card.	1. De-energize the drive. 2. Make sure that the option card is correctly connected to the connector. 3. If the problem continues, replace the option card.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
oFA43	Drive Receive Time Over 5	A fault occurred in the option card.	1. De-energize the drive. 2. Make sure that the option card is correctly connected to the connector. 3. If the problem continues, replace the option card.
Note: Do a Fault Reset to clear the fault.			

Code	Name	Causes	Possible Solutions
oH	Heatsink Overheat	The ambient temperature is high and the heatsink temperature of the drive is more than the value set in *L8-02 [Overheat Alarm Level]*.	• Measure the ambient temperature. • Increase the airflow in the control panel. • Install a cooling device (cooling fan or air conditioner) to lower the ambient temperature. • Remove objects near the drive that are producing too much heat.
		The load is too heavy.	• Measure the output current. • Decrease the load. • Decrease the value set in *C6-02 [Carrier Frequency Selection]*.
		The internal cooling fan of the drive stopped.	1. Use the procedures in this manual to replace the cooling fan. 2. Set *o4-03 = 0 [Fan Operation Time Setting = 0 h]*.

Note:
• The drive detects this fault if the heatsink temperature of the drive is more than the value set in *L8-02*.
• Do a Fault Reset to clear the fault.
• If the drive detects this fault, it will operate the motor as specified by the Stopping Method set in *L8-03 [Overheat Pre-Alarm Selection]*.

Code	Name	Causes	Possible Solutions
oH1	Heatsink Overheat	The ambient temperature is high and the heatsink temperature of the drive is more than the *oH1* detection level.	• Measure the ambient temperature. • Increase the airflow in the control panel. • Install a cooling device (cooling fan or air conditioner) to lower the ambient temperature. • Remove objects near the drive that are producing too much heat.
		The load is too heavy.	• Measure the output current. • Decrease the load. • Decrease the value set in *C6-02 [Carrier Frequency Selection]*.

Note:
• The drive detects this fault if the heatsink temperature of the drive is more than the *oH1* detection level. *o2-04 [Drive Model (KVA) Selection]* determines the *oH1* detection level.
• Do a Fault Reset to clear the fault.
• *L5-08 [Fault Reset Enable Select Grp2]* disables the Auto Restart function.

Code	Name	Causes	Possible Solutions
oH3	Motor Overheat (PTC Input)	The thermistor wiring that detects motor temperature is defective.	Correct wiring errors.
		A fault occurred on the machine. Example: The machine is locked.	Examine the machine and remove the cause of the fault
		The motor has overheated.	• Check the load level, acceleration/deceleration time, and motor start/stop frequency (cycle time). • Decrease the load. • Increase the values set in *C1-01 to C1-04 [Acceleration/ Deceleration Times]*. • Set *E2-01 [Motor Rated Current (FLA)]* correctly to the value specified by the motor nameplate. • Make sure that the motor cooling system is operating correctly, and repair or replace it if it is damaged. • Adjust *E1-04 to E1-10 [V/f Pattern Parameters]*. For motor 2, adjust *E3-04 to E3-10*. Decrease the values set in *E1-08 [Mid Point A Voltage]* and *E1-10 [Minimum Output Voltage]*. **Note:** If the values set in *E1-08* and *E1-10* are too low, the overload tolerance will decrease at low speeds.

Note:
• When *H3-02 or H3-10 = E [MFAI Function Selection = Motor Temperature (PTC Input)]*, the drive detects this fault if the motor overheat signal entered to analog input terminals A1 or A2 is more than the alarm detection level.
• Do a Fault Reset to clear the fault.
• If the drive detects this fault, it will operate the motor as specified by the Stopping Method set in *L1-03 [Motor Thermistor oH Alarm Select]*.

Code	Name	Causes	Possible Solutions
oH4	Motor Overheat Fault (PTC Input)	The motor has overheated.	• Check the load level, acceleration/deceleration time, and motor start/stop frequency (cycle time). • Decrease the load. • Increase the values set in *C1-01 to C1-04 [Acceleration/ Deceleration Times]*. • Set *E2-01 [Motor Rated Current (FLA)]* correctly to the value specified by the motor nameplate. • Make sure that the motor cooling system is operating correctly, and repair or replace it if it is damaged. • Adjust *E1-04 to E1-10 [V/f Pattern Parameters]*. For motor 2, adjust *E3-04 to E3-10*. Decrease the values set in *E1-08 [Mid Point A Voltage]* and *E1-10 [Minimum Output Voltage]*. **Note:** If *E1-08* and *E1-10* are set too low, the overload tolerance will decrease at low speeds.

Note:
• The drive detects this fault if the motor overheat signal that was entered to an analog input terminals A1or A2 is more than the alarm detection level. (If *H3-02 or H3-10= E [MFAI Function Select = Motor Temperature (PTC Input)]* was set.)
• Do a Fault Reset to clear the fault.

Code	Name	Causes	Possible Solutions
oL1	Motor Overload	The load is too heavy.	Decrease the load. **Note:** Reset *oL1* when *U4-16 [Motor oL1 Level]* < 100.
		The acceleration/deceleration times or cycle times are too short.	• Examine the acceleration/deceleration times and the motor start/ stop frequencies (cycle times). • Increase the values set in *C1-01 to C1-04 [Acceleration/ Deceleration Times]*.
		Overload occurred while running at low speed.	• Decrease the load when running at low speed. • Increase the motor speed. • If the motor is run frequently at low speeds, replace the motor with a larger motor or use a drive-dedicated motor. **Note:** For general-purpose motors, overload can occur while running at low speed when operating at below the rated current.
		L1-01 [Motor Overload (oL1) Protection] is set incorrectly.	Set *L1-01* in as specified by the motor qualities for a drive-dedicated motor.
		The V/f pattern does not fit the motor qualities.	• Examine the ratios between the V/f pattern frequency and voltage. Decrease the voltage if it is too high compared to the frequency. • Adjust *E1-04 to E1-10 [V/f Pattern Parameters]*. For motor 2, adjust *E3-04 to E3-10*. Decrease the values set in *E1-08 [Mid Point A Voltage]* and *E1-10 [Minimum Output Voltage]*. **Note:** If the values set in *E1-08* and *E1-10* are too low, the overload tolerance will decrease at low speeds.
		E1-06 [Base Frequency] is set incorrectly.	Set *E1-06* to the rated frequency shown on the motor nameplate.
		One drive is operating more than one motor.	Set *L1-01 = 0 [Motor Overload (oL1) Protection = Disabled]*, connect thermal overload relay to each motor to prevent damage to the motor.
		The electronic thermal protector qualities and the motor overload properties do not align.	• Examine the motor qualities and set *L1-01 [Motor Overload (oL1) Protection]* correctly. • Connect a thermal overload relay to the motor.
		The electronic thermal protector is operating at an incorrect level.	Set *E2-01 [Motor Rated Current (FLA)]* correctly to the value specified by the motor nameplate.
		There is increased motor loss from overexcitation operation.	• Lower the value set in *n3-13 [OverexcitationBraking (OEB) Gain]*. • Set *L3-04 ≠ 4 [Stall Prevention during Decel ≠ Overexcitation/ High Flux]*. • Set *n3-23 = 0 [Overexcitation Braking Operation = Disabled]*.
		The speed search-related parameters are set incorrectly.	• Examine the settings for all speed search related parameters. • Adjust *b3-03 [Speed Search Deceleration Time]*. • Set *b3-24 = 1 [Speed Search Method Selection = Speed Estimation]* after Auto-Tuning.
		Phase loss in the input power supply is causing the output current to change.	Make sure that there is no phase loss, and repair problems.

Code	Name	Causes	Possible Solutions
		Overload occurred during overexcitation deceleration.	• Decrease the value set in *n3-13 [OverexcitationBraking (OEB) Gain]*. • Decrease the value set in *n3-21 [HSB Current Suppression Level]*.

Note:
• The drive detects this fault if the electronic thermal protector of the drive started the motor overload protection.
• Do a Fault Reset to clear the fault.
• *L5-07 [Fault Reset Enable Select Grp1]* disables the Auto Restart function.

Code	Name	Causes	Possible Solutions
oL2	Drive Overload	The load is too large.	Decrease the load.
		The acceleration/deceleration times or cycle times are too short.	• Examine the acceleration/deceleration times and the motor start/stop frequencies (cycle times). • Increase the values set in *C1-01 to C1-04 [Acceleration/Deceleration Times]*.
		The V/f pattern does not fit the motor qualities.	• Examine the ratios between the V/f pattern frequency and voltage. Decrease the voltage if it is too high compared to the frequency. • Adjust *E1-04 to E1-10 [V/f Pattern Parameters]*. Decrease the values set in *E1-08 [Mid Point A Voltage]* and *E1-10 [Minimum Output Voltage]*. For motor 2, adjust *E3-04 to E3-10*. **Note:** If the values set in *E1-08* and *E1-10* are too low, the overload tolerance will decrease at low speeds.
		The drive capacity is too small.	Replace the drive with a larger capacity model.
		Overload occurred while running at low speed.	• Decrease the load when running at low speed. • Replace the drive with a larger capacity model. • Decrease the value set in *C6-02 [Carrier Frequency Selection]*.
		The torque compensation gain is too large.	Decrease the value set in *C4-01 [Torque Compensation Gain]* to make sure that the motor does not stall.
		The speed search-related parameters are set incorrectly.	• Examine the settings for all speed search-related parameters. • Adjust *b3-03 [Speed Search Deceleration Time]*. • Set *b3-24 = 1 [Speed Search Method Selection = Speed Estimation]* after Auto-Tuning.
		Phase loss in the input power supply is causing the output current to change.	• Correct errors with the wiring for main circuit drive input power. • Make sure that there is no phase loss, and repair problems.
		Overload occurred during overexcitation deceleration.	• Decrease the value set in *n3-13 [OverexcitationBraking (OEB) Gain]*. • Decrease the value set in *n3-21 [HSB Current Suppression Level]*.

Note:
• The drive detects this fault if the electronic thermal protector of the drive started the drive overload protection.
• Do a Fault Reset to clear the fault.
• *L5-07 [Fault Reset Enable Select Grp1]* disables the Auto Restart function.

Code	Name	Causes	Possible Solutions
oL3	Overtorque Detection 1	A fault occurred on the machine. Example: The machine is locked.	Examine the machine and remove the cause of the fault.
		The parameters are incorrect for the load.	Adjust *L6-02 [Torque Detection Level 1]* and *L6-03 [Torque Detection Time 1]* settings.

Note:
• The drive detects this fault if the drive output current is more than the level set in *L6-02* for longer than *L6-03*.
• Do a Fault Reset to clear the fault.
• If the drive detects this fault, it will operate the motor as specified by the Stopping Method set in *L6-01 [Torque Detection Selection 1]*.
• *L5-07 [Fault Reset Enable Select Grp1]* disables the Auto Restart function.

Code	Name	Causes	Possible Solutions
oL4	Overtorque Detection 2	A fault occurred on the machine. Example: The machine is locked.	Examine the machine and remove the cause of the fault.
		The parameters are incorrect for the load.	Adjust *L6-05 [Torque Detection Level 2]* and *L6-06 [Torque Detection Time 2]* settings.

Note:
• The drive detects this fault if the drive output current is more than the level set in *L6-05* for longer than *L6-06*.
• Do a Fault Reset to clear the fault.
• If the drive detects this fault, it will operate the motor as specified by the Stopping Method set in *L6-04 [Torque Detection Selection 2]*.
• *L5-07 [Fault Reset Enable Select Grp1]* disables the Auto Restart function.

Code	Name	Causes	Possible Solutions
oL7	High Slip Braking Overload	The load inertia is too large.	Decrease deceleration times in *C1-02 and C1-04 [Deceleration Times]* for applications that do not use High Slip Braking.
		An external force on the load side rotated the motor.	
		Something is preventing deceleration on the load side.	
		The value set in *n3-04 [HSB Overload Time]* is too small.	• Increase the value set in *n3-04*. • Connect a thermal overload relay to the motor, and set *n3-04 = 1200 s (maximum value)*.

Note:
• The drive detects this fault if the output frequency is constant for longer than *n3-04*.
• Do a Fault Reset to clear the fault.

Code	Name	Causes	Possible Solutions
oPr	Keypad Connection Fault	The keypad is not securely connected to the connector on the drive.	Examine the connection between the keypad and the drive.
		The connection cable between the drive and the keypad is disconnected.	• Remove the keypad and connect it again. • If the cable is damaged, replace it.

Note:
• The drive detects this fault if these conditions are correct:
– *o2-06 = 1 [Keypad Disconnect Detection = Enabled]*.
– *b1-02 = 0 [Run Command Selection 1 = Keypad]*, or the drive is operating in HAND Mode with the keypad.
• Do a Fault Reset to clear the fault.

Code	Name	Causes	Possible Solutions
oS	Overspeed	There is overshoot.	Decrease *C5-01 [ASR Proportional Gain 1]* and increase *C5-02 [ASR Integral Time 1]*.

Note:
Do a Fault Reset to clear the fault.

Code	Name	Causes	Possible Solutions
ov	Overvoltage	Deceleration time is too short and regenerative energy is flowing from the motor into the drive.	• Set *L3-04 = 1 [Stall Prevention during Decel = General Purpose]*. • Increase the values set in *C1-02 or C1-04 [Deceleration Times]*. • Perform Deceleration Rate Auto-Tuning.
		The acceleration time is too short.	• Make sure that sudden drive acceleration does not cause the fault. • Increase the values set in *C1-01 or C1-03 [Acceleration Times]*. • Increase the value set in *C2-02 [S-Curve Time @ End of Accel]*. • Set *L3-11 = 1 [Overvoltage Suppression Select = Enabled]*.
		The drive output cable or motor is shorted to ground (the current short to ground is charging the main circuit capacitor of the drive through the power supply).	1. Examine the motor main circuit cable, terminals, and motor terminal box, and then remove ground faults. 2. Re-energize the drive.
		If the drive detects *ov* in these conditions, the speed search-related parameters are incorrect: • During speed search • During momentary power loss recovery • When the drive starts again automatically • When you set *A1-02 = 0 [Control Method Selection = V/f Control]* and do rotational Auto-Tuning	• Examine the settings for all speed search related parameters. • Set *b3-19 ≠ 0 [Speed Search Restart Attempts ≠ 0 times]*. • Adjust *b3-03 [Speed Search Deceleration Time]* setting. • Do Stationary Auto-Tuning for Line-to-Line Resistance and then set *b3-24 = 1 [Speed Search Method Selection = Speed Estimation]*. • Increase the value set in *L2-04 [Powerloss V/f Recovery Ramp Time]*.
		The power supply voltage is too high.	Decrease the power supply voltage to align with the drive rated voltage.
		Electrical interference caused a drive malfunction.	• Examine the control circuit lines, main circuit lines, and ground wiring, and decrease the effects of electrical interference. • Make sure that a magnetic contactor is not the source of the electrical interference, then use a Surge Protective Device if necessary.
		The load inertia is set incorrectly.	• Examine the load inertia settings with KEB, overvoltage suppression, or stall prevention during deceleration. • Adjust *L3-25 [Load Inertia Ratio]* to align with the qualities of the machine.
		The Short Circuit Braking function was used in OLV/PM control method.	Connect a braking resistor to the drive.
		There is motor hunting.	• Adjust *n1-02 [Hunting Prevention Gain Setting]* settings. • Adjust *n8-45 [Speed Feedback Detection Gain]* and *n8-47 [Pull-in Current Comp Filter Time]* settings.

Code	Name	Causes	Possible Solutions
		Speed search does not complete at start when you use an induction motor in EZOLV control.	When *E9-01 = 0 [Motor Type Selection = Induction (IM)]*, set *b3-24 = 2 [Speed Search Method Selection = Current Detection 2]*.

Note:
• The drive detects this error if the DC bus voltage is more than the *ov* detection level while the drive is running.
• The *ov* detection level is approximately 410 V with 208 V class drives. The detection level is approximately 820 V with 480 V class drives.
• Do a Fault Reset to clear the fault.
• Parameter *L5-08 [Fault Reset Enable Select Grp2]* disables the Auto Restart function.

Code	Name	Causes	Possible Solutions
ov2	DC Bus Overvoltage 2	The wiring is too long and DC bus voltage is too large.	• Shorten the shielded motor cable. • Decrease the carrier frequency. • If the power supply has a neutral ground, switch on the internal EMC filter.

Note:
• The drive detects this fault when the DC bus voltage increases to more than the Stall Prevention Level during Deceleration for the time set in *S6-23 [OV2 Detect Time]*.
• Do a Fault Reset to clear the fault.
• This fault is resettable, but will not auto-restart.

Code	Name	Causes	Possible Solutions
PE1, PE2	PLC Faults	The communication option detected a fault.	Refer to the manual for the communication option card.

Note:
Do a Fault Reset to clear the fault.

Code	Name	Causes	Possible Solutions
PF	Input Phase Loss	There is a phase loss in the drive input power.	Correct errors with the wiring for main circuit drive input power.
		There is loose wiring in the drive input power terminals.	Tighten the terminal screws to the correct tightening torque.
		The drive input power voltage is changing too much.	• Examine the input power for problems. • Make the drive input power stable. • If the input power supply is good, examine the magnetic contactor on the main circuit side for problems.
		There is unsatisfactory balance between voltage phases.	• Examine the input power for problems. • Make the drive input power stable. • Set *L8-05 = 0 [Input Phase Loss Protection Sel = Disabled]*.
		The main circuit capacitors have become unserviceable.	• Examine the capacitor maintenance time in monitor *U4-05 [CapacitorMaintenance]*. If *U4-05* is more than 90%, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative. • If drive input power is correct and the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.

Note:
• The drive detects this error if the DC bus voltage changes irregularly without regeneration.
• Do a Fault Reset to clear the fault.
• Use *L8-05* to enable and disable *PF* detection.

Code	Name	Causes	Possible Solutions
SC	Short Circuit/IGBT Failure	Overheating caused damage to the motor or the motor insulation is not satisfactory.	Measure the motor insulation resistance, and replace the motor if there is electrical conduction or unserviceable insulation.
		The motor main circuit cable is contacting ground to make a short circuit.	• Examine the motor main circuit cable for damage, and repair short circuits. • Measure the resistance between the motor main circuit cable and the ground terminal. If there is electrical conduction, replace the cable.
		A short circuit or ground fault on the drive output side caused damage to the output transistor of the drive.	• Make sure that there is not a short circuit in terminal B1 and terminals U/T1, V/T2, and W/T3. Make sure that there is not a short circuit in terminals - and terminals U/T1, V/T2, and W/T3. • If there is a short circuit, contact Yaskawa or your nearest sales representative.
		When *A1-02 = 5 [Control Method Selection = OLV/PM]*, the output current is more than the value set in *L8-27 [Overcurrent Detection Gain]*.	Set *L8-27* correctly.

Note:
• The drive detects this error if there is a short circuit or ground fault on the drive output side, or an IGBT failure.
• Do a Fault Reset to clear the fault.

Code	Name	Causes	Possible Solutions
SCF	Safety Circuit Fault	The safety circuit is broken.	Replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.

Note:
Do a Fault Reset to clear the fault.

Code	Name	Causes	Possible Solutions
SEr	Speed Search Retries Exceeded	The speed search-related parameters are set incorrectly.	• Decrease *b3-10 [Speed Estimation Detection Gain]*. • Increase *b3-17 [Speed Est Retry Current Level]*. • Increase *b3-18 [Speed Est Retry Detection Time]*. • Do Auto-Tuning again.
		The motor is coasting in the opposite direction of the Run command.	Set *b3-14 = 1 [Bi-directional Speed Search = Enabled]*.

Note:
• The drive detects this error if the number of speed search restarts is more than *b3-19 [Speed Search Restart Attempts]*.
• Do a Fault Reset to clear the fault.

Code	Name	Causes	Possible Solutions
STPo	Motor Step-Out Detected	The motor code is set incorrectly for PM Control Methods.	• Set *E5-01 [PM Motor Code Selection]* correctly as specified by the motor. • For specialized motors, refer to the motor test report and set *E5-xx* correctly.
		The load is too large.	• Increase the value set in *n8-55 [Motor to Load Inertia Ratio]*. • Increase the value set in *n8-51 [Pull-in Current @ Acceleration]*. If the drive detects *STPo* during deceleration when increasing the value set in *n8-51*, set the value of *n8-79 [Pull-in Current @ Deceleration]* lower than *n8-51*. • Decrease the load. • Replace the drive and motor with larger capacity models.
		The load inertia is too large.	Increase the value set in *n8-55*.
		The acceleration/deceleration times are too short.	• Increase the values set in *C1-01 to C1-04 [Acceleration/Deceleration Times]*. • Increase the value set in *C2-01 [S-Curve Time @ Start of Accel]*.
		Speed response is too slow.	Increase the value set in *n8-55*.

Note:
Do a Fault Reset to clear the fault.

Code	Name	Causes	Possible Solutions
TiM	Keypad Time Not Set	There is a battery in the keypad, but the date and time are not set.	Use the keypad to set the date and time.

Note:
• Do a Fault Reset to clear the fault.
• Parameter *o4-24 [bAT Detection Selection]* enables and disables *TiM* detection.

Code	Name	Causes	Possible Solutions
UL3	Undertorque Detection 1	A fault occurred on the machine. Example: There is a broken pulley belt.	Examine the machine and remove the cause of the fault.
		The parameters are incorrect for the load.	Adjust *L6-02 [Torque Detection Level 1]* and *L6-03 [Torque Detection Time 1]* settings.

Note:
• The drive detects this error if the drive output current is less than the level set in *L6-02* for longer than *L6-03*.
• Do a Fault Reset to clear the fault.
• If the drive detects this error, it will operate the motor as specified by the Stopping Method set in *L6-01 [Torque Detection Selection 1]*.

Code	Name	Causes	Possible Solutions
UL4	Undertorque Detection 2	A fault occurred on the machine. Example: There is a broken pulley belt.	Examine the machine and remove the cause of the fault.
		The parameters are incorrect for the load.	Adjust *L6-05 [Torque Detection Level 2]* and *L6-06 [Torque Detection Time 2]* settings.

Note:
• The drive detects this error if the drive output current is less than the level set in *L6-05* for longer than *L6-06*.
• Do a Fault Reset to clear the fault.
• If the drive detects this error, it will operate the motor as specified by the Stopping Method set in *L6-04 [Torque Detection Selection 2]*.

Code	Name	Causes	Possible Solutions
UL6	Underload or Belt Break Detected	The output current decreased less than the motor underload curve set in *L6-14 [Motor Underload Level @ Min Freq]* for longer than the time set in *L6-03 [Torque Detection Time 1]*.	Adjust the *L6-14* setting to set the output current to stay the level more than the motor underload curve during usual operations.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
Uv1	DC Bus Undervoltage	There is a phase loss in the drive input power.	Correct errors with the wiring for main circuit drive input power.
		There is loose wiring in the drive input power terminals.	Tighten the terminal screws to the correct tightening torque.
		The drive input power voltage is changing too much.	• Examine the input power for problems. • Make the drive input power stable. • If the input power supply is good, examine the magnetic contactor on the main circuit side for problems.
		There was a loss of power.	Use a better power supply.
		The main circuit capacitors have become unserviceable.	Examine the capacitor maintenance time in monitor *U4-05 [CapacitorMaintenance]*. If *U4-05* is more than 90%, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
		The relay or contactor on the soft-charge bypass relay is damaged.	*U4-06 [PreChargeRelayMainte]* shows the performance life of the soft-charge bypass relay. If *U4-06* is more than 90%, replace the board or the drive. For information about replacing the board, contact Yaskawa or your nearest sales representative.
Note: • The drive detects this error if the DC bus voltage decreases below the level set in *L2-05 [Undervoltage Detection Lvl (Uv1)]* while the drive is running. • The *Uv1* detection level is approximately 190 V for a 208 V class drives. The detection level is approximately 380 V for 480 V class drives. The detection level is approximately 350 V when *E1-01 [Input AC Supply Voltage]* < 400. • Do a Fault Reset to clear the fault. • Fault trace is not available for this fault. • *L5-08 [Fault Reset Enable Select Grp2]* disables the Auto Restart function.			
Code	**Name**	**Causes**	**Possible Solutions**
Uv2	Control Power Undervoltage	The value set in *L2-02 [Power Loss Ride Through Time]* increased and the momentary power loss recovery unit is not connected to the drive.	Connect the momentary power loss recovery unit to the drive.
		There was a problem with the drive hardware.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: • The drive detects this error if the control power supply voltage decreases. • Do a Fault Reset to clear the fault. • Fault trace is not available for this fault.			
Code	**Name**	**Causes**	**Possible Solutions**
Uv3	Soft Charge Answerback Fault	The relay or contactor on the soft-charge bypass relay is damaged.	• Re-energize the drive. • If the fault stays, replace the control board or the drive. • Check monitor *U4-06 [PreChargeRelayMainte]*, which shows the performance life of the soft-charge bypass relay. If *U4-06* is more than 90%, replace the board or the drive. For information about replacing the board, contact Yaskawa or your nearest sales representative.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for this fault.			
Code	**Name**	**Causes**	**Possible Solutions**
VLTS	Thermostat Fault	The digital input from the terminal set for *Thermostat Fault [H1-xx = 88]* is active.	Examine the wiring or wait for the motor to cool.
Note: • Do a Fault Reset to clear the fault. • Parameter *L5-53 [Thermostat Fault Retry Selection]* sets the Auto Restart function of this fault.			

2.5 Minor Faults/Alarms

This section gives information about the causes and possible solutions when a minor fault or alarm occurs. Use the information in this table to remove the cause of the minor fault or alarm.

Code	Name	Causes	Possible Solutions
AFBL	Analog Fbk Lost, Switched to Net	The analog input source is defective or broken.	• Make sure that you install the PID Feedback source and it operates correctly. • If the drive does not have an analog PID Feedback source, set *Y9-02 = 3 [System Feedback Source = Network Only]* to set the drive to read the network PID Feedback from another drive.
		The parameter setting is *H3-xx ≠ B [MFAI Function Selection ≠ PID Feedback]*.	• Set *H3-xx = B* to use the analog input source for PID Feedback. • If the drive does not have an analog PID Feedback source, set *Y9-02 = 3*.

Note:
If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
AuDis	Low PI Aux Fdbk Drive Disabled	• Parameter setting of *Y9-51 = 1 [PI Aux Control Turn-Off Method = Enabled]* does not let the drive operate in Memobus Multiplex. • PI Auxiliary Feedback is less than the *YF-06 [PI Aux Control Wake-up Level]* setting, and the drive is stopped or running as a Lag drive.	• Make sure that the *YF-06* setting is correct. • Wait for the PI Auxiliary Feedback to recover.

Note:
If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
AuFbl	PI Aux Fdbk Lost Switched to Net	The analog input source is defective or broken.	• Make sure that you install the Auxiliary PI Feedback source and it operates correctly. • Make sure that the *YF-19 [PI Aux Ctrl Feedback WireBreak]* setting is correct. • If there is no analog feedback, set *Y9-50 = 3 [PI Auxiliary Control Source = Network Only]* to set the drive to read the network Auxiliary PI Feedback from another drive.

Note:
• The drive detects this error if it detected a wire-break with the *PI Auxiliary Control Feedback [H3-xx = 27]* analog signal and it uses PI Auxiliary Feedback.
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
AUXFB	PI Aux Feedback Level Loss	The analog input from the terminal set to *H3-xx = 27 [MFAI Function Selection = PI Auxiliary Control Feedback Level]* is more than 21 mA or less than 3 mA for longer than 1 s.	Repair transducer or wiring.

Note:
If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
bAT	Keypad Battery Low Voltage	The keypad battery voltage is low.	Replace the keypad battery.

Note:
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.
• Set *o4-24 [bAT Detection Selection]* to enable/disable *bAT* detection.

Code	Name	Causes	Possible Solutions
bb	Baseblock	An external baseblock command was entered through one of the MFDI terminals Sx, and the drive output stopped as shown by an external baseblock command.	Examine the external sequence and timing of the baseblock command input.

Note:
The drive will not output a minor fault signal for this alarm.

Code	Name	Causes	Possible Solutions
bCE	Bluetooth Communication Error	The smartphone or tablet with DriveWizard Mobile is too far from the keypad.	Move to 10 m (32.8 ft) or less from the keypad. **Note:** *bCE* can occur when the smartphone or tablet is 10 m (32.8 ft) or nearer to the keypad for different smartphone and tablet specifications.
		Radio waves from a different device are causing interference with communications between the smartphone or tablet and keypad.	Make sure that no device around the keypad uses the same radio bandwidth (2400 MHz to 2480 MHz), and prevent radio interference.

Note:
• The drive detects this error when you use a smartphone or tablet and a Bluetooth LCD keypad to operate the drive.
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.
• Use *o2-27 [bCE Detection selection]* to enable and disable *bCE* detection.

Code	Name	Causes	Possible Solutions
BuDif	Main Fdbk Lost, Using Diff Fdbk	Parameter *Y4-41 = 1 [Diff Lvl Src Fdbk Backup Select = Enabled]* and the drive detected a wire-break on the analog input terminal set for *PID Feedback [H3-xx = B]*.	Examine the connection of the Main PID Feedback Transducer.
		Main PID Feedback Transducer is broken.	Replace Main PID Feedback Transducer.

Note:
• The drive detects this error if it does not receive the *PID Feedback* signal and it uses *Differential Feedback [H3-xx = 2D]* as backup.
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
Bu-Fb	Main Fdbk Lost Using Backup Fdbk	The drive detected wire-break on the analog input terminal set to *H3-xx = B [MFAI Function Selection = PID Feedback]*.	Examine the connection of the Main PID Feedback Transducer.
		Main PID Feedback Transducer is broken.	Replace Main PID Feedback Transducer.

Note:
If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
BuFbl	Backup Fdbk Lost Chk/Repl Xducer	The drive detected wire-break on the analog input terminal set for *PID Feedback Backup [H3-xx = 24]*.	Examine the connection of the Differential PID Feedback transducer.
		Backup PID Feedback Transducer is broken.	Replace Backup PID Feedback Transducer.
		Parameter *Y4-41 = 1 [Diff Lvl Src Fdbk Backup Select = Enabled]* and the drive detected a wire-break on the analog input terminal set for *Differential Level Source [H3-xx = 2D]*.	Examine the connection of the Differential PID Feedback transducer.
		Parameter *Y4-41 = 1* and the Differential PID Feedback Transducer is broken.	• Replace the Differential PID Feedback Transducer. • Set *Y4-41 = 0 [Disabled]*.

Note:
• The drive detects this error if it does not receive the *PID Feedback Backup* signal.
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
bUS	Option Communication Error	The communications cable wiring is incorrect.	Correct wiring errors.
		There is a short-circuit in the communications cable or the communications cable is not connected.	• Repair short circuits and connect cables. • Replace the defective communications cable.
		Electrical interference caused a communication data error.	• Examine the control circuit lines, main circuit lines, and ground wiring, and decrease the effects of electrical interference. • Make sure that a magnetic contactor is not the source of the electrical interference, then use a Surge Protective Device if necessary. • Use only the recommended cables or other shielded line. Ground the shield on the controller side or the drive input power side. • Separate the communication wiring from drive power lines, and install a noise filter to the input side of the power supply for communication. • Decrease the effects of electrical interference from the controller.
		The option card is incorrectly installed to the drive.	Correctly install the option card to the drive.
		The option card is damaged.	If the alarm continues and the wiring is correct, replace the option card.

Note:
• The drive detects this error if the Run command or frequency reference is assigned to the option card.
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.
• If the drive detects this error, it will operate the motor as specified by the stopping method set in *F6-01 [Communication Error Selection]*.

Code	Name	Causes	Possible Solutions
bUSy	Busy	You set the drive to use MEMOBUS/Modbus communications to change parameters, but you used the keypad to change parameters.	Use MEMOBUS/Modbus communications to enter the enter command, then use the keypad to change the parameter.
		You tried to change a parameter while the drive was changing setting.	Wait until the process is complete.

Code	Name	Causes	Possible Solutions
CALL	Serial Comm Transmission Error	The communications cable wiring is incorrect.	Correct wiring errors.
		There is a short circuit in the communications cable or the communications cable is not connected.	• Repair the short-circuited or disconnected portion of the cable. • Replace the defective communications cable.
		A programming error occurred on the controller side.	Examine communications at start-up and correct programming errors.

Code	Name	Causes	Possible Solutions
		There is damage to the communications circuitry.	• Do a self-diagnostics check. • If the problem continues, replace the control board or the drive. Contact Yaskawa or your nearest sales representative to replace the control board.
		The termination resistor setting for MEMOBUS/ Modbus communications is incorrect.	On the last drive in a MEMOBUS/Modbus network, set DIP switch S2 to the ON position to enable the termination resistor.

Note:
• The drive detects this error if it does not correctly receive control data from the controller when energizing the drive.
• If the drive detects this error, the terminal assigned to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.
• Parameter *H5-33 [Power-up CALL Alarm]* enables or disables the detection of this alarm at power-up.

Code	Name	Causes	Possible Solutions
CE	Modbus Communication Error	The communications cable wiring is incorrect.	Correct wiring errors.
		There is a short circuit in the communications cable or the communications cable is not connected.	• Repair short circuits and connect cables. • Replace the defective communications cable.
		Electrical interference caused a communication data error.	• Examine the control circuit lines, main circuit lines, and ground wiring, and decrease the effects of electrical interference. • Make sure that a magnetic contactor is not the source of the electrical interference, then use a Surge Protective Device if necessary. • Use only the recommended cables or other shielded line. Ground the shield on the controller side or the drive input power side. • Separate the communication wiring from drive power lines, and install a noise filter to the input side of the power supply for communication. • Decrease the effects of electrical interference from the controller.
		The communication protocol is not compatible.	• Examine the values set in *H5-xx*. • Examine the settings on the controller side and correct the difference in communication conditions.
		The value set in *H5-09 [CE Detection Time]* is too small for the communications cycle.	• Change the controller software settings. • Increase the value set in *H5-09*.
		The controller software or hardware is causing a communication problem.	Examine the controller and remove the cause of the problem.

Note:
• This alarm is a different alarm from *CE [Run at H5-34 (CE Go-To-Freq)]*. The keypad will show this alarm when:
– *H5-04 ≠ 4 [Communication Error Stop Method ≠ Run at H5-34 (CE Go-To-Freq)]*
– *H5-04 = 4* but the drive cannot operate at the selected frequency
• The drive detects this error if it does not correctly receive control data for the *CE* detection time set to *H5-09*.
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.
• If the drive detects this error, it will operate the motor as specified by the stopping method set in *H5-04*.

Code	Name	Causes	Possible Solutions
CE	Run at H5-34 (CE Go-To-Freq)	The communications cable wiring is incorrect.	Correct wiring errors.
		There is a short circuit in the communications cable or the communications cable is not connected.	• Repair short circuits and connect cables. • Replace the defective communications cable.
		Electrical interference caused a communication data error.	• Examine the control circuit lines, main circuit lines, and ground wiring, and decrease the effects of electrical interference. • Make sure that a magnetic contactor is not the source of the electrical interference, then use a Surge Protective Device if necessary. • Use only recommended shielded line. Ground the shield on the controller side or on the drive input power side. • Separate the communication wiring from drive power lines, and install a noise filter to the input side of the power supply for communication. • Decrease the effects of electrical interference from the controller.
		The communication protocol is not compatible.	• Examine the values set in *H5-xx*. • Examine the settings on the controller side and correct the difference in communication conditions.
		The value set in *H5-09 [CE Detection Time]* is too small for the communications cycle.	• Make sure that the settings are compatible. • Change the software settings in the PLC. • Increase the value set in *H5-09*.

Code	Name	Causes	Possible Solutions
		The controller software or hardware is causing a communication problem.	Examine the controller and remove the cause of the problem.

Note:
• This alarm is a different alarm from the standard *CE [Modbus Communication Error]*. The keypad will show this alarm only when *H5-04 = 4 [Communication Error Stop Method = Run at H5-34 (CE Go-To-Freq)]*. If the drive cannot operate at the selected frequency, the keypad will show the standard *CE* alarm.
• The drive detects this error if it does not correctly receive control data for the *CE* detection time set to *H5-09*.
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
CrST	Cannot Reset	The drive received a fault reset command when a Run command was active.	Turn off the Run command then de-energize and re-energize the drive.

Code	Name	Causes	Possible Solutions
CyPo	Cycle Power to Accept Changes	Although *F6-15 = 1 [Comm. Option Parameters Reload = Reload Now]*, the drive does not update the communication option parameters.	Re-energize the drive to update the communication option parameters.

Code	Name	Causes	Possible Solutions
dEv	Speed Deviation	The load is too heavy	Decrease the load.
		Acceleration and deceleration times are set too short.	Increase the values set in *C1-01 to C1-04 [Acceleration/ Deceleration Time]*.
		The *dEv* detection level settings are incorrect.	Adjust *F1-10 [Speed Deviation Detection Level]* and *F1-11 [Speed Deviation Detect DelayTime]*.
		The load is locked up.	Examine the machine.
		The holding brake is stopping the motor.	Release the holding brake.

Note:
• The drive detects this error if the difference between the detected speed and the speed reference is more than the setting of *F1-10* for longer than *F1-11*.
• If the drive detects this error, the terminal assigned to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will be ON.
• If the drive detects this error, the drive will operate the motor as specified by the stopping method set in *F1-04 [Speed Deviation Detection Select]*.

Code	Name	Causes	Possible Solutions
DIFF	Differential Feedback Exceeded	The difference between the PID Feedback and *Differential Level Source [H3-xx = 2D]* is more than the level set in *Y4-18 [Pre-Charge Loss of Prime Level 2]* for the time set in *Y4-19 [Differential Lvl Detection Time]*.	• Replace the feedback transducer or transducers. • Set *Y4-18* and *Y4-19* correctly.

Note:
• If the drive detects this error, it will respond as specified by the setting of *Y4-20 [Differential Level Detection Sel]*.
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
dnE	Drive Disabled	A terminal set for *H1-xx = 6A [MFDI Function Selection = Drive Enable]* deactivated.	Examine the operation sequence.

Note:
If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
dWA2	DriveWorksEZ Alarm 2	The DriveWorksEZ program output a minor fault.	Examine the DriveWorksEZ program and remove the cause of the fault. This is not a drive fault.

Note:
If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
dWA3	DriveWorksEZ Alarm 3	The DriveWorksEZ program output a minor fault.	Examine the DriveWorksEZ program and remove the cause of the fault. This is not a drive fault.

Note:
If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
dWAL	DriveWorksEZ Alarm	There was an error in the DriveWorksEZ program.	Examine the DriveWorksEZ program and remove the cause of the error. This is not a drive fault.

Note:
If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
EF	FWD/REV Run Command Input Error	The drive received a forward command and a reverse command at the same time for longer than 0.5 s.	Examine the forward and reverse command sequence and correct the problem.

Note:
• If the drive detects *EF*, the motor will ramp to stop.
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
EF0	Option Card External Fault	The communication option card received an external fault from the controller.	1. Find the device that caused the external fault and remove the cause. 2. Clear the external fault input from the controller.
		Programming error occurred on the controller side.	Examine the operation of the controller program.

Note:
• The drive detects this error if the alarm function on the external device side is operating.
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.
• Use *F6-03 [Comm External Fault (EF0) Select]* to set the stopping method for this fault.

Code	Name	Causes	Possible Solutions
EF1	External Fault (Terminal S1)	MFDI terminal S1 caused an external fault through an external device.	1. Find the device that caused the external fault and remove the cause. 2. Clear the external fault input in the MFDI.
		The wiring is incorrect.	Correctly connect the signal line to MFDI terminal S1.
		External Fault [H1-01 = 2C to 2F] is set to MFDI terminal S1, but the terminal is not in use.	Correctly set the MFDI.

Note:
If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
EF2	External Fault (Terminal S2)	MFDI terminal S2 caused an external fault through an external device.	1. Find the device that caused the external fault and remove the cause. 2. Clear the external fault input in the MFDI.
		The wiring is incorrect.	Correctly connect the signal line to MFDI terminal S2.
		External Fault [H1-02 = 2C to 2F] is set to MFDI terminal S2, but the terminal is not in use.	Correctly set the MFDI.

Note:
If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
EF3	External Fault (Terminal S3)	MFDI terminal S3 caused an external fault through an external device.	1. Find the device that caused the external fault and remove the cause. 2. Clear the external fault input in the MFDI.
		The wiring is incorrect.	Correctly connect the signal line to MFDI terminal S3.
		External Fault [H1-03 = 2C to 2F] is set to MFDI terminal S3, but the terminal is not in use.	Correctly set the MFDI.

Note:
If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
EF4	External Fault (Terminal S4)	MFDI terminal S4 caused an external fault through an external device.	1. Find the device that caused the external fault and remove the cause. 2. Clear the external fault input in the MFDI.
		The wiring is incorrect.	Correctly connect the signal line to MFDI terminal S4.
		External Fault [H1-04 = 2C to 2F] is set to MFDI terminal S4, but the terminal is not in use.	Correctly set the MFDI.

Note:
If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
EF5	External Fault (Terminal S5)	MFDI terminal S5 caused an external fault through an external device.	1. Find the device that caused the external fault and remove the cause. 2. Clear the external fault input in the MFDI.
		The wiring is incorrect.	Correctly connect the signal line to MFDI terminal S5.
		External Fault [H1-05 = 2C to 2F] is set to MFDI terminal S5, but the terminal is not in use.	Correctly set the MFDI.

Note:
If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
EF6	External Fault (Terminal S6)	MFDI terminal S6 caused an external fault through an external device.	1. Find the device that caused the external fault and remove the cause. 2. Clear the external fault input in the MFDI.
		The wiring is incorrect.	Correctly connect the signal line to MFDI terminal S6.

Code	Name	Causes	Possible Solutions
		External Fault [H1-06 = 2C to 2F] is set to MFDI terminal S6, but the terminal is not in use.	Correctly set the MFDI.

Note:
If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
EF7	External Fault (Terminal S7)	MFDI terminal S7 caused an external fault through an external device.	1. Find the device that caused the external fault and remove the cause. 2. Clear the external fault input in the MFDI.
		The wiring is incorrect.	Correctly connect the signal line to MFDI terminal S7.
		External Fault [H1-07 = 2C to 2F] is set to MFDI terminal S7, but the terminal is not in use.	Correctly set the MFDI.

Note:
If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
EOF	Emergency Override FWD	The digital input terminal set to *H1-xx = AF [MFDI Function Selection = Emergency Override FWD]* activated.	When the emergency condition is gone, deactivate the digital input set to *Emergency Override FWD*.

Note:
If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
EOR	Emergency Override REV	The digital input terminal set to *H1-xx = B0 [MFDI Function Selection = Emergency Override REV]* activated.	When the emergency condition is gone, deactivate the digital input set to *Emergency Override REV*.

Note:
If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
EP24v	External Power 24V Supply	The voltage of the main circuit power supply decreased, and the 24 V power supply is supplying power to the drive.	• Examine the main circuit power supply. • Turn ON the main circuit power supply to run the drive.

Note:
• Set *o2-26 [Ext. Power 24V Supply Display]* to enable or disable *EP24v* detection.
• The drive will not output an alarm signal for this alarm.

Code	Name	Causes	Possible Solutions
FDBKL	Feedback Loss Wire Break	The analog input from the terminal set to *H3-xx = B [MFAI Function Selection = PID Feedback]* is more than 21 mA or less than 3 mA for longer than 1 s in these conditions: • *b5-82 = 1 [Feedback Loss 4 ~ 20mA Detect Sel = Alarm Only]* • *b5-01 ≠ 0 [PID Mode Setting ≠ Disabled]* • *H3-01 or H3-09 = 2 [Terminal A1/A2 Signal Level Selection = 4 to 20 mA]*	Make sure that you install the PID feedback source and it operates correctly.

Note:
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.
• If the drive detects this error, it will operate the motor as specified by the settings of *b5-82*.
• Parameter *L5-42 [Feedback Loss Fault Retry Select]* sets the Auto Restart function of this error.

Code	Name	Causes	Possible Solutions
FLGT	Feedback Loss, Go To Freq b5-83	The analog input from the terminal set to *H3-xx = B [MFAI Function Selection = PID Feedback]* is more than 21 mA or less than 3 mA for longer than 1 s in these conditions: • *b5-82 = 3 [Feedback Loss 4 ~ 20mA Detect Sel = Run At b5-83]* • *b5-01 ≠ 0 [PID Mode Setting ≠ Disabled]* • *H3-01 or H3-09 = 2 [Terminal A1/A2 Signal Level Selection = 4 to 20 mA]*	Make sure that you install the PID feedback source and it operates correctly.

Note:
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.
• If the drive detects this error, it will operate the motor at the speed set in *b5-83 [Feedback Loss Goto Frequency]* as specified by the setting of *b5-82*.

Code	Name	Causes	Possible Solutions
FR<MS	Freq Ref < Minimum Speed (Y1-06)	The drive frequency reference setting is less than the value set in *Y1-06 [Minimum Speed]* in these conditions: • The drive is not in PI Mode • The drive is running • *Minimum Speed* is enabled (*Y1-06 > 0.00*) • *Y1-06 > Y4-12 [Thrust Frequency]*	Increase the frequency reference to a value more than *Y1-06*.

Note:
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.
• If the drive detects this error, it internally sets the frequency reference to the value set in *Y1-06*.

Code	Name	Causes	Possible Solutions
FR<TH	Freq. Reference < Thrust (Y4-12)	The drive frequency reference setting is less than the value set in *Y4-12 [Thrust Frequency]* in these conditions: • The drive is not in PI Mode • The drive is running • *Thrust* is enabled (*Y4-11 [Thrust Acceleration Time] > 0.00* and *Y4-12 > Y1-06 [Minimum Speed]*)	Increase the frequency reference to a value more than *Y4-12*.

Note:
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.
• If the drive detects this error, it internally sets the frequency reference to the value set in *Y4-12*.

Code	Name	Causes	Possible Solutions
HCA	High Current Alarm	The load is too heavy.	• Decrease the load for applications with repetitive starts and stops. • Replace the drive with a larger capacity model.
		The acceleration time is too short.	• Calculate the torque necessary during acceleration related to the load inertia and the specified acceleration time. • Increase the values set in *C1-01 or C1-03 [Acceleration Times]* until you get the necessary torque. • Increase the values set in *C2-01 to C2-04 [S-Curve Characteristics]* until you get the necessary torque. • Replace the drive with a larger capacity model.
		The drive is trying to operate a specialized motor or a motor that is larger than the maximum applicable motor output of the drive.	• Examine the motor nameplate, the motor, and the drive to make sure that the drive rated current is larger than the motor rated current. • Replace the drive with a larger capacity model.
		The current level temporarily increased because of speed search after a momentary power loss or while trying to Auto Restart.	If speed search or Auto Restart cause an increase in current, the drive can temporarily show this alarm. The time that the drive shows the alarm is short. No more steps are necessary to clear the alarm.

Note:
• The drive detects this error if the drive output current is more than the overcurrent alarm level (150% of the rated current).
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
HIAUX	High PI Aux Feedback Level	PI Auxiliary Feedback is more than the level set in *YF-12 [PI Aux Control High Level Detect]* for the time set in *YF-13 [PI Aux High Level Detection Time]* in these conditions: • The drive operates in AUTO Mode. • The output frequency > 0.	• Decrease the PI Auxiliary Feedback level to less than *YF-12*. • Set *YF-12* and *YF-13* correctly.

Note:
If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
HIFB	High Feedback Sensed	The feedback level is more than the level set in *Y1-11 [High Feedback Level]*.	• Decrease the feedback level to less than *Y1-11 - Y1-14 [Hysteresis Level]*. • Set *Y1-11* and *Y1-12* correctly.

Note:
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.
• If the drive detects this error, it will respond as specified by the setting of *Y1-13 [High Feedback Selection]*.

Code	Name	Causes	Possible Solutions
INTLK	BAS Interlock	The digital input terminal set to *H1-xx = B2 [MFDI Function Selection = BAS Interlock]* deactivates.	Make sure the cause of interlock.
Note: • If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate. • If the drive detects this error,  will not flash.			
Code	**Name**	**Causes**	**Possible Solutions**
L24v	Loss of External Power 24 Supply	The voltage of the backup 24 V power supply has decreased. The main circuit power supply is operating correctly.	• Examine the external 24 V power supply for disconnected wires and wiring errors and repair the problems. • Examine the external 24 V power supply for problems.
Note: • Set *o2-23 [External 24V Powerloss Detection]* to enable or disable *L24v* detection. • The drive will not output an alarm signal for this alarm.			
Code	**Name**	**Causes**	**Possible Solutions**
LCP	Low City Pressure	Insufficient pressure is present on the inlet to the pump in these conditions: • *Y4-24 = 0 [Low City Alarm Text = Low City Pressure]* • The terminal set for *H1-xx = B8 or 1B8 [MFDI Function Selection = Low City Pressure or !Low City Pressure]* activates	• Examine the pressure switch contact for correct operation. • Make sure that control wiring to drive terminal strip from pressure switch contact. • Make sure that suction pressure is present with an isolated measuring device. • Set *Y4-22 [Low City On-Delay Time]* and *Y4-23 [Low City Off-Delay Time]* correctly. • Deactivate the digital input terminals set to *H1-xx = B8 or 1B8*.
Note: • If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate. • If the drive detects this error during run, it coasts to stop and does not operate until the digital input has deactivated for the time set in *Y4-22*.			
Code	**Name**	**Causes**	**Possible Solutions**
LOAUX	Low PI Aux Feedback Level	When the drive operates in AUTO Mode or HAND Mode, PI Auxiliary Feedback is less than the level set in *YF-09 [PI Aux Control Low Lvl Detection]* for the time set in *YF-10 [PI Aux Control Low Lvl Det Time]* and the drive is running.	• Increase the PI Auxiliary Feedback level more than *YF-09*. • Set *YF-09* and *YF-10* correctly.
Note: If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.			
Code	**Name**	**Causes**	**Possible Solutions**
LOFB	Low Feedback Sensed	The feedback level is less than the level set in *Y1-08 [Low Feedback Level]* for the time set in *Y1-09 [Low Feedback Lvl Fault Dly Time]*.	• Increase the feedback level to more than *Y1-08 + Y1-14 [High Feedback Hysteresis Level]*. • Set *Y1-08* and *Y1-09* correctly.
Note: • If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate. • If the drive detects this fault, it will respond as specified by the setting of *Y1-10 [Low Feedback Selection]*.			
Code	**Name**	**Causes**	**Possible Solutions**
LoG	Com Error / Abnormal SD Card	There is not a micro SD card in the keypad.	Put a micro SD card in the keypad.
		• The drive is connected to USB. • The number of log communication files is more than 1000. • The micro SD card does not have available memory space. • The line number data in a log communication file was changed. • A communication error between the keypad and drive occurred during a log communication.	Set *o5-01 = 0 [Log Start/Stop Selection = OFF]*.
Note: If the drive detects this error, the terminal set to *H2-01 to H2-03 = 6A [MFDO Function Selection = Data Logger Error]* will activate.			
Code	**Name**	**Causes**	**Possible Solutions**
LOP	Loss of Prime	The pump load that measured based on the *Y1-18 [Prime Loss Detection Method]* setting is less than the level set in *Y1-19 [Prime Loss Level]* for the time set in *Y1-20 [Prime Loss Time]*, and the output frequency is *Y1-21 [Prime Loss Activation Freq]* or more.	• Examine a dry well, air in the system, or no water in the system. Use preferred priming method suggested by the pump manufacturer to restart the pump. • When there is resistance in the pump, allow the system to pump water again. • Set *Y1-18* to *Y1-21* correctly.
Note: • If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate. • If the drive detects this fault, it will respond as specified by the setting of *Y1-22 [Prime Loss Selection]*.			

Code	Name	Causes	Possible Solutions
LSP	Low Suction Pressure	An external input has indicated that an insufficient suction pressure condition exists in these conditions: • *Y4-24 = 1 [Low City Alarm Text = Low Suction Pressure]* • The terminal set for *H1-xx = B8 or 1B8 [MFDI Function Selection = Low City Pressure or !Low City Pressure]* activates	• Examine the pressure switch contact for correct operation. • Make sure that control wiring to drive terminal strip from pressure switch contact. • Make sure that suction pressure is present with an isolated measuring device. • Increase the system pressure. • Set *Y4-22 [Low City On-Delay Time]* and *Y4-23 [Low City Off-Delay Time]* correctly. • Deactivate the digital input terminals set to *H1-xx = B8 or 1B8*.

Note:
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.
• If the drive detects this error during run, it coasts to stop and does not operate until the digital input has deactivated for the time set in *Y4-22*.

Code	Name	Causes	Possible Solutions
LT-1	Cooling Fan Maintenance Time	The cooling fan is at 90% of its performance life estimate.	1. Replace the cooling fan. 2. Set *o4-03 = 0 [Fan Operation Time Setting = 0 h]* to reset the cooling fan operation time.

Note:
When the performance life estimate is expired, the terminal set to *H2-01 to H2-03 = 2F [MFDO Function Selection = Maintenance Notification]* will activate.

Code	Name	Causes	Possible Solutions
LT-2	Capacitor Maintenance Time	The capacitors for the main circuit and control circuit are at 90% of their performance life estimate.	Replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.

Note:
When the performance life estimate is expired, the terminal set to *H2-01 to H2-03 = 2F [MFDO Function Selection = Maintenance Notification]* will activate.

Code	Name	Causes	Possible Solutions
LT-3	SoftChargeBypassRelay MainteTime	The soft charge bypass relay is at 90% of its performance life estimate.	Replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.

Note:
When the performance life estimate is expired, the terminal set to *H2-01 to H2-03 = 2F [MFDO Function Selection = Maintenance Notification]* will activate.

Code	Name	Causes	Possible Solutions
LT-4	IGBT Maintenance Time (50%)	The IGBT is at 50% of its performance life estimate.	Check the load, carrier frequency, and output frequency.

Note:
When the performance life estimate is expired, the terminal set to *H2-01 to H2-03 = 2F [MFDO Function Selection = Maintenance Notification]* will activate.

Code	Name	Causes	Possible Solutions
LWT	Low Water In Tank	An external input has indicated that the water level in the tank is too low in these conditions: • *Y4-24 = 2 [Low City Alarm Text = Low Water in Tank]* • The terminal set for *H1-xx = B8 or 1B8 [MFDI Function Selection = Low City Pressure or !Low City Pressure]* activates	• Examine the pressure switch contact for correct operation. • Make sure that control wiring to drive terminal strip from pressure switch contact. • Make sure that suction pressure is present with an isolated measuring device. • Increase the water level. • Set *Y4-22 [Low City On-Delay Time]* and *Y4-23 [Low City Off-Delay Time]* correctly. • Deactivate the digital input terminals set to *H1-xx = B8 or 1B8*.

Note:
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.
• If the drive detects this error during run, it coasts to stop and does not operate until the digital input has deactivated for the time set in *Y4-22*.

Code	Name	Causes	Possible Solutions
NETSC	NETSCAN Waiting for Master	The drive does not receive message from the master in the time set in *Y9-28 [NETSCAN Alarm Time]*.	• Increase *Y9-28* to account for network latency. • Make sure that there is a drive on the network with parameters set to *Y1-01 = 3 [Multiplex Mode = Memobus Network]* and *Y9-27 = 0 [Network Recovery = Automatic]*. • Examine the network connections and the settings of *H5-01 [Drive Node Address]* and *Y9-25 [Highest Node Address]* for all drives on the network.

Note:
If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
NMS	Setpoint Not Met	The feedback deviates from the setpoint at a level more than *Y1-15 [Maximum Setpoint Difference]* for the time set in *Y1-16 [Not Maintaining Setpoint Time]*.	• Examine for a blocked impeller, over cycling, or broken pipe. • Set *Y1-15* and *Y1-16* correctly.

Note:
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.
• If the drive detects this error, it will respond as specified by the setting of *Y1-17 [Not Maintaining Setpoint Sel]*.

Code	Name	Causes	Possible Solutions
OD	Output Disconnect	The output circuit between the drive and the motor is open, and the drive output current is less than 5% of *E2-01 [Motor Rated Current (FLA)]*.	• Close the disconnected output circuit between the drive and the motor. • If you do not use a motor disconnect, set *Y4-42 = 0 [Disabled]*.

Note:
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.
• If the drive detects this error, it will respond as specified by the setting of *Y4-42 [Output Disconnect Detection Sel]*.

Code	Name	Causes	Possible Solutions
oH	Heatsink Overheat	The ambient temperature is high and the heatsink temperature is more than the *L8-02 [Overheat Alarm Level]*.	• Measure the ambient temperature. • Increase the airflow around the drive. • Install a cooling device (cooling fan or air conditioner) to decrease the ambient temperature. • Remove objects near the drive that are producing too much heat.
		There is not sufficient airflow around the drive.	• Give the drive the correct installation space as shown in the manual. • Make sure that there is sufficient circulation around the control panel. • Examine the drive for dust or other unwanted materials that could clog the cooling fan. • Remove unwanted materials that prevent air circulation.
		The internal cooling fan or fans stopped.	1. Replace the cooling fan. 2. Set *o4-03 = 0 [Fan Operation Time Setting = 0 h]* to reset the cooling fan operation time.

Note:
• The drive detects this error if the heatsink temperature of the drive is more than *L8-02*.
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.
• Use *L8-03 [Overheat Pre-Alarm Selection]* to the stopping method for this fault.

Code	Name	Causes	Possible Solutions
oH2	External Overheat (H1-XX=B)	An external device sent an *oH2* alarm.	1. Find the external device that output the overheat alarm. 2. Remove the cause of the problem. 3. Clear the *Overheat Alarm (oH2) [H1-xx = B]* in MFDI terminals S1 to S7.

Note:
If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
oH3	Motor Overheat (PTC Input)	The thermistor wiring that detects motor temperature is defective.	Correct wiring errors.
		A fault occurred on the machine. Example: The machine is locked.	Examine the machine and remove the cause of the fault
		The motor has overheated.	• Check the load level, acceleration/deceleration time, and motor start/stop frequency (cycle time). • Decrease the load. • Increase the values set in *C1-01 to C1-04 [Acceleration/ Deceleration Times]*. • Set *E2-01 [Motor Rated Current (FLA)]* correctly to the value specified by the motor nameplate. • Make sure that the motor cooling system is operating correctly, and repair or replace it if it is damaged. • Adjust *E1-04 to E1-10 [V/f Pattern Parameters]*. For motor 2, adjust *E3-04 to E3-10*. Decrease the values set in *E1-08 [Mid Point A Voltage]* and *E1-10 [Minimum Output Voltage]*. **Note:** If the values set in *E1-08* and *E1-10* are too low, the overload tolerance will decrease at low speeds.

Note:
• When *H3-02 or H3-10 = E [MFAI Function Selection = Motor Temperature (PTC Input)]*, the drive detects this fault if the motor overheat signal entered to analog input terminals A1 and A2 is more than the alarm detection level.
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.
• If the drive detects this error, it will operate the motor as specified by the stopping method set in *L1-03 [Motor Thermistor oH Alarm Select]*.

Code	Name	Causes	Possible Solutions
oL3	Overtorque 1	A fault occurred on the machine. Example: The machine is locked.	Examine the machine and remove the cause of the fault.
		The parameters are incorrect for the load.	Adjust *L6-02 [Torque Detection Level 1]* and *L6-03 [Torque Detection Time 1]* settings.

Note:
• The drive detects this fault if the drive output current is more than the level set in *L6-02* for longer than *L6-03*.
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.
• Use *L6-01 [Torque Detection Selection 1]* to set the conditions that trigger the minor fault.

Code	Name	Causes	Possible Solutions
oL4	Overtorque 2	A fault occurred on the machine. Example: The machine is locked.	Examine the machine and remove the cause of the fault.
		The parameters are incorrect for the load.	Adjust *L6-05 [Torque Detection Level 2]* and *L6-06 [Torque Detection Time 2]* settings.

Note:
• The drive detects this error if the drive output current is more than the level set in *L6-05* for longer than *L6-06*.
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.
• Use *L6-04 [Torque Detection Selection 2]* to set the conditions that trigger the minor fault.

Code	Name	Causes	Possible Solutions
oS	Overspeed	There is overshoot.	Decrease *C5-01 [ASR Proportional Gain 1]* and increase *C5-02 [ASR Integral Time 1]*.

Note:
If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
ov	DC Bus Overvoltage	The drive output cable or motor is shorted to ground (the current short to ground is charging the main circuit capacitor of the drive through the power supply).	1. Examine the motor main circuit cable, terminals, and motor terminal box, and then remove ground faults. 2. Re-energize the drive.
		The power supply voltage is too high.	Decrease the power supply voltage to align with the drive rated voltage.
		Electrical interference caused a drive malfunction.	• Examine the control circuit lines, main circuit lines, and ground wiring, and minimize the effects of noise. • Find the source of the noise. If a magnetic contactor is the source, use Surge Protective Device if necessary. • Set *L5-01 ≠ 0 [Number of Auto-Restart Attempts ≠ 0 times]*.

Note:
• The drive detects this error if the DC bus voltage is more than the *ov* detection level when the Run command has not been input (while the drive is stopped).
• The *ov* detection level is approximately 410 V with 208 V class drives. The detection level is approximately 820 V with 480 V class drives.
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
ovEr	Too Many Parameters Changed	You tried to change more than 150 parameters.	Make sure that parameters that do not have an effect on drive operation are at their default settings. **Note:** • You can change 150 parameters maximum. • If you change parameters that have dependencies, the drive can detect *ovEr* when the number of changed parameters is fewer than 150.

Code	Name	Causes	Possible Solutions
PASS	Modbus Communication Test	The MEMOBUS/Modbus communications test is complete.	The *PASS* display will turn off after communications test mode is cleared.

Code	Name	Causes	Possible Solutions
PF	Input Phase Loss	There is a phase loss in the drive input power.	Correct errors with the wiring for main circuit drive input power.
		Loose wiring in the input power terminals.	Tighten the terminal screws to the correct tightening torque.
		The drive input power voltage is changing too much.	• Examine the input power for problems. • Make the drive input power stable.
		Unsatisfactory balance between voltage phases.	• Examine the input power for problems. • Make the drive input power stable. • If the input power supply is good, examine the magnetic contactor on the main circuit side for problems.

Code	Name	Causes	Possible Solutions
		The main circuit capacitors are unserviceable.	• Examine the capacitor maintenance time in monitor *U4-05 [CapacitorMaintenance]*. • If *U4-05* is more than 90%, replace the capacitor. Contact Yaskawa or your nearest sales representative for more information.
			• Examine the input power for problems. • Re-energize the drive. • If the alarm stays, replace the circuit board or the drive. Contact Yaskawa or your nearest sales representative for more information.

Note:
• The drive detects this error if the DC bus voltage changes irregularly without regeneration.
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.
• Use *L8-05 [Input Phase Loss Protection Sel]* to enable and disable PF detection.

Code	Name	Causes	Possible Solutions
rUn	Motor Switch during Run	The drive received a *Motor 2 Selection [H1-xx = 16]* during run.	Make sure that the drive receives the Motor 2 Selection while the drive is stopped.

Note:
If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
SAFE	Customer Safeties	External contact from customer wiring is open.	Examine the cause of the open safety.

Note:
• If the terminal set for *H1-xx = B1 [MFDI Function Selection = Customer Safeties]* deactivates, the drive detects this alarm.
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.
• This alarm has display priority over *INTLK [BAS Interlock]*.

Code	Name	Causes	Possible Solutions
SE	Modbus Test Mode Error	MEMOBUS/Modbus communications self-diagnostics *[H1-xx = 67]* was done while the drive was running.	Stop the drive and do MEMOBUS/Modbus communications self-diagnostics.

Note:
If drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
STo	Safe Torque OFF	Safe Disable inputs H1-HC and H2-HC are open.	• Make sure that the Safe Disable signal is input from an external source to terminal H1-HC and H2-HC. • When the Safe Disable function is not in use, use a jumper to connect terminals H1-HC and H2-HC.
		There is internal damage to the two Safe Disable channels.	Replace the board or the drive. Contact Yaskawa or your nearest sales representative to replace the board.

Note:
• The drive will not output an alarm signal for this alarm.
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 21 [MFDO Function Selection = Safe Torque OFF]* will activate.

Code	Name	Causes	Possible Solutions
SToF	Safe Torque OFF Hardware	One of the two terminals H1-HC or H2-HC received the Safe Disable input signal.	• Make sure that the Safe Disable signal is input from an external source to terminals H1-HC or H2-HC. • When the Safe Disable function is not in use, use a jumper to connect terminals H1-HC and H2-HC.
		The Safe Disable input signal is wired incorrectly.	
		There is internal damage to one Safe Disable channel.	Replace the board or the drive. Contact Yaskawa or your nearest sales representative to replace the board.

Note:
If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
TiM	Keypad Time Not Set	There is a battery in the keypad, but you have not set the date and time.	Use the keypad to set the date and time.

Note:
• Parameter *o4-24 [bAT Detection selection]* enables and disables *TiM* detection.
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
TrPC	IGBT Maintenance Time (90%)	The IGBT is at 90% of its performance life estimate.	Replace the IGBT or the drive. For more information, contact Yaskawa or your nearest sales representative.

Note:
If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
UL3	Undertorque Detection 1	A fault occurred on the machine. Example: There is a broken pulley belt.	Examine the machine and remove the cause of the fault.
		The parameters are incorrect for the load.	Adjust *L6-02 [Torque Detection Level 1]* and *L6-03 [Torque Detection Time 1]* settings.

Note:
• The drive detects this error if the drive output current is less than the level set in *L6-02* for longer than *L6-03*.
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.
• If the drive detects this error, it will operate the motor as specified by the Stopping Method set in *L6-01 [Torque Detection Selection 1]*.

Code	Name	Causes	Possible Solutions
UL4	Undertorque Detection 2	A fault occurred on the machine. Example: There is a broken pulley belt.	Examine the machine and remove the cause of the fault.
		The parameters are incorrect for the load.	Adjust *L6-05 [Torque Detection Level 2]* and *L6-06 [Torque Detection Time 2]* settings.

Note:
• The drive detects this error if the drive output current is less than the level set in *L6-05* for longer than *L6-06*.
• If detected, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.
• If the drive detects this error, it will operate the motor as specified by the Stopping Method set in *L6-04 [Torque Detection Selection 2]*.

Code	Name	Causes	Possible Solutions
UL6	Underload or Belt Break Detected	The output current decreased less than the motor underload curve set in *L6-14 [Motor Underload Level @ Min Freq]* for longer than the time set in *L6-03 [Torque Detection Time 1]*.	Examine parameters *L6-13 [Motor Underload Curve Select]* and *L6-14*.
		The belt has broken disconnecting the motor from the load.	

Note:
If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
Uv	Undervoltage	The drive input power voltage is changing too much.	• Examine the input power for problems. • Make the drive input power stable. • If the input power supply is good, examine the magnetic contactor on the main circuit side for problems.
		There is a phase loss in the drive input power.	Correct errors with the wiring for main circuit drive input power.
		There is loose wiring in the drive input power terminals.	Tighten the terminal screws to the correct tightening torque.
		There was a loss of power.	Use a better power supply.
		The main circuit capacitors have become unserviceable.	Examine the capacitor maintenance time in monitor *U4-05 [CapacitorMaintenance]*. If *U4-05* is more than 90%, replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
		The drive input power transformer is too small and voltage drops when the power is switched on.	• Check for an alarm when a molded-case circuit breaker, Leakage Breaker (ELCB or GFCI) (with overcurrent protective function), or magnetic contactor is ON. • Check the capacity of the drive power supply transformer.
		Air inside the drive is too hot.	Check the ambient temperature of the drive.
		The Charge LED is broken.	Replace the control board or the entire drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.

Note:
• The drive detects this error if one of these conditions is correct when the Run command has not been input (while the drive is stopped).
  – The DC bus voltage < *L2-05 [Undervoltage Detection Lvl (Uv1)]*.
  – The Contactor that prevents inrush current in the drive was opened.
  – There is low voltage in the control drive input power.
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate.

2.6 Parameter Setting Errors

Parameter setting errors occur when multiple parameter settings do not agree, or when parameter setting values are not correct. Refer to the table in this section, examine the parameter setting that caused the error, and remove the cause of the error. You must first correct the parameter setting errors before you can operate the drive. The drive will not send notification signals for the faults and alarms when these parameter setting errors occur.

Code	Name	Causes	Possible Solutions
oPE01	Drive Capacity Setting Error	The value set in *o2-04 [Drive Model (KVA) Selection]* does not agree with the drive model.	Set *o2-04* to the correct value.
Code	**Name**	**Causes**	**Possible Solutions**
oPE02	Parameter Range Setting Error	Parameters settings are not in the applicable setting range.	1. Push ↵ to show *U1-18 [oPE Fault Parameter]*, and find parameters that are not in the applicable setting range. 2. Correct the parameter settings. **Note:** If more than one error occurs at the same time, other *oPExx* errors have priority over *oPE02*.
		You set *E2-01 ≤ E2-03 [Motor Rated Current (FLA) ≤ Motor No-Load Current]*.	Make sure that *E2-01 > E2-03*. **Note:** If it is necessary to set *E2-01 < E2-03*, first lower the value set in *E2-03*, and then set *E2-01*.
		The settings for these parameters do not agree: • *L8-12 [Ambient Temperature Setting] = 60 °C* and *L8-35 = 1 or 3 [Installation Method Selection = Side-by-Side Mounting or IP55/UL Type 12]* for models 2011 to 2114 and 4005 to 4124 • *L8-35 = 1 or 3* for models 2143 to 2273 and 4156 to 4302	Set *L8-35 = 0 or 2 [IP20/UL Open Type or IP20/UL Type 1]*.
		The settings for these parameters do not agree: • *Y1-01 = 3 [Multiplex Mode = Memobus Network]* • *F6-16 ≠ 0 [Gateway Mode ≠ Disabled]*	When *Y1-01 = 3*, set *F6-16 = 0* or disable DriveWorksEZ while *q7-01 ≠ 0*.
		The settings for these parameters do not agree: • *Y1-01 = 3* • The parameter settings to enable Remote I/O function: – *A1-07 = 1 [DriveWorksEZ Function Selection = DWEZ Enabled]* – *q7-01 [Slave Address] ≠ 0* – *H1-xx ≠ 9F [MFDI Function Selection ≠ DWEZ Disable]*	
		You set *S3-09 < S3-10 [PI2 Control Output Upper Limit < PI2 Control Output Lower Limit]*.	Make sure that *S3-09 > S3-10* at all times.
		You set *S3-13 > S3-15 [PI2 Control Low Feedback Lvl > PI2 Control High Feedback Lvl]*.	Make sure that *S3-13 < S3-15* at all times.
		The settings for these parameters do not agree: • *o1-17 = 4 [F3 Key Function Selection = RELAY (ON/OFF H2-XX = A9)]* • *H2-xx ≠ A9 [MFDO Function Selection ≠ RELAY Operator Control]*	• Set *H2-xx = A9* to an MFDO. • Change the parameter setting to *o1-17 ≠ 4*.
Code	**Name**	**Causes**	**Possible Solutions**
oPE03	Multi-Function Input Setting Err	The settings for these parameters do not agree: • *H1-01 to H1-07 [Terminals S1 to S7 Function Selection]* • *H7-01 to H7-04 [Virtual Multi-Function Inputs 1 to 4]*	Correct the parameter settings.
		The settings for MFDIs overlap. **Note:** This does not include *H1-xx = 20 to 2F [MFDI Function Selection = External Fault]* and *[Reserved]*.	Set the parameters correctly to prevent MFDI function overlap.

Code	Name	Causes	Possible Solutions
		These pairs of MFDI functions are not set to Digital Inputs (*H1-xx* and *H7-01 to H7-04*) at the same time: • Setting values *10 [Up Command]* and *11 [Down Command]* • Setting values *42 [Run Command (2-Wire Sequence 2)]* and *43 [FWD/REV (2-Wire Sequence 2)]*	Set the MFDI pairs.
		A minimum of two of these MFDI combinations are set to Digital Inputs (*H1-xx* and *H7-01 to H7-04*) at the same time: • Setting values *10 [Up Command]* and *11 [Down Command]* • Setting value *1E [Reference Sample Hold]* • Setting values *44 to 46 [Add Offset Frequency 1 to 3 (d7-01 to d7-03)]*	Remove the function settings that are not in use.
		The parameter settings are enabled at the same time. • *b5-01 [PID Mode Setting]* • *H1-xx = 10 [Up Command]* • *H1-xx = 11 [Down Command]*	• Set *b5-01 = 0 [Disabled]*. • Remove the function Up/Down command settings.
		These commands are set in Digital Inputs (*H1-xx* and *H7-01 to H7-04*) at the same time: • Setting values *61 [Speed Search from Fmax]* and *62 [Speed Search from Fref]* • Setting values *65, 66, 7A, 7B [KEB Ride-Thru 1 or 2 Activate]* and *68 [High Slip Braking (HSB) Activate]* • Setting values *65, 66 [KEB Ride-Thru 1 Activate]* and *7A, 7B [KEB Ride-Thru 2 Activate]* • Setting values *40, 41 [Forward RUN (2-Wire), Reverse RUN (2-Wire)]* and *42, 43 [Run Command (2-Wire Sequence 2), FWD/REV (2-Wire Sequence 2)]*	Remove the function settings that are not in use.
		These groups of MFDI functions are not set to Digital Inputs (*H1-xx* and *H7-01 to H7-04*) at the same time: • Setting values *3E [PID Setpoint Selection 1]* and *3F [PID Setpoint Selection 2]* • Setting values *83 [Dedicated Multi-Setpoint YA-02]*, *84 [Dedicated Multi-Setpoint YA-03]*, and *85 [Dedicated Multi-Setpoint YA-04]*	Set the MFDI groups correctly.
		Two of these three MFDI functions are set to Digital Inputs (*H1-xx* and *H7-01 to H7-04*) at the same time: • Setting value *50 [Motor Pre-heat 2]* • Setting value *60 [DC Injection Braking Command]* • Setting value *6A [Drive Enable]*	Remove the function setting that are not in use and use only one function.
		Settings for N.C. and N.O. input *[H1-xx]* for these functions were selected at the same time: • Setting value *15 [Fast Stop (N.O.)]* • Setting value *17 [Fast Stop (N.C.)]*	Remove one of the function settings.
		These MFDI functions are set at the same time: • *H1-xx ≠ 6A [Drive Enable]* and *H1-xx ≠ 70 [Drive Enable 2]* • *H2-xx = 38 [Drive Enabled]*	• Set *H1-xx = 6A or 70*. • Change the MFDO setting.
		These MFDI functions are set at the same time: • *H1-xx = 6A [Drive Enable]* • *H1-xx = 70 [Drive Enable 2]*	Remove one of the function settings.
		These MFDI functions are set at the same time: • *H1-xx = 69 [Jog Run 2]* • *H1-xx = 12 [Forward Jog]* or *H1-xx = 13 [Reverse Jog]*	Make sure the operation direction of Jog Run 2 and remove one of the function settings *H1-xx = 12* or *H1-xx = 13*. **Note:** The direction command from 3-wire sequence sets the operation direction of Jog Run 2.
		These parameters are set at the same time: • *H1-xx = 62 [Speed Search from Fref]* • *H5-22 = 1 [Speed Search from MODBUS = Enabled]*	Remove one of the function settings.

Code	Name	Causes	Possible Solutions
		The MFDI setting is *H1-xx = 69 [Jog Run 2]* but the drive is not in 3-wire sequence or 2-wire sequence 2 control.	• Remove the setting of *H1-xx = 69*. • Set *H1-xx = 0 [3-Wire Sequence]*.
		Parameter *S3-01 ≠ 0 [PI2 Control Enable Selection ≠ Disabled]* and MFDI set for *H1-xx = AD [Select PI2 Control PI Parameters]* is ON or MFDI set for *H1-xx = 1AD [!Select PI2 Control PI Parameters]* is OFF.	• Set *S3-01 = 0* to use *H1-xx = AD or 1AD* for the adjustments of *S3-06 [PI2 Control Proportional Gain]* and *S3-07 [PI2 Control Integral Time]* instead of the primary PI controller Proportional and Integral adjustments. • When PI2 Control is necessary, remove the MFDI function setting.
Code	**Name**	**Causes**	**Possible Solutions**
oPE05	Run Cmd/Freq Ref Source Sel Err	The setting to assign the Run command or frequency reference to an option card is incorrect.	Correct the parameter settings.
		b1-01 = 3 [Frequency Reference Selection 1 = Option PCB] is set, but there is no option card connected to the drive.	Connect an option card to the drive.
		b1-02 = 3 [Run Command Selection 1 = Option PCB] is set, but there is no option card connected to the drive.	
		When *S5-04 = 0 [HAND-OFF-AUTO Behavior = Legacy]*, you set *b1-02 ≠ 7, 8, or 9 [Run Command Selection 1 ≠ AUTO Command + Term Run, AUTO Command + Serial Run, or AUTO Command + Option Run]*.	Set *b1-02 = 7, 8, or 9*.
		When *S5-10 = 2 [AUTO Key Memory at Power Down = AUTO Mode]*, you set *b1-02 = 0 [Keypad]*.	Change the *b1-02* or *S5-10* setting.
Code	**Name**	**Causes**	**Possible Solutions**
oPE07	Analog Input Selection Error	The settings for *H3-02 and H3-10 [MFAI Function Selection]* and *H7-30 [Virtual Analog Input Selection]* overlap.	Set *H3-02, H3-10, and H7-30* correctly to prevent overlap. **Note:** It is possible to set these functions to multiple analog input terminals at the same time: • Setting value *0 [Frequency Reference]* • Setting values *F and 1F [Not Used]*
Code	**Name**	**Causes**	**Possible Solutions**
oPE08	Parameter Selection Error	You set a function that is not compatible with the control method set in *A1-02 [Control Method Selection]*.	1. Push  to show *U1-18 [oPE Fault Parameter]*, and find parameters that are not in the applicable setting range. 2. Correct the parameter settings. **Note:** If more than one error occurs at the same time, other *oPExx* errors have priority over *oPE02*.
		When *A1-02 = 0 [Control Method Selection = V/f]*, you set these parameters: • *S1-01 = 1 [Dynamic Noise Control = Enabled]* • *Y4-42 ≠ 0 [Output Disconnect Detection Sel ≠ Disabled]*	Set *S1-01 = 0* or *Y4-42 = 0*.
		When *A1-02 = 0*, you used *H1-xx = 16 [MFDI Function Selection = Motor 2 Selection]*.	Correct the parameter setting. **Note:** You cannot use Speed Feedback (v/f Control) with the Motor Switch function.
		When *A1-02 = 5 [OLV/PM]*, you set *E5-02 to E5-07 [PM Motor Parameters] = 0*.	• Set *E5-01 [PM Motor Code Selection]* correctly as specified by the motor. • For specialized motors, refer to the motor test report and set *E5-xx* correctly.
		When *A1-02 = 5*, you used these parameter settings: • *E5-09 = 0.0 [PM Back-EMF Vpeak (mV/(rad/s)) = 0.0 mV/(rad/s)]* • *E5-24 = 0.0 [PM Back-EMF L-L Vrms (mV/rpm) = 0.0 mV/min^{-1}]*	Set *E5-09* or *E5-24* to the correct value.
		When *A1-02 = 5*, you set *E5-09 ≠ 0* and *E5-24 ≠ 0*.	Set *E5-09 = 0* or *E5-24 = 0*.
		When *A1-02 = 8 [EZOLV]*, you used these parameter settings: • *E9-01 = 1, 2 [Motor Type Selection = Permanent Magnet (PM), Synchronous Reluctance (SynRM)]* • *b3-24 = 2 [Speed Search Method Selection = Current Detection 2]*	When *E9-01 = 1 or 2*, set *b3-24 = 1 [Speed Estimation]*.
		You set *L6-02 [Torque Detection Level 1] < L6-14 [Motor Underload Level @ Min Freq]*.	Set parameters to be *L6-02 ≥ L6-14*.

Code	Name	Causes	Possible Solutions
oPE09	PID Control Selection Fault	These parameters are set at the same time: • *b5-01 = 1* • *b5-11 = 1 [PID Output Reverse Selection = Negative Output Accepted]* And one of these parameters is set: • *d2-02 ≠ 0.0 [Frequency Reference Lower Limit ≠ 0.0%]* • *Y1-06 ≠ 0.0 [Minimum Speed ≠ 0.0%]* • *Y4-12 ≠ 0.0 [Thrust Frequency ≠ 0.0%]* • *Y1-01 ≠ 0 [Multiplex Mode ≠ Drive Only]* • *YF-01≠ 0 [PI Aux Control Selection ≠ Disabled]*	Correct the parameter settings.
		Parameter *b5-01 = 3* and one of these parameters is set at the same time: • *d2-02 ≠ 0.0* • *Y1-06 ≠ 0.0* • *Y4-12 ≠ 0.0* • *Y1-01 ≠ 0* • *YF-01≠ 0*	Correct the parameter settings.

Note:
The drive detects this error if the PID control function selection is incorrect.
(When *b5-01 = 1 or 3 [PID Mode Setting = Standard or Fref + PID Trim]*)

Code	Name	Causes	Possible Solutions
oPE10	V/f Data Setting Error	The parameters that set the V/f pattern do not satisfy these conditions: • For motor 1: *E1-09 ≤ E1-07 < E1-06 ≤ E1-11 ≤ E1-04 [Minimum Output Frequency ≤ Mid Point A Frequency < Base Frequency ≤ Mid Point B Frequency ≤ Maximum Output Frequency]* • For motor 2: *E3-09 ≤ E3-07 < E3-06 ≤ E3-11 ≤ E3-04 [Minimum Output Frequency ≤ Mid Point A Frequency < Base Frequency ≤ Mid Point B Frequency ≤ Maximum Output Frequency]*	Set the parameters correctly to satisfy the conditions.

Code	Name	Causes	Possible Solutions
oPE11	Carrier Frequency Setting Error	These parameters are set at the same time: • *C6-05 > 6 [Carrier Freq Proportional Gain > 6]* • *C6-04 > C6-03 [Carrier Frequency Lower Limit > Carrier Frequency Upper Limit]* **Note:** When *C6-05 < 7*, *C6-04* becomes disabled. *C6-03* stays active.	Set *C6-02 to C6-05* correctly.
		C6-02 to C6-05 settings are not in the applicable setting range.	

Code	Name	Causes	Possible Solutions
oPE16	Energy Saving Constants Error	The Energy Saving parameters are not set in the applicable setting range.	Make sure that *E5-xx* is set correctly as specified by the motor nameplate data.
		These parameters are set at the same time: • *b8-01 = 1 [Energy Saving Control Selection = Enabled]* • *S1-01 = 1 [Dynamic Noise Control = Enabled]*	Disable Energy Saving Control or Dynamic Noise Control.

Code	Name	Causes	Possible Solutions
oPE33	Digital Output Selection Error	These two parameters are set at the same time: • *H2-60 ≠ F [Term M1-M2 Secondary Function ≠ Not Used]* • *H2-01 = 1xx [Term M1-M2 Function Selection = Inverse output of xx]*	Clear the *H2-01 to H2-03 = 1xx [Inverse output of xx]* settings. **Note:** It is not possible to set *H2-01 to H2-03 = 1xx [Inverse output of xx]* when using output functions for logic operations (*H2-60, H2-63, H2-66 ≠ F*).
		These two parameters are set at the same time: • *H2-63 ≠ F [Term M3-M4 Secondary Function ≠ Not Used]* • *H2-02 = 1xx [Term M3-M4 Function Selection = Inverse output of xx]*	
		These two parameters are set at the same time: • *H2-66 ≠ F [Term M5-M6 Secondary Function ≠ Not Used]* • *H2-03 = 1xx [Term M5-M6 Function Selection = Inverse output of xx]*	

Code	Name	Causes	Possible Solutions
oPE34	HAND/OFF/AUTO Input Setting	When *S5-04 = 0 [HAND-OFF-AUTO Behavior = Legacy]*, *H1-xx = 6D and 6E [MFDI Function Selection = AUTO Command and HAND Command]* are set at the same time.	Set only one of the two functions *H1-xx = 6D or 6E*.
		When *S5-04 = 1 [HAND-OFF-AUTO Behavior = Normal]* and *b1-02 ≠ 1 [Run Command Selection 1 ≠ Digital Input]*, only one of *H1-xx = 6D or 6E* is set.	Set *H1-xx = 6D and 6E* for operation from terminals, or remove both input settings.
		These parameters are set at the same time: • *S5-04 = 1* • *b1-02 = 1* • *H1-xx = 6D*	Remove the MFDI setting of *H1-xx = 6D*. **Note:** When *S5-04 = 1* and *b1-02 = 1*, the AUTO Mode Run command comes from the Run command MFDI based on one of these operation sequence settings: • *H1-xx = 0 [3-Wire Sequence]* • *H1-xx = 40 [Forward RUN (2-Wire)]* • *H1-xx = 41 [Reverse RUN (2-Wire)]* • *H1-xx = 42 [Run Command (2-Wire Sequence 2)]*
Code	**Name**	**Causes**	**Possible Solutions**
oPE35	Network PI Aux Operation Mode	These parameter settings are not compatible: • *Y9-50 ≠ 0 [PI Auxiliary Control Source ≠ Analog Only]* • *Y9-51 = 1 [PI Aux Control Turn-Off Method = Enabled]*	Examine the settings for *Y9-50* and *Y9-51*.

2.7 Auto-Tuning Errors

This table gives information about errors detected during Auto-Tuning. If the drive detects an Auto-Tuning error, the keypad will show the error and the motor will coast to stop. The drive will not send notification signals for faults and alarms when Auto-Tuning errors occur.

Two types of Auto-Tuning errors are: *Endx* and *Erx*. *Endx* identifies that Auto-Tuning has successfully completed with calculation errors. Find and repair the cause of the error and do Auto-Tuning again, or set the motor parameters manually. You can use the drive in the application if you cannot find the cause of the *Endx* error.

Erx identifies that Auto-Tuning was not successful. Find and repair the cause of the error and do Auto-Tuning again.

Code	Name	Causes	Possible Solutions
End1	Excessive Rated Voltage Setting	The torque reference was more than 20% during Auto-Tuning or the no-load current that was measured after Auto-Tuning is more than 80%.	• Make sure that the input motor nameplate data is correct. • Do Auto-Tuning again and correctly set the motor nameplate data. • If you can uncouple the motor and load, remove the motor from the machine and do Rotational Auto-Tuning again. • If you cannot uncouple the motor and load, use the results from Auto-Tuning.
Code	**Name**	**Causes**	**Possible Solutions**
End2	Iron Core Saturation Coefficient	The motor nameplate data entered during Auto-Tuning is incorrect.	• Make sure that the input motor nameplate data is correct. • Do Auto-Tuning again and correctly set the motor nameplate data.
Code	**Name**	**Causes**	**Possible Solutions**
End3	Rated Current Setting Alarm	The rated current value is incorrect.	Do Auto-Tuning again and set the correct rated current shown on the motor nameplate.
Code	**Name**	**Causes**	**Possible Solutions**
End4	Adjusted Slip Calculation Error	The Auto-Tuning results were not in the applicable parameter setting range.	• Make sure the input motor nameplate data is correct. • Do Rotational Auto-Tuning again and correctly set the motor nameplate data. • If you cannot uncouple the motor and load, do Stationary Auto-Tuning 2.
		The motor rated slip that was measured after Stationary Auto-Tuning was 0.2 Hz or lower.	
		The secondary resistor measurement results were not in the applicable range.	
Code	**Name**	**Causes**	**Possible Solutions**
End5	Resistance Tuning Error	The Auto-Tuning results of the Line-to-Line Resistance were not in the applicable range.	• Make sure that the input motor nameplate data is correct. • Examine and repair damaged motor wiring.
Code	**Name**	**Causes**	**Possible Solutions**
End6	Leakage Inductance Alarm	The Auto-Tuning results were not in the applicable parameter setting range.	Make sure that the input motor nameplate data is correct, and do Auto-Tuning again.
		A1-02 [Control Method Selection] setting is not applicable.	• Examine the value set in *A1-02*. • Make sure that the input motor nameplate data is correct, and do Auto-Tuning again.
Code	**Name**	**Causes**	**Possible Solutions**
End7	No-Load Current Alarm	The Auto-Tuning results of the motor no-load current value were not in the applicable range.	Examine and repair damaged motor wiring.
		Auto-Tuning results were less than 5% of the motor rated current.	Make sure that the input motor nameplate data is correct, and do Auto-Tuning again.
Code	**Name**	**Causes**	**Possible Solutions**
End8	HFI Alarm	• Inductance saliency ratio (*E5-07*/*E5-06*) is too small. • The drive cannot find the *n8-36 [HFI Frequency Level for L Tuning]* value.	• Set the correct value on the motor nameplate to *E5-xx [PM Motor Settings]* or do rotational/stationary Auto-Tuning. • When it is necessary to set *n8-35 = 1 [Initial Pole Detection Method = High Frequency Injection]*, make sure that there is no unusual noise in the low speed range (10% or less) and that the motor does not rotate in reverse at start. **Note:** If the drive detects *End8*, it will automatically set *n8-35 =0 [Pull-in]*. Do not change the settings unless necessary.

Code	Name	Causes	Possible Solutions
End9	Initial Pole Detection Alarm	The drive cannot calculate the correct value for *n8-84 [Polarity Detection Current]* during High Frequency Injection Tuning.	When *n8-35 = 1 [Initial Pole Detection Method = High Frequency Injection]*, make sure that the motor does not rotate in reverse at start. **Note:** If the drive detects *End9*, it will automatically set *n8-35 =0 [Pull-in]*. Do not change the settings unless necessary.
Code	**Name**	**Causes**	**Possible Solutions**
Er-01	Motor Data Error	The motor nameplate data entered during Auto-Tuning is incorrect.	• Make sure that the motor nameplate data is correct. • Do Auto-Tuning again and correctly set the motor nameplate data.
		The combination of the motor rated power and motor rated current do not match.	• Examine the combination of drive capacity and motor output. • Do Auto-Tuning again, and correctly set the motor rated power and motor rated current.
		The combination of the motor rated current that was entered during Auto-Tuning and *E2-03 [Motor No-Load Current]* do not match.	• Examine the motor rated current and the no-load current. • Set *E2-03* correctly. • Do Auto-Tuning again, and correctly set the motor rated current.
		The combination of the setting values of Motor Base Frequency and Motor Base Speed do not match.	Do Auto-Tuning again, and correctly set the Motor Base Frequency and Motor Base Speed.
Code	**Name**	**Causes**	**Possible Solutions**
Er-02	Drive in an Alarm State	The motor nameplate data entered during Auto-Tuning is incorrect.	• Make sure that the motor nameplate data entered in Auto-Tuning is correct. • Do Auto-Tuning again and correctly set the motor nameplate data.
		You did Auto-Tuning while the drive had a minor fault or alarm.	Clear the minor fault or alarm and do Auto-Tuning again.
		There is a defective motor cable or cable connection.	Examine and repair motor wiring.
		The load is too large.	• Decrease the load. • Examine the machine area to see if, for example, the motor shaft is locked.
		The drive detected a minor fault during Auto-Tuning.	1. Stop Auto-Tuning. 2. Examine the minor fault code and remove the cause of the problem. 3. Do Auto-Tuning again.
Code	**Name**	**Causes**	**Possible Solutions**
Er-03	OFF Button was Pressed	You pushed OFF during Auto-Tuning.	Auto-Tuning did not complete correctly. Do Auto-Tuning again.
Code	**Name**	**Causes**	**Possible Solutions**
Er-04	Line-to-Line Resistance Error	The Auto-Tuning results were not in the applicable parameter setting range.	• Examine and repair motor wiring. • Disconnect the machine from the motor and do Rotational Auto-Tuning again.
		Auto-Tuning did not complete in a pre-set length of time.	
		There is a defective motor cable or cable connection.	
		The motor nameplate data entered during Auto-Tuning is incorrect.	• Make sure that the input motor nameplate data is correct. • Do Auto-Tuning again and correctly set the motor nameplate data.
Code	**Name**	**Causes**	**Possible Solutions**
Er-05	No-Load Current Error	The Auto-Tuning results were not in the applicable parameter setting range.	• Examine and repair motor wiring. • Disconnect the machine from the motor and do Rotational Auto-Tuning again.
		Auto-Tuning did not complete in a pre-set length of time.	
		The motor nameplate data entered during Auto-Tuning is incorrect.	• Make sure that the input motor nameplate data is correct. • Do Auto-Tuning again and correctly set the motor nameplate data.
		Rotational Auto-Tuning was done with a load that was more than 30% of the rating connected to the motor.	• Disconnect the machine from the motor and do Rotational Auto-Tuning again. • If you cannot uncouple the motor and load, make sure that the load is less than 30% of the motor rating. If a mechanical brake is installed in the motor, release the brake during Rotational Auto-Tuning.

Code	Name	Causes	Possible Solutions
Er-08	Rated Slip Error	The motor nameplate data entered during Auto-Tuning is incorrect.	• Make sure that the input motor nameplate data is correct. • Do Auto-Tuning again and correctly set the motor nameplate data.
		Auto-Tuning did not complete in a pre-set length of time.	• Examine and repair the motor wiring. • If the motor and machine are connected during Rotational Auto-Tuning, decouple the motor from the machinery.
		The Auto-Tuning results were not in the applicable parameter setting range.	
		Rotational Auto-Tuning was done with a load that was more than 30% of the rating connected to the motor.	• Disconnect the machine from the motor and do Rotational Auto-Tuning again. • If you cannot uncouple the motor and load, make sure that the load is less than 30% of the motor rating. If a mechanical brake is installed in the motor, release the brake during Rotational Auto-Tuning.
Code	**Name**	**Causes**	**Possible Solutions**
Er-09	Acceleration Error	The motor did not accelerate for the specified acceleration time.	1. Increase the value set in *C1-01 [Acceleration Time 1]*. 2. Disconnect the machine from the motor and do Rotational Auto-Tuning again.
		Rotational Auto-Tuning was done with a load that was more than 30% of the rating connected to the motor.	• Disconnect the machine from the motor and do Rotational Auto-Tuning again. • If you cannot uncouple the motor and load, make sure that the load is less than 30% of the motor rating. If a mechanical brake is installed in the motor, release the brake during Rotational Auto-Tuning.
Code	**Name**	**Causes**	**Possible Solutions**
Er-12	Current Detection Error	There is a phase loss in the drive input power. (U/T1, V/T2, W/T3)	Examine and repair motor wiring.
		The current exceeded the current rating of the drive.	• Check the motor wiring for any short circuits between the wires. • Check and turn ON any magnetic contactors used between motors. • Replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
		The output current is too low.	
		You tried Auto-Tuning without a motor connected to the drive.	Connect the motor and do Auto-Tuning.
		There was a current detection signal error.	Replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Code	**Name**	**Causes**	**Possible Solutions**
Er-13	Leakage Inductance Error	The motor rated current value is incorrect.	Correctly set the rated current indicated on the motor nameplate and do Auto-Tuning again.
		The drive could not complete tuning for leakage inductance in fewer than 300 s.	Examine and repair motor wiring.
Code	**Name**	**Causes**	**Possible Solutions**
Er-18	Back EMF Error	The result of the induced voltage tuning was not in the applicable range.	1. Make sure that the input motor nameplate data is correct. 2. Do Auto-Tuning again and correctly set the motor nameplate data.
Code	**Name**	**Causes**	**Possible Solutions**
Er-19	PM Inductance Error	The Auto-Tuning results of the PM motor inductance were not in the applicable range.	1. Make sure that the input motor nameplate data is correct. 2. Do Auto-Tuning again and correctly set the motor nameplate data.
Code	**Name**	**Causes**	**Possible Solutions**
Er-20	Stator Resistance Error	The Auto-Tuning results of the PM Motor Stator Resistance were not in the applicable range.	1. Make sure that the input motor nameplate data is correct. 2. Do Auto-Tuning again and correctly set the motor nameplate data.
Code	**Name**	**Causes**	**Possible Solutions**
Er-25	HighFreq Inject Param Tuning Err	The motor data is incorrect.	Do Stationary Auto-Tuning again. **Note:** If the drive detects *Er-25* after you do Stationary Auto-Tuning, it is possible that the motor cannot use high frequency injection. For more information, contact Yaskawa or your nearest sales representative.

2.8 Backup Function Operating Mode Display and Errors

◆ Operating Mode Display

When the drive does backup function tasks with the HOA keypad, the keypad will show the current task. These indicators do not show that an error has occurred.

Keypad Display	Name	Display	State
Drive and Keypad mismatch. Should the parameters be restored?	Detection of inconsistency between the drive and keypad	Normally displayed	The drive detected the connection of a keypad from a different drive. Select [Yes] to copy parameters backed up in the keypad to the connected drive.
Restore Restore from keypad	Restoring parameters	Flashing	The parameters stored in the keypad have been restored to the drive.
End	Backup/restore/verify operation ended normally	Normally displayed	The parameter backup, restore, or verify operation ended normally.
Backup Backup from Drive	Backing up parameters	Flashing	The parameters stored in the drive are being backed up to the keypad.
Verify Keypad & Drive	Verifying parameters	Flashing	The parameter settings stored in the keypad and the parameter settings in the drive align or are being compared.

◆ Backup Function Runtime Errors

When an error occurs, the keypad shows a code to identify the error.

The table in this section shows the error codes. Refer to this table to remove the cause of the errors.

Note:

Push any key on the keypad to clear an error.

Code	Name	Causes	Possible Solutions
CPEr	Control Mode Mismatch	The keypad setting and drive setting for *A1-02 [Control Method Selection]* do not agree.	1. Set *A1-02* on the drive to the same value that is on the keypad. 2. Restore the parameters.
Code	**Name**	**Causes**	**Possible Solutions**
CPyE	Error Writing Data	Parameter restore did not end correctly.	Restore the parameters.
Code	**Name**	**Causes**	**Possible Solutions**
CSEr	Control Mode Mismatch	The keypad is broken.	Replace the keypad.
Code	**Name**	**Causes**	**Possible Solutions**
dFPS	Drive Model Mismatch	You tried to restore parameters to a different drive model than the one that you backed up.	1. Examine the drive model that you used to back up the parameters. 2. Restore the parameters.
Code	**Name**	**Causes**	**Possible Solutions**
iFEr	Keypad Communication Error	There was a communications error between the keypad and the drive.	Examine the connector or cable connection.
Code	**Name**	**Causes**	**Possible Solutions**
ndAT	Error Received Data	The parameter settings for model and specifications (power supply voltage and capacity) are different between the keypad and the drive.	1. Make sure that drive model and the value set in *o2-04 [Drive Model (KVA) Selection]* agree. 2. Restore the parameters.
		The parameters are not stored in the keypad.	1. Connect a keypad that has the correct parameters. 2. Restore the parameters.
Code	**Name**	**Causes**	**Possible Solutions**
PWEr	DWEZ Password Mismatch	The password set in the backup operation with *qx-xx [DriveWorksEZ Parameters]* and *rx-xx [DriveWorksEZ Connections]* is incorrect.	Set the DWEZ PC software password supplied by Yaskawa for the DWEZ program user ID downloaded to the drive.
Note: *U8-11 and U8-12 [DWEZ Versions 1 and 2]* show the user ID of the DWEZ program.			

Code	Name	Causes	Possible Solutions
rdEr	Error Reading Data	You tried to back up the data when *o3-02 = 0 [Copy Allowed Selection = Disabled]*.	Set *o3-02 = 1 [Enabled]* and back up again.
Code	**Name**	**Causes**	**Possible Solutions**
vAEr	Voltage Class, Capacity Mismatch	The power supply specifications or drive capacity parameter settings are different between the keypad and the drive.	1. Make sure that drive model and the value set in *o2-04 [Drive Model (KVA) Selection]* agree. 2. Restore the parameters.
Code	**Name**	**Causes**	**Possible Solutions**
vFyE	Parameters do not Match	The parameters that are backed up in the keypad and the parameters in the drive are not the same.	1. Restore or backup the parameter again. 2. Verify the parameters.

2.9 Diagnosing and Resetting Faults

When a fault occurs and the drive stops, do the procedures in this section to remove the cause of the fault, then re-energize the drive.

◆ Fault and Power Loss Occur at the Same Time

WARNING! *Crush Hazard. Wear eye protection when you do work on the drive. If you do not use correct safety equipment, it can cause serious injury or death.*

WARNING! *Electrical Shock Hazard. After the drive blows a fuse or trips a GFCI, do not immediately energize the drive or operate peripheral devices. Wait for the time specified on the warning label at a minimum and make sure that all indicators are OFF. Then check the wiring and peripheral device ratings to find the cause of the problem. If you do not know the cause of the problem, contact Yaskawa before you energize the drive or peripheral devices. If you do not fix the problem before you operate the drive or peripheral devices, it can cause serious injury or death.*

1. Supply power to the control circuit from the external 24 V input.
2. Use monitor parameters *U2-xx [Fault Trace]* to show the fault code and data about the operating status of the drive immediately before the fault occurred.
3. Use the information in the Troubleshooting tables to remove the fault.

Note:

1. To find the faults that were triggered, check the fault history in *U2-02 [Previous Fault]*. To find information about drive status (such as frequency, current, and voltage) when the faults were triggered, check *U2-03 to U2-20*.
2. If the fault display stays after you re-energize the drive, remove the cause of the fault and reset.

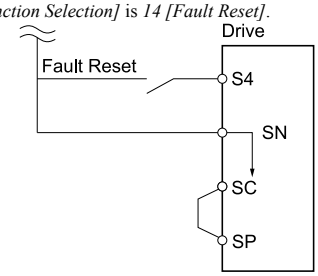
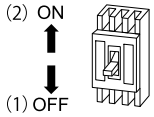
◆ Fault Occurs Without Power Loss

1. Examine the fault code shown on the keypad.
2. Use the information in the Troubleshooting tables to remove the fault.
3. Do a fault reset.

◆ Fault Reset

If a fault occurs, you must remove the cause of the fault and re-energize the drive. Table 2.3 lists the different methods to reset the drive after a fault.

Table 2.3 Fault Reset Methods

Methods	Description
Method 1	While the keypad is showing the fault or alarm code, push F1 (Reset) or > on the keypad.
Method 2	Switch ON the MFDI terminal set to *H1-xx = 14 [MFDI Function Select = Fault Reset]*. **Note:** The default setting for *H1-04 [Terminal S4 Function Selection]* is *14 [Fault Reset]*. 
Method 3	1. De-energize the drive main circuit power supply. 2. Energize the drive again after the keypad display goes out. 

Note:

If the drive receives a Run command from a communication option or control circuit terminal, the drive will not reset the fault. Remove the Run command then try to clear the fault. If you do a fault reset when the drive has a Run command, the keypad will show minor fault *CrST [Remove RUN Command to Reset]*.

2.10 Troubleshooting Without Fault Display

Note:

Make sure that you use a keypad with FLASH number 1004 or later. Keypads with FLASH numbers 1003 and earlier will not show characters correctly.

If the drive or motor operate incorrectly, but the keypad does not show a fault or error code, refer to the items this section.

- Motor hunting and oscillation
- Unsatisfactory motor torque
- Unsatisfactory speed precision
- Unsatisfactory motor torque and speed response
- Motor noise

◆ Typical Problems

Symptom	Reference
The Parameter Settings Will Not Change	112
The Motor Does Not Rotate After Entering Run Command	113
The Motor Rotates in the Opposite Direction from the Run Command	114
The Motor Rotates in Only One Direction	114
The Motor Is Too Hot	114
oPE02 Error Occurs When Decreasing the Motor Rated Current Setting	115
The Correct Auto-Tuning Mode Is Not Available	115
The Motor Stalls during Acceleration or Accel/Decel Time Is Too Long	115
The Drive Frequency Reference Is Different than the Controller Frequency Reference Command	116
The Motor Speed Is Not Stable When Using a PM Motor	116
There Is Too Much Motor Oscillation and the Rotation Is Irregular	116
There Is Audible Noise from the Drive or Motor Cables When the Drive Is Energized	116
The Ground Fault Circuit Interrupter (GFCI) Trips During Run	117
Motor Rotation Causes Unexpected Audible Noise from Connected Machinery	117
Motor Rotation Causes Oscillation or Hunting	117
PID Output Fault	117
The Starting Torque Is Not Sufficient	117
The Motor Rotates after the Drive Output Is Shut Off	118
The Output Frequency Is Lower Than the Frequency Reference	118
The Motor Is Making an Audible Noise	118
The Motor Will Not Restart after a Loss of Power	118

◆ The Parameter Settings Will Not Change

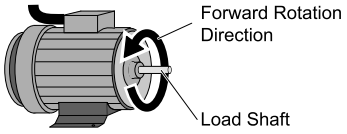
Causes	Possible Solutions
The drive is operating the motor (the drive is in Drive Mode).	Stop the drive and change to Programming Mode.
Parameter *A1-01 = 0 [Access Level Selection = Operation Only]*.	Set *A1-01 = 2 [Access Level Selection = Advanced Level]* or *A1-01 = 3 [Expert Level]*.
Parameter *H1-xx = 1B [MFDI Function Select = Programming Lockout]*.	Activate the terminals to which *H1-xx = 1B* is set, and then change the parameters.

Causes	Possible Solutions
You entered an incorrect password in *A1-04 [Password]*.	• Enter the correct password to *A1-04* again. • If you forgot the password, set the password again with *A1-04* and *A1-05 [Password Setting]*. **Note:** If you set the password, you cannot change these parameters until the password aligns: *• A1-01 [Access Level Selection]* *• A1-02 [Control Method Selection]* *• A1-03 [Initialize Parameters]* *• A1-06 [Application Preset]* *• A1-07 [DriveWorksEZ Function Selection]* *• A2-01 to A2-32 [User Parameter 1 to User Parameter 32]*
The drive detected *Uv [Undervoltage]*.	• View *U1-07 [DC Bus Voltage]* to see the power supply voltage. • Examine the main circuit wiring.

◆ The Motor Does Not Rotate After Entering Run Command

Causes	Possible Solutions
The drive is not in Drive Mode.	1. Make sure that the keypad shows [Rdy]. 2. If the keypad does not show [Rdy], go back to the Home screen.
Auto-Tuning completed.	Go back to the Home screen on the keypad. **Note:** When Auto-Tuning completes, the drive changes to Programming Mode. The drive will not accept a Run command unless the drive is in Drive Mode.
The drive stopped, you pushed HAND, and changed the Run command source to the keypad.	Do one of these two: • Push OFF. • Re-energize the drive.
The drive received a fast stop command.	Turn off the fast stop input signal.
The settings for the source that supplies the Run command are incorrect.	Set *b1-02 [Run Command Selection 1]* correctly.
The frequency reference source is set incorrectly.	Set *b1-01 [Frequency Reference Selection 1]* correctly.
There is defective wiring in the control circuit terminals.	• Correctly wire the drive control circuit terminals. • View *U1-10 [Input Terminal Status]* for input terminal status.
The settings for voltage input and current input of the master frequency reference are incorrect.	Examine these analog input terminal signal level settings: • Terminal A1: Jumper switch S1 and *H3-01 [Terminal A1 Signal Level Select]* • Terminal A2: Jumper switch S1 and *H3-09 [Terminal A2 Signal Level Select]*
The selection for the sinking/sourcing mode and the internal/external power supply is incorrect.	• For sinking mode, close the circuit between terminals SC-SP with a wire jumper. • For sourcing mode, close the circuit between terminals SC-SN with a wire jumper. • For external power supply, remove the wire jumper.
The frequency reference is too low.	• View *U1-01 [Freq Reference]*. • Increase the frequency reference to a value higher than *E1-09 [Minimum Output Frequency]*.
The MFAI setting is incorrect.	• Make sure that the functions set to the MFAI are correct. The frequency reference is 0 when *H3-02, H3-10 = 1 [MFAI Function Select = Frequency Gain]* and voltage (current) is not input. • View *U1-13 and U1-14 [Terminal A1, A2 Input Voltage]* to see if the analog input values set to terminals A1 and A2 are applicable.
OFF was pushed.	Turn the Run command OFF then ON from an external input. **Note:** When you push OFF during operation, the drive will coast to stop. Set *o2-02 = 0 [STOP Key Function Selection = Disabled]* to disable the OFF function.
The 2-wire sequence and 3-wire sequence are set incorrectly.	• Set one of the parameters *H1-03 to H1-07 [Terminals S3 to S7 Function Select]* to *0 [3-Wire Sequence]* to enable the 3-wire sequence. • If a 2-wire sequence is necessary, make sure that *H1-03 to H1-07 ≠ 0*.

◆ The Motor Rotates in the Opposite Direction from the Run Command

Causes	Possible Solutions
The phase wiring between the drive and motor is incorrect.	• Examine the wiring between the drive and motor. • Connect drive output terminals U/T1, V/T2, and W/T3 in the correct sequence to agree with motor terminals U, V, and W. • Switch two motor cables U, V, and W to reverse motor direction.
The forward direction for the motor is set incorrectly.	• Connect drive output terminals U/T1, V/T2, and W/T3 in the correct sequence to agree with motor terminals U, V, and W. • Switch two motor cables U, V, and W to reverse motor direction.  **Figure 2.1 Forward Rotating Motor** **Note:** • For Yaskawa motors, the forward direction is counterclockwise when looking from the motor shaft side. • Refer to the motor specifications, and make sure that the forward rotation direction is correct for the application. The forward rotation direction of motors can be different for different motor manufacturers and types.
The signal connections for forward run and reverse run on the drive control circuit terminals and control panel side are incorrect.	Correctly wire the control circuit.
The motor is running at almost 0 Hz and the Speed Search estimated the speed to be in the opposite direction.	Set *b3-14 = 0 [Bi-directional Speed Search = Disabled]*, then the drive will only do speed search in the specified direction.

◆ The Motor Rotates in Only One Direction

Causes	Possible Solutions
The drive will not let the motor rotate in reverse.	Set *b1-04 = 0 [Reverse Operation Selection = Reverse Enabled]*.
The drive did not receive a Reverse run signal and 3-Wire sequence is selected.	Activate the terminals to which *H1-xx = 0 [3-Wire Sequence]* is set, and then enable reverse operation.

◆ The Motor Is Too Hot

Causes	Possible Solutions
The load is too heavy.	• Decrease the load. • Increase the acceleration and deceleration times. • Examine the values set in *L1-01 [Motor Overload (oL1) Protection]*, *L1-02 [Motor Overload Protection Time]*, and *E2-01 [Motor Rated Current (FLA)]*. • Use a larger motor. **Note:** The motor also has a short-term overload rating. Examine this rating carefully before setting drive parameters.
The motor is running continuously at a very low speed.	• Change the run speed. • Use a drive-dedicated motor.
The drive is operating in a vector control mode, but Auto-Tuning has not been done.	• Do Auto-Tuning. • Calculate motor parameter and set motor parameters. • Set *A1-02 = 0 [Control Method Selection = V/f Control]*.
The voltage insulation between motor phases is not sufficient.	• Use a motor with a voltage tolerance that is higher than the maximum voltage surge. • Use a drive-dedicated motor that is rated for use with AC drives for applications that use a motor on drives rated higher than 480 V class. • Install an AC reactor on the output side of the drive and set *C6-02 = 1 [Carrier Frequency Selection = 2.0 kHz]*. **Note:** When the motor is connected to the drive output terminals U/T1, V/T2, and W/T3, surges occur between the drive switching and the motor coils. These surges can be three times the drive input power supply voltage (600 V for a 208 V class drive, 1200 V for a 480 V class drive).
The air around the motor is too hot.	• Measure the ambient temperature. • Decrease the temperature in the area until it is in the specified temperature range.
The motor fan stopped or is clogged.	• Clean the motor fan. • Make the drive environment better.

◆ oPE02 Error Occurs When Decreasing the Motor Rated Current Setting

Causes	Possible Solutions
Motor rated current and the motor no-load current setting in the drive are incorrect.	• You are trying to set the motor rated current in *E2-01 [Motor Rated Current (FLA)]* to a value lower than the no-load current set in *E2-03 [Motor No-Load Current]*. • Make sure that value set in *E2-01* is higher than *E2-03*. • If it is necessary to set *E2-01* lower than *E2-03*, first decrease the value set to *E2-03*, then change the *E2-01* setting as necessary.

◆ The Correct Auto-Tuning Mode Is Not Available

Causes	Possible Solutions
The desired Auto-Tuning mode is not available for the selected control mode.	Change the motor control method with parameter *A1-02 [Control Method Selection]*.

◆ The Motor Stalls during Acceleration or Accel/Decel Time Is Too Long

Causes	Possible Solutions
The drive and motor system reached the torque limit or current suppression will not let the drive accelerate.	• Decrease the load. • Use a larger motor. **Note:** Although the drive has a Stall Prevention function and a Torque Compensation Limit function, accelerating too fast or trying to drive a load that is too large can exceed the limits of the motor.
Torque limit is set incorrectly.	Set the torque limit correctly.
The acceleration time setting is too short.	Examine the values set in *C1-01 or C1-03 [Acceleration Times]* and set them to applicable values.
The load is too heavy.	• Increase the acceleration time. • Examine the mechanical brake and make sure that it is fully releasing. • Decrease the load to make sure that the output current stays less than the motor rated current. • Use a larger motor. **Note:** • In extruder and mixer applications, the load can increase as the temperature decreases. • Although the drive has a Stall Prevention function and a Torque Compensation Limit function, accelerating too fast or trying to drive a load that is too large can exceed the limits of the motor.
The frequency reference is low.	• Examine *E1-04 [Maximum Output Frequency]* and increase the setting if it is set too low. • Examine *U1-01 [Frequency Reference]* for the correct frequency reference. • Examine the multi-function input terminals to see if a frequency reference signal switch has been set. • Examine the low gain level set in *H3-03, H3-11 [Terminal A1, A2 Gain Setting]* when you use MFAI.
The frequency reference is set incorrectly.	When *H3-02, H3-10 = 1 [MFAI Function Selection = Frequency Gain]* are set, see if voltage (current) has been set. • Check the values set in *H3-02 and H3-10*. • Use *U1-13 and U1-14 [Terminal A1, A2 Input Voltage]* to make sure that the analog input values set to terminals A1 and A2 are applicable.
The motor characteristics and drive parameter settings are not compatible.	• Set the correct V/f pattern to agree with the characteristics of the motor. • Examine the V/f pattern set in *E1-03 [V/f Pattern Selection]*. • Perform Rotational Auto-Tuning.
The drive is operating in vector control mode, but Auto-Tuning is not completed.	• Do Auto-Tuning. • Calculate motor data and reset motor parameters. • Set *A1-02 = 0 [Control Method Selection = V/f Control]*.
The Stall Prevention level during acceleration setting is too low.	Increase the value set in *L3-02 [Stall Prevent Level during Accel]*. **Note:** If the *L3-02* value is too low, the acceleration time can be unsatisfactorily long.
The Stall Prevention level during run setting is too low.	Increase the value set in *L3-06 [Stall Prevent Level during Run]*. **Note:** If the *L3-06* value is too low, speed will decrease while the drive outputs torque.
Drive reached the limitations of the V/f motor control method.	• When the motor cable is longer than 50 m (164 ft), do Auto-Tuning for line-to-line resistance. • Set the V/f pattern to "High Starting Torque". • Use a Vector Control method. **Note:** V/f control method does not provide high torque at low speeds.

◆ The Drive Frequency Reference Is Different than the Controller Frequency Reference Command

Causes	Possible Solutions
The analog input gain and bias for the frequency reference input are set incorrectly.	Examine the gain and bias settings for the analog inputs that set the frequency reference. • Terminal A1: *H3-03 [Terminal A1 Gain Setting]*, *H3-04 [Terminal A1 Bias Setting]* • Terminal A2: *H3-11 [Terminal A2 Gain Setting]*, *H3-12 [Terminal A2 Bias Setting]*
The drive is receiving frequency bias signals from analog input terminals A1 and A2 and the sum of all signals makes the frequency reference.	• Examine parameters *H3-02, H3-10 [MFAI Function Selection]*. If two or more of these parameters are set to *0 [Frequency Reference]*, change the settings. • Use *U1-13 and U1-14 [Terminal A1, A2 Input Voltage]* to make sure that the analog input values set to terminals A1 and A2 are applicable.
PID control is enabled.	If PID control is not necessary, set *b5-01 = 0 [PID Mode Setting = Disabled]*. **Note:** When PID control is enabled, the drive adjusts the output frequency as specified by the target value. The drive will only accelerate to the maximum output frequency set in *E1-04 [Maximum Output Frequency]* while PID control is active.

◆ The Motor Speed Is Not Stable When Using a PM Motor

Causes	Possible Solutions
Parameter *E5-01 [PM Motor Code Selection]* is set incorrectly.	Refer to "Motor Performance Fine-Tuning" in the technical manual.
The drive is operating the motor at more than the specified speed control range.	Examine the speed control range and adjust the speed.
The motor is hunting.	Adjust these parameters to have the largest effect: • *n8-55 [Motor to Load Inertia Ratio]* • *n8-45 [Speed Feedback Detection Gain]* • *C4-02 [Torque Compensation Delay Time]*
Hunting occurs at start.	Increase the value set in *C2-01 [S-Curve Time @ Start of Accel]*.
Too much current is flowing through the drive.	Set *E5-01* correctly as specified by the motor. For special-purpose motors, enter the correct value to *E5-xx* as specified by the motor test report.

◆ There Is Too Much Motor Oscillation and the Rotation Is Irregular

Causes	Possible Solutions
Unsatisfactory balance of motor phases.	• Make sure that the drive input power voltage supplies stable power. • Set *L8-05 = 0 [Input Phase Loss Protect Select = Disabled]*.
The motor is hunting.	Set *n1-01 = 1 [Hunting Prevention Selection = Enabled]*.

◆ There Is Audible Noise from the Drive or Motor Cables When the Drive Is Energized

Causes	Possible Solutions
The relay switching in the drive is making too much noise.	• Use *C6-02 [Carrier Frequency Selection]* to decrease the carrier frequency. • Connect a noise filter to the input side of the drive power supply. • Connect a noise filter to the output side of the drive. • Isolate the control circuit wiring from the main circuit wiring. • Use a metal cable gland to wire the drive. • Shield the periphery of the drive with metal. • Make sure that the drive and motor are grounded correctly. • Make sure that ground faults have not occurred in the wiring or motor.

◆ The Ground Fault Circuit Interrupter (GFCI) Trips During Run

Causes	Possible Solutions
There is too much leakage current from the drive.	• Increase the GFCI sensitivity or use GFCI with a higher threshold. • Use *C6-02 [Carrier Frequency Selection]* to decrease the carrier frequency. • Decrease the length of the cable used between the drive and the motor. • Install a noise filter or AC reactor on the output side of the drive. Set *C6-02 = 1 [2.0 kHz]* when connecting an AC reactor. • Disable the internal EMC filter.

◆ Motor Rotation Causes Unexpected Audible Noise from Connected Machinery

Causes	Possible Solutions
The carrier frequency and the resonant frequency of the connected machinery are the same.	• Adjust *C6-02 to C6-05 [Carrier Frequency]*. • Set *C6-02 = 1 to 6 [Carrier Frequency Selection = Frequency other than Swing PWM]*. **Note:** If *C6-02 = 7 to A [Carrier Frequency Selection = Swing PWM]*, the drive will not know if the noise comes from the drive or the machine.
The drive output frequency and the resonant frequency of the connected machinery are the same.	• Adjust *d3-01 to d3-04 [Jump Frequency]*. • Put the motor on a rubber pad to decrease vibration.

◆ Motor Rotation Causes Oscillation or Hunting

Causes	Possible Solutions
The frequency reference is assigned to an external source, and there is electrical interference in the signal.	Make sure that electrical interference does not have an effect on the signal lines. • Isolate control circuit wiring from main circuit wiring. • Use twisted-pair cables or shielded wiring for the control circuit. • Increase the value of *H3-13 [Analog Input FilterTime Constant]*.
The cable between the drive and motor is too long.	• Do Auto-Tuning. • Make the wiring as short as possible.
The PID parameters are not sufficiently adjusted.	Adjust *b5-xx [PID control]*.

◆ PID Output Fault

Causes	Possible Solutions
There is no PID feedback input.	• Examine the MFAI terminal settings. • See if *H3-02, H3-10 = B [MFAI Function Selection = PID Feedback]* is set. • Make sure that the MFAI terminal settings agree with the signal inputs. • Examine the connection of the feedback signal. • Make sure that *b5-xx [PID Control]* is set correctly. **Note:** If there is no PID feedback input to the terminal, the detected value is 0, which causes a PID fault and also causes the drive to operate at maximum frequency.
The detection level and the target value do not agree.	Use *H3-03, H3-11 [Terminal A1, A2 Gain Setting]* to adjust PID target and feedback signal scaling. **Note:** PID control keeps the difference between the target value and detection value at 0. Set the input level for the values relative to each other.
Reverse drive output frequency and speed detection. When output frequency increases, the sensor detects a speed decrease.	Set *b5-09 = 1 [PID Output Level Selection = Reverse Output (Reverse Acting)]*.

◆ The Starting Torque Is Not Sufficient

Causes	Possible Solutions
Auto-Tuning has not been done in vector control method.	Do Auto-Tuning.
The control method was changed after doing Auto-Tuning.	Do Auto-Tuning again.
Stationary Auto-Tuning for Line-to-Line Resistance was done.	Do Rotational Auto-Tuning.

◆ The Motor Rotates after the Drive Output Is Shut Off

Causes	Possible Solutions
DC Injection Braking is too low and the drive cannot decelerate correctly.	• Increase the value set in *b2-02 [DC Injection Braking Current]*. • Increase the value set in *b2-04 [DC Inject Braking Time at Stop]*.
The stopping method makes the drive coast to stop.	Set *b1-03 = 0 or 2 [Stopping Method Selection = Ramp to Stop, DC Injection Braking to Stop]*.

◆ The Output Frequency Is Lower Than the Frequency Reference

Causes	Possible Solutions
The frequency reference is in the Jump frequency range.	Adjust *d3-01 to d3-03 [Jump Frequency 1 to 3]* and *d3-04 [Jump Frequency Width]*. **Note:** Enabling the Jump frequency prevents the drive from outputting the frequencies specified in the Jump range.
The upper limit for the frequency reference has been exceeded.	Set *E1-04 [Maximum Output Frequency]* and *d2-01 [Frequency Reference Upper Limit]* to the best values for the application. **Note:** This calculation supplies the upper value for the output frequency: *E1-04* × *d2-01* / 100
A large load triggered Stall Prevention function during acceleration.	• Decrease the load. • Adjust *L3-02 [Stall Prevent Level during Accel]*.
L3-01 = 3 [Stall Prevention during Accel = Current Limit Method] has been set.	1. Make sure that the V/f pattern and motor parameter settings are appropriate, and set them correctly. 2. If this does not solve the problem, and it is not necessary to limit the current level of stall during acceleration, adjust *L3-02*. 3. If this does not solve the problem, set *L3-01 = 1 [Enabled]*.
The motor is rotating at this speed: *b2-01 [DC Injection/Zero SpeedThreshold]* ≤ Motor Speed < *E1-09 [Minimum Output Frequency]*	Set *E1-09* < *b2-01*.

◆ The Motor Is Making an Audible Noise

Causes	Possible Solutions
100% of the rated output current of the drive was exceeded while operating at low speeds.	• If the sound is coming from the motor, set *L8-38 = 0 [Carrier Frequency Reduction = Disabled]*. • If *oL2 [Drive Overloaded]* occurs frequently after setting *L8-38 = 0*, replace the drive with a high-capacity drive.

◆ The Motor Will Not Restart after a Loss of Power

Causes	Possible Solutions
The drive did not receive a Run command after applying power.	• Examine the sequence and wiring that enters the Run command. • Set up a relay to make sure that the Run command stays enabled during a loss of power.
For applications that use 3-wire sequence, the momentary power loss continued for a long time, and the relay that keeps the Run command has been switched off.	Examine the wiring and circuitry for the relay that keeps the Run command enabled during the momentary power loss ride-thru time.

3

Parameter List

3.1 Section Safety

⚠DANGER

Do not ignore the safety messages in this manual.

If you ignore the safety messages in this manual, it will cause serious injury or death. The manufacturer is not responsible for injuries or damage to equipment.

3.2 How to Read the Parameter List

◆ Icons and Terms that Identify Parameters and Control Methods

Icon	Description
	The parameter is available when operating the drive with V/f Control.
	The parameter is available when operating the drive with Open Loop Vector Control for PM.
	The parameter is available when operating the drive with EZ Open Loop Vector Control.
Hex.	Hexadecimal numbers that represent MEMOBUS addresses to change parameters over network communication.
RUN	You can change the parameter setting during Run.
Expert	The parameter is available in Expert Mode only. *1

*1 Set *A1-01 = 3 [Access Level Selection = Expert Level]* to show and set Expert Mode parameters on the keypad.

Note:

Gray icons identify parameters that are not available in the specified control method.

3.3 Parameter Groups

Represents the type of product parameters.

Parameters	Name
A1	Initialization
A2	User Parameters
b1	Operation Mode Selection
b2	DC Injection Braking and Short Circuit Braking
b3	Speed Search
b4	Timer Function
b5	PID Control
b8	Energy Saving
C1	Accel & Decel Time
C2	S-Curve Characteristics
C3	Slip Compensation
C4	Torque Compensation
C5	Auto Speed Regulator (ASR)
C6	Carrier Frequency
d1	Frequency Reference
d2	Reference Limits
d3	Jump Frequency
d4	Frequency Ref Up/Down & Hold
d6	Field Weakening
d7	Offset Frequency
E1	V/f Pattern for Motor 1
E2	Motor Parameters
E3	V/f Pattern for Motor 2
E4	Motor 2 Parameters
E5	PM Motor Settings
E9	Motor Setting
F6	Communication Options
F7	Ethernet Options
H1	Digital Inputs
H2	Digital Outputs
H3	Analog Inputs
H4	Analog Outputs
H5	Serial Communication
H7	Virtual Inputs / Outputs
L1	Motor Protection
L2	Power Loss Ride Through
L3	Stall Prevention
L4	Speed Detection
L5	Fault Restart

Parameters	Name
L6	Torque Detection
L7	Torque Limit
L8	Drive Protection
L9	Drive Protection 2
n1	Hunting Prevention
n3	High Slip/Overexcite Braking
n7	EZ Drive
n8	PM Motor Control Tuning
o1	Keypad Display
o2	Keypad Operation
o3	Copy Keypad Function
o4	Maintenance Monitors
o5	Log Function
q	DriveWorksEZ Parameters
r	DriveWorksEZ Connections
S1	Dynamic Noise Control
S2	Sequence Run Timers
S3	PI2 Control
S5	HAND/OFF/AUTO Operation
S6	Protection
T0	Tuning Mode Selection
T1	InductionMotor Auto-Tuning
T2	PM Motor Auto-Tuning
T4	EZ Tuning
U1	Operation Status Monitors
U2	Fault Trace
U3	Fault History
U4	Maintenance Monitors
U5	PID Monitors
U6	Operation Status Monitors
U8	DriveWorksEZ Monitors
UA	Network Multiplexing
UC	BACnet Diagnostic Monitors
Y1	Application Basics
Y2	PID Sleep and Protection
Y4	Application Advanced
Y9	Network Multiplex Options
YA	Preset Setpoint

Parameters	Name
YC	Foldback Features

Parameters	Name
YF	PI Auxiliary Control

3.4 A: Initialization Parameters

◆ A1: Initialization

No. (Hex.)	Name	Description	Default (Range)
A1-00 (0100) RUN	Language Selection	Sets the language for the HOA keypad. **Note:** When you use *A1-03 [Initialize Parameters]* to initialize the drive, the drive will not reset this parameter. 0 : English 1 : Japanese 2 : German 3 : French 4 : Italian 5 : Spanish 6 : Portuguese	0 (0 - 6)
A1-01 (0101) RUN	Access Level Selection	Sets user access to parameters. The access level controls which parameters the keypad will display and which parameters the user can set. 0 : Operation Only 1 : User Parameters 2 : Advanced Level 3 : Expert Level 4 : Lock Parameters	2 (0 - 4)
A1-02 (0102)	Control Method Selection	Sets the control method for the drive application and the motor. 0 : V/f Control 5 : PM Open Loop Vector 8 : EZ Vector Control	0 (0 - 8)
A1-03 (0103)	Initialize Parameters	Sets parameters to default values. 0 : No Initialization 1110 : User Initialization 2220 : 2-Wire Initialization 3330 : 3-Wire Initialization 3410 : HVAC Initialization	0 (0 - 3410)
A1-04 (0104)	Password	Entry point for the password set in *A1-05 [Password Setting]*. The user can view the settings of parameters that are locked without entering the password. Enter the correct password in this parameter to change parameter settings.	0000 (0000 - 9999)
A1-05 (0105)	Password Setting	Sets a password to lock parameters and prevent changes to parameter settings. Enter the correct password in *A1-04 [Password]* to unlock parameters and accept changes.	0000 (0000 - 9999)
A1-06 (0127)	Application Preset	Sets the drive to operate in selected application conditions. 0 : No Preset Selected 1 : General Purpose Fan 2 : Fan w/ PID Control 3 : Return Fan w/ PID Control 4 : Cooling Tower Fan 5 : Cooling Tower Fan w/ PID 6 : Secondary Pump 7 : Pump w/ PID Control 8 : Pump Network Multiplex	0 (0 - 8)
A1-07 (0128)	DriveWorksEZ Function Selection	Sets the drive to operate with DriveWorksEZ. 0 : DWEZ Disabled 1 : DWEZ Enabled 2 : Enabled/Disabled wDigital Input	0 (0 - 2)
A1-11 (111D) Expert	Firmware Update Lock	Protects the drive firmware. When you enable the protection, you cannot update the drive firmware. 0 : Disabled 1 : Enabled	0 (0, 1)
A1-12 (1564)	Bluetooth ID	Sets the password necessary to use Bluetooth to control the drive with a smartphone or tablet.	- (0000 - 9999)

◆ A2: User Parameters

No. (Hex.)	Name	Description	Default (Range)
A2-01 (0106)	User Parameter 1	Sets the parameter number to be shown for number 1 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*.	A1-02 (Determined by A1-07)
A2-02 (0107)	User Parameter 2	Sets the parameter number to be shown for number 2 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*.	b1-01 (Determined by A1-07)
A2-03 (0108)	User Parameter 3	Sets the parameter number to be shown for number 3 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*.	b1-02 (Determined by A1-07)
A2-04 (0109)	User Parameter 4	Sets the parameter number to be shown for number 4 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*.	b1-03 (Determined by A1-07)
A2-05 (010A)	User Parameter 5	Sets the parameter number to be shown for number 5 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*.	C1-01 (Determined by A1-07)
A2-06 (010B)	User Parameter 6	Sets the parameter number to be shown for number 6 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*.	C1-02 (Determined by A1-07)
A2-07 (010C)	User Parameter 7	Sets the parameter number to be shown for number 7 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*.	C6-02 (Determined by A1-07)
A2-08 (010D)	User Parameter 8	Sets the parameter number to be shown for number 8 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*.	d1-01 (Determined by A1-07)
A2-09 (010E)	User Parameter 9	Sets the parameter number to be shown for number 9 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*.	d1-02 (Determined by A1-07)
A2-10 (010F)	User Parameter 10	Sets the parameter number to be shown for number 10 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*.	d1-03 (Determined by A1-07)
A2-11 (0110)	User Parameter 11	Sets the parameter number to be shown for number 11 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*.	d1-04 (Determined by A1-07)
A2-12 (0111)	User Parameter 12	Sets the parameter number to be shown for number 12 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*.	d1-17 (Determined by A1-07)
A2-13 (0112)	User Parameter 13	Sets the parameter number to be shown for number 13 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*.	E1-01 (Determined by A1-07)
A2-14 (0113)	User Parameter 14	Sets the parameter number to be shown for number 14 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*.	E1-03 (Determined by A1-07)
A2-15 (0114)	User Parameter 15	Sets the parameter number to be shown for number 15 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*.	E1-04 (Determined by A1-07)
A2-16 (0115)	User Parameter 16	Sets the parameter number to be shown for number 16 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*.	E1-05 (Determined by A1-07)
A2-17 (0116)	User Parameter 17	Sets the parameter number to be shown for number 17 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*. You can set *A2-17* to *A2-32* when *A2-33 = 0 [User Parameter Auto Selection = Disabled: Manual Entry Required]*.	E1-06 (Determined by A1-07)
A2-18 (0117)	User Parameter 18	Sets the parameter number to be shown for number 18 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*. You can set *A2-17* to *A2-32* when *A2-33 = 0 [User Parameter Auto Selection = Disabled: Manual Entry Required]*.	E1-09 (Determined by A1-07)
A2-19 (0118)	User Parameter 19	Sets the parameter number to be shown for number 19 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*. You can set *A2-17* to *A2-32* when *A2-33 = 0 [User Parameter Auto Selection = Disabled: Manual Entry Required]*.	E1-13 (Determined by A1-07)
A2-20 (0119)	User Parameter 20	Sets the parameter number to be shown for number 20 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*. You can set *A2-17* to *A2-32* when *A2-33 = 0 [User Parameter Auto Selection = Disabled: Manual Entry Required]*.	E2-01 (Determined by A1-07)
A2-21 (011A)	User Parameter 21	Sets the parameter number to be shown for number 21 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*. You can set *A2-17* to *A2-32* when *A2-33 = 0 [User Parameter Auto Selection = Disabled: Manual Entry Required]*.	E2-04 (Determined by A1-07)

No. (Hex.)	Name	Description	Default (Range)
A2-22 (011B)	User Parameter 22	Sets the parameter number to be shown for number 22 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*. You can set *A2-17* to *A2-32* when *A2-33 = 0 [User Parameter Auto Selection = Disabled: Manual Entry Required]*.	E2-11 (Determined by A1-07)
A2-23 (011C)	User Parameter 23	Sets the parameter number to be shown for number 23 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*. You can set *A2-17* to *A2-32* when *A2-33 = 0 [User Parameter Auto Selection = Disabled: Manual Entry Required]*.	H4-02 (Determined by A1-07)
A2-24 (011D)	User Parameter 24	Sets the parameter number to be shown for number 24 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*. You can set *A2-17* to *A2-32* when *A2-33 = 0 [User Parameter Auto Selection = Disabled: Manual Entry Required]*.	L1-01 (Determined by A1-07)
A2-25 (011E)	User Parameter 25	Sets the parameter number to be shown for number 25 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*. You can set *A2-17* to *A2-32* when *A2-33 = 0 [User Parameter Auto Selection = Disabled: Manual Entry Required]*.	L3-04 (Determined by A1-07)
A2-26 (011F)	User Parameter 26	Sets the parameter number to be shown for number 26 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*. You can set *A2-17* to *A2-32* when *A2-33 = 0 [User Parameter Auto Selection = Disabled: Manual Entry Required]*.	- (Determined by A1-07)
A2-27 (0120)	User Parameter 27	Sets the parameter number to be shown for number 27 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*. You can set *A2-17* to *A2-32* when *A2-33 = 0 [User Parameter Auto Selection = Disabled: Manual Entry Required]*.	- (Determined by A1-07)
A2-28 (0121)	User Parameter 28	Sets the parameter number to be shown for number 28 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*. You can set *A2-17* to *A2-32* when *A2-33 = 0 [User Parameter Auto Selection = Disabled: Manual Entry Required]*.	- (Determined by A1-07)
A2-29 (0122)	User Parameter 29	Sets the parameter number to be shown for number 29 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*. You can set *A2-17* to *A2-32* when *A2-33 = 0 [User Parameter Auto Selection = Disabled: Manual Entry Required]*.	- (Determined by A1-07)
A2-30 (0123)	User Parameter 30	Sets the parameter number to be shown for number 30 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*. You can set *A2-17* to *A2-32* when *A2-33 = 0 [User Parameter Auto Selection = Disabled: Manual Entry Required]*.	- (Determined by A1-07)
A2-31 (0124)	User Parameter 31	Sets the parameter number to be shown for number 31 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*. You can set *A2-17* to *A2-32* when *A2-33 = 0 [User Parameter Auto Selection = Disabled: Manual Entry Required]*.	- (Determined by A1-07)
A2-32 (0125)	User Parameter 32	Sets the parameter number to be shown for number 32 of the [User Custom Parameters] under the main menu. You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01* to *A2-32*. You can set *A2-17* to *A2-32* when *A2-33 = 0 [User Parameter Auto Selection = Disabled: Manual Entry Required]*.	- (Determined by A1-07)
A2-33 (0126)	User Parameter Auto Selection	Sets the automatic save feature for changes to parameters *A2-17 to A2-32 [User Parameters 17 to 32]*. 0 : Disabled: Manual Entry Required 1 : Enabled: Auto Save Recent Parms	Determined by A1-06 (0, 1)

3.5 b: Application

◆ b1: Operation Mode Selection

No. (Hex.)	Name	Description	Default (Range)
b1-01 (0180)	Frequency Reference Selection 1	Sets the input method for the frequency reference. 0 : Keypad 1 : Analog Input 2 : Serial Communications 3 : Option PCB	1 (0 - 3)
b1-02 (0181)	Run Command Selection 1	Sets the input method for the Run command. 0 : Keypad 1 : Digital Input 2 : Serial Communications 3 : Option PCB 7 : AUTO Command + Term Run 8 : AUTO Command + Serial Run 9 : AUTO Command + Option Run **Note:** If you use these parameter settings at the same time, the drive will detect an *oPE05 [Run Cmd/ Freq Ref Source Sel Err]*: • *S5-04 = 0 [HAND-OFF-AUTO Behavior = Legacy]* and *b1-02 = 0 to 3* • *S5-10 = 2 [AUTO Key Memory at Power Down = AUTO Mode]* and *b1-02 = 0*	7 (0 - 9)
b1-03 (0182)	Stopping Method Selection	Sets the method to stop the motor after removing a Run command or entering a Stop command. **Note:** When *A1-02 = 5 or 8 [Control Method Selection = OLV/PM or EZOLV]*, the setting range is 0, 1, 3. 0 : Ramp to Stop 1 : Coast to Stop 2 : DC Injection Braking to Stop 3 : Coast to Stop with Timer	1 (0 - 3)
b1-04 (0183)	Reverse Operation Selection	Sets the reverse operation function. Disable reverse operation in fan or pump applications where reverse rotation is dangerous. 0 : Reverse Enabled 1 : Reverse Disabled	1 (0, 1)
b1-08 (0187)	Run Command Select in PRG Mode	Sets the conditions for the drive to accept a Run command entered from an external source when using the keypad to set parameters. 0 : Disregard RUN while Programming 1 : Accept RUN while Programming 2 : Allow Programming Only at Stop	0 (0 - 2)
b1-11 (01DF)	Run Delay @ Stop	Sets the amount of time that the drive will not accept the Run command again after the Run command is lost. **Note:** • This parameter will operate for both AUTO Mode and HAND Mode. • This parameter will operate when the drive goes to sleep then wakes up. • The time set in this parameter does not apply for faults or Auto-Restarts. • When there is an active Run command while the time set in *b1-11* is active, the keypad will show a *[Start Delay]* message as specified by the *o1-82 [Message Screen Display]* display format.	0.0 s (0.0 - 6000.0 s)
b1-12 (01E0)	Run Delay Memory Selection	Sets how the drive saves the Run Delay Timer to the EEPROM during power loss. 0 : Disabled 1 : Only at Stop 2 : Running & Stop	2 (0 - 2)
b1-14 (01C3)	Phase Order Selection	Sets the phase order for output terminals U/T1, V/T2, and W/T3. This parameter can align the Forward Run command from the drive and the forward direction of the motor without changing wiring. 0 : Standard 1 : Switch Phase Order	0 (0, 1)
b1-17 (01C6)	Run Command at Power Up	Sets drive response when you apply power to drive that has an external Run command. Set this parameter in applications where energizing or de-energizing the drive enables the Run command. 0 : Disregard Existing RUN Command 1 : Accept Existing RUN Command	1 (0, 1)
b1-40 (3BCF)	Deceleration Abort Time	Sets the maximum time until the drive shuts off the output to decelerate to stop. **Note:** Set this parameter to 0.0 s to disable this function.	0.0 s (0.0 - 6000.0 s)

◆ b2: DC Injection Braking and Short Circuit Braking

No. (Hex.)	Name	Description	Default (Range)
b2-01 (0189)	DC Injection/Zero SpeedThreshold	Sets the frequency to start DC Injection Braking and Short Circuit Braking. **Note:** This parameter is available when *b1-03 = 0 [Stopping Method Selection = Ramp to Stop]*.	Determined by A1-02 (0.0 - 10.0 Hz)
b2-02 (018A)	DC Injection Braking Current	Sets the DC Injection Braking current as a percentage of the drive rated current.	50% (0 - 100%)
b2-03 (018B)	DC Inject Braking Time at Start	Sets the DC Injection Braking Time at stop.	0.00 s (0.00 - 10.00 s)
b2-04 (018C)	DC Inject Braking Time at Stop	Sets the DC Injection Braking Time at stop.	0.00 s (0.00 - 10.00 s)
b2-09 (01E1)	Pre-heat Current 2	Sets the percentage of motor rated output current used for the motor pre-heat function.	5% (0 - 100%)
b2-12 (01BA)	Short Circuit Brake Time @ Start	Sets the Short Circuit Braking time at start.	0.00 s (0.00 - 25.50 s)
b2-13 (01BB)	Short Circuit Brake Time @ Stop	Sets the Short Circuit Braking time at stop.	Determined by A1-02 (0.00 - 25.50 s)
b2-18 (0177)	Short Circuit Braking Current	Sets the Short Circuit Braking Current as a percentage of the motor rated current. **Note:** Parameter *A1-02 [Control Method Selection]* selects which parameter is the motor rated current. • *A1-02 = 5 [OLV/PM]*: *E5-03 [PM Motor Rated Current (FLA)]* • *A1-02 = 8 [EZOLV]*: *E9-06 [Motor Rated Current (FLA)]*	100.0% (0.0 - 200.0%)

◆ b3: Speed Search

No. (Hex.)	Name	Description	Default (Range)
b3-01 (0191)	Speed Search at Start Selection	Sets the Speed Search at Start function where the drive will perform Speed Search with each Run command. 0 : Disable 1 : Enabled	0 (0, 1)
b3-02 (0192)	SpeedSearch Deactivation Current	Sets the current level that stops Speed Search as a percentage of the drive rated output current. Usually it is not necessary to change this setting.	Determined by A1-02 (0 - 200%)
b3-03 (0193)	Speed Search Deceleration Time	Sets the deceleration time during Speed Search operation. Set the length of time to decelerate from the maximum output frequency to the minimum output frequency. **Note:** When *A1-02 = 8 [Control Method Selection = EZOLV]*, this parameter takes effect only in Expert Mode.	2.0 s (0.1 - 10.0 s)
b3-04 (0194)	V/f Gain during Speed Search	Sets the ratio used to reduce the V/f during searches to reduce the output current during speed searches.	Determined by o2-04 (10 - 100)
b3-05 (0195)	Speed Search Delay Time	Sets the Speed Search delay time to activate a magnetic contactor installed between the drive and motor.	0.2 s (0.0 - 100.0 s)
b3-06 (0196) Expert	Speed Estimation Current Level 1	Sets the level of current that flows to the motor during Speed Estimation Speed Search as a coefficient of the motor rated current. Usually it is not necessary to change this setting.	Determined by o2-04 (0.0 - 2.0)
b3-07 (0197) Expert	Speed Estimation Current Level 2	Sets the level of current that flows to the motor during Speed Estimation Speed Search as a coefficient of *E2-03 [Motor No-Load Current]* or *E4-03 [Motor 2 Rated No-Load Current]*. Usually it is not necessary to change this setting.	1.0 (0.0 - 3.0)
b3-08 (0198)	Speed Estimation ACR P Gain	Sets the proportional gain for the automatic current regulator during Speed Estimation Speed Search. Also adjusts speed search responsiveness. Usually it is not necessary to change this setting.	Determined by A1-02 and o2-04 (0.00 - 6.00)
b3-09 (0199)	Speed Estimation ACR I Time	Sets the integral time for the automatic current regulator during Speed Estimation Speed Search. Also adjusts speed search responsiveness. Usually it is not necessary to change this setting.	Determined by A1-02 when A1-02 ≠ 5 20.0 when A1-02 = 5 (0.0 - 1000.0 ms)

No. (Hex.)	Name	Description	Default (Range)
b3-10 (019A) Expert	Speed Estimation Detection Gain	Sets the gain to correct estimated frequencies from Speed Estimation Speed Search. **Note:** When *A1-02 = 8 [Control Method Selection = EZOLV]*, the default setting is 1.00 and the setting range is 1.00 - 1.10.	1.05 (1.00 - 1.20)
b3-11 (019B) Expert	Spd Est Method Switch-over Level	Uses the quantity of voltage in the motor to automatically switch the search method within the type of speed measurement. **Note:** • 208 V class at 100% = 200 V • 480 V class at 100% = 400 V	5.0% (0.5 - 100.0%)
b3-12 (019C) Expert	Speed Search Current Deadband	Sets the minimum current detection level during Speed Search. If the drive does not do Speed Estimation, increase this setting in 0.1-unit increments.	determined by o2-04 (2.0 - 10.0)
b3-14 (019E)	Bi-directional Speed Search	Sets the direction of Speed Search to the direction of the frequency reference or in the motor rotation direction as detected by the drive. 0 : Disabled 1 : Enabled **Note:** • Refer to page 230 for information about the initial value of *b3-14* that applies when you set these parameters: –*A1-02 = 0, 8 [Control Method Selection = V/f, EZOLV]* –*E9-01 = 0 [Motor Type Selection = Induction (IM)]* –*b3-24 = 1 [Speed Search Method Selection = Speed Estimation Speed Search]* • The initial value of *b3-14* is 0 when you set these parameters: –*A1-02 = 0, 8* –*E9-01 = 0* –*b3-24 = 2 [Current Detection 2]* • Refer to page 230 for information about the initial value of *b3-14* that applies when you set these parameters: –*A1-02 = 8 [EZOLV]* –*E9-01 = 1, 2 [Permanent Magnet (PM), Synchronous Reluctance (SynRM)]* • When you change *A1-02*, *b3-24*, and *E9-01*, also set *b3-14*.	Determined by A1-02 and b3-24 (0, 1)
b3-17 (01F0) Expert	Speed Est Retry Current Level	Sets the current level for the search retry function in Speed Estimation Speed Search as a percentage where drive rated current is a setting value of 100%.	110% (0 - 200%)
b3-18 (01F1) Expert	Speed Est Retry Detection Time	Sets the length of time that the drive will wait to retry Speed Estimation Speed Search when too much current flow stopped the Speed Search.	0.10 s (0.00 - 1.00 s)
b3-19 (01F2)	Speed Search Restart Attempts	Sets the number of times to restart Speed Search if Speed Search does not complete.	3 times (0 - 10 times)
b3-24 (01C0)	Speed Search Method Selection	Sets the Speed Search method when you start the motor or when you return power after a momentary power loss. **Note:** • The default setting is different for different control methods. –*A1-02 = 0 [Control Method Selection = V/f]*: 2 –*A1-02 = 8 [EZOLV]* and *E9-01 = 0 [Motor Type Selection = Induction (IM)]*: 2 –*A1-02 = 8* and *E9-01 ≠ 0*: 1 • Set *b3-24 = 1*. If *b3-24 = 2*, the drive will detect *oPE08 [Parameter Selection Error]*. 1 : Speed Estimation 2 : Current Detection 2	Determined by A1-02 (1, 2)
b3-25 (01C8) Expert	Speed Search Wait Time	Sets the length of time the drive will wait to start the Speed Search Retry function.	0.5 s (0.0 - 30.0 s)
b3-26 (01C7) Expert	Direction Determination Level	Sets the level to find the motor rotation direction. Increase the value if the drive cannot find the direction.	1000 (40 to 60000)
b3-27 (01C9) Expert	Speed Search RUN/BB Priority	Sets the conditions necessary to start Speed Search. 0 : SS Only if RUN Applied Before BB 1 : SS Regardless of RUN/BB Sequence	0 (0, 1)
b3-29 (077C) Expert	Speed Search Back-EMF Threshold	Sets the induced voltage for motors that use Speed Search. The drive will start Speed Search when the motor induced voltage level is the same as the setting value. Usually it is not necessary to change this setting.	10% (0 - 10%)
b3-31 (0BC0) Expert	Spd Search Current Reference Lvl	Sets the current level that decreases the output current during Current Detection Speed Search.	1.50 (1.50 - 3.50)

No. (Hex.)	Name	Description	Default (Range)
b3-32 (0BC1) Expert	Spd Search Current Complete Lvl	Sets the current level that completes Speed Search.	1.20 (0.00 - 1.49)
b3-33 (0B3F) Expert	Speed Search during Uv Selection	Sets the function that starts Speed Search at start-up if the drive detects a *Uv [Undervoltage]* when it receives a Run command. 0 : Disabled 1 : Enabled	1 (0, 1)
b3-54 (3123)	Search Time	Sets the length of time that the drive will run Speed Search.	400 ms (10 - 2000 ms)
b3-55 (3124) Expert	Current Increment Time	Sets the length of time that the drive will increase the current from zero current to the setting value of *b3-06 [Speed Estimation Current Level 1]*.	10 ms (10 - 2000 ms)
b3-56 (3126)	InverseRotationSearch WaitTime	Sets the wait time until the drive starts inverse rotation search after it completes forward search when you do inverse rotation search during Current Detection Speed Search.	Determined by o2-04 (0.1 - 5.0 s)

◆ b4: Timer Function

No. (Hex.)	Name	Description	Default (Range)
b4-01 (01A3)	Timer Function ON-Delay Time	Sets the ON-delay time for the timer input.	0.0 s (0.0 - 3000.0 s)
b4-02 (01A4)	Timer Function OFF-Delay Time	Sets the OFF-delay time for the timer input.	0.0 s (0.0 - 3000.0 s)
b4-03 (0B30) Expert	Terminal M1-M2 ON-Delay Time	Sets the delay time to activate the contact after the function set in *H2-01* activates.	0 ms (0 - 65000 ms)
b4-04 (0B31) Expert	Terminal M1-M2 OFF-Delay Time	Sets the delay time to deactivate the contact after the function set in *H2-01* deactivates.	0 ms (0 - 65000 ms)
b4-05 (0B32) Expert	Terminal M3-M4 ON-Delay Time	Sets the delay time to activate the contact after the function set in *H2-02* activates.	0 ms (0 - 65000 ms)
b4-06 (0B33) Expert	Terminal M3-M4 OFF-Delay Time	Sets the delay time to deactivate the contact after the function set in *H2-02* deactivates.	0 ms (0 - 65000 ms)
b4-07 (0B34) Expert	Terminal M5-M6 ON-Delay Time	Sets the delay time to activate the contact after the function set in *H2-03* activates.	0 ms (0 - 65000 ms)
b4-08 (0B35) Expert	Terminal M5-M6 OFF-Delay Time	Sets the delay time to deactivate the contact after the function set in *H2-03* deactivates.	0 ms (0 - 65000 ms)

◆ b5: PID Control

No. (Hex.)	Name	Description	Default (Range)
b5-01 (01A5)	PID Mode Setting	Sets the type of PID control. 0 : Disabled 1 : Standard 3 : Fref + PID Trim	0 (0 - 3)
b5-02 (01A6) RUN	Proportional Gain (P)	Sets the proportional gain (P) that is applied to PID input.	2.00 (0.00 - 25.00)
b5-03 (01A7) RUN	Integral Time (I)	Sets the integral time (I) that is applied to PID input.	0.5 s (0.0 - 360.0 s)

No. (Hex.)	Name	Description	Default (Range)
b5-04 (01A8) RUN	Integral Limit	Sets the upper limit for integral control (I) as a percentage of the Maximum Output Frequency. **Note:** Parameter *A1-02 [Control Method Selection]* selects which parameter is the maximum output frequency. • *A1-02 ≠ 8 [EZOLV]*: *E1-04 [Maximum Output Frequency]* • *A1-02 = 8*: *E9-02 [Maximum Speed]*	100.0% (0.0 - 100.0%)
b5-05 (01A9) RUN	Derivative Time (D)	Sets the derivative time (D) for PID control. This parameter adjusts system responsiveness.	0.00 s (0.00 - 10.00 s)
b5-06 (01AA) RUN	PID Output Limit	Sets the maximum possible output from the PID controller as a percentage of the Maximum Output Frequency. **Note:** Parameter *A1-02 [Control Method Selection]* selects which parameter is the maximum output frequency. • *A1-02 ≠ 8 [EZOLV]*: *E1-04 [Maximum Output Frequency]* • *A1-02 = 8*: *E9-02 [Maximum Speed]*	100.0% (0.0 - 100.0%)
b5-07 (01AB) RUN	PID Offset Adjustment	Sets the offset for the PID control output as a percentage of the Maximum Output Frequency. **Note:** Parameter *A1-02 [Control Method Selection]* selects which parameter is the maximum output frequency. • *A1-02 ≠ 8 [EZOLV]*: *E1-04 [Maximum Output Frequency]* • *A1-02 = 8*: *E9-02 [Maximum Speed]*	0.0% (-100.0 - +100.0%)
b5-08 (01AC) RUN Expert	PID Primary Delay Time Constant	Sets the primary delay time constant for the PID control output. Usually it is not necessary to change this setting.	0.00 s (0.00 - 10.00 s)
b5-09 (01AD)	PID Output Level Selection	Sets the polarity of the PID output. 0 : Normal Output (Direct Acting) 1 : Reverse Output (Reverse Acting)	0 (0, 1)
b5-10 (01AE) RUN	PID Output Gain Setting	Sets the amount of gain to apply to the PID output.	1.00 (0.00 - 25.00)
b5-11 (01AF)	PID Output Reverse Selection	Sets the function that enables and disables reverse motor rotation for negative PID control output. 0 : Lower Limit is Zero 1 : Negative Output Accepted	0 (0, 1)
b5-17 (01B5) RUN	PID Accel/Decel Time	Raises or lowers the PID setpoint using the acceleration and deceleration times set to the drive. This is a soft-starter for the PID setpoint.	0.0 s (0.0 - 6000.0 s)
b5-28 (01EA)	PID Feedback Square Root Sel	Enables and disables the square root of the PID Feedback compared to the PID Setpoint to set an appropriate drive output for the correct system regulation. 0 : Disabled 1 : Enabled	0 (0, 1)
b5-29 (01EB)	PID Feedback Square Root Gain	Sets the multiplier applied to the square root of the feedback.	0.00 (0.00 - 2.00)
b5-30 (01EC)	PID Feedback Offset	Sets PID feedback Offset as a percentage of maximum frequency.	0.00% (0.00 - 100.00%)
b5-34 (019F) RUN	PID Output Lower Limit Level	Sets the output lower limit for the PID control as a percentage of the Maximum Output Frequency. **Note:** Parameter *A1-02 [Control Method Selection]* selects which parameter is the maximum output frequency. • *A1-02 ≠ 8 [EZOLV]*: *E1-04 [Maximum Output Frequency]* • *A1-02 = 8*: *E9-02 [Maximum Speed]*	0.0% (-100.0 - +100.0%)
b5-35 (01A0) RUN	PID Input Limit Level	Sets the output upper limit for the PID control as a percentage of the Maximum Output Frequency. **Note:** Parameter *A1-02 [Control Method Selection]* selects which parameter is the maximum output frequency. • *A1-02 ≠ 8 [EZOLV]*: *E1-04 [Maximum Output Frequency]* • *A1-02 = 8*: *E9-02 [Maximum Speed]*	1000.0% (0.0 - 1000.0%)
b5-38 (01FE)	PID User Unit Display Scaling	Sets the value that the drive sets or shows as the PID setpoint when at the maximum output frequency.	100.00 (0.01 - 600.00)

No. (Hex.)	Name	Description	Default (Range)
b5-39 (01FF)	PID User Unit Display Digits	Sets the number of digits to set and show the PID setpoint. 0 : No Decimal Places (XXXXX) 1 : One Decimal Places (XXXX.X) 2 : Two Decimal Places (XXX.XX) 3 : Three Decimal Places (XX.XXX)	2 (0 - 3)
b5-41 (0160)	PID Output 2 Unit	Sets the display units in *U5-14 [PID Out2 Upr4 Digits]* and *U5-15 [PID Out2 Lwr4 Digits]*. 0 : "WC: inches of water column 1 : PSI: pounds per square inch 2 : GPM: gallons/min 3 : °F: Fahrenheit 4 : ft^3/min: cubic feet/min 5 : m^3/h: cubic meters/hour 6 : L/h: liters/hour 7 : L/s: liters/sec 8 : bar: bar 9 : Pa: Pascal 10 : °C: Celsius 11 : m: meters 12 : ft: feet 13 : L/min: liters/min 14 : m^3/min: cubic meters/min 15 : "Hg: Inch Mercury 16 : kPa: kilopascal 48 : %: Percent 49 : Custom(b5-68~70) 50 : None	0 (0 - 50)
b5-42 (0161) RUN	PID Output 2 Calc Mode	Sets how to calculate the original PID output. 0 : Linear 1 : Square Root 2 : Quadratic 3 : Cubic **Note:** Used for *U5-14 [PID Out2 Upr4 Digits]* and *U5-15 [PID Out2 Lwr4 Digits]* only.	0 (0 - 3)
b5-43 (0162) RUN	PID Out2 Monitor MAX Upper4 Dig	Sets the upper 4 digits of the maximum monitor value. Used with *b5-44 [PID Out2 Monitor MAX Lower4 Dig]* to set maximum monitor value of *U5-14 [PID Out2 Upr4 Digits]* and *U5-15 [PID Out2 Lwr4 Digits]* at maximum frequency. **Note:** Used for *U5-14 [PID Out2 Upr4 Digits]* and *U5-15 [PID Out2 Lwr4 Digits]* only.	0 (0 - 9999)
b5-44 (0163) RUN	PID Out2 Monitor MAX Lower4 Dig	Sets the lower 4 digits of the maximum monitor value. Used with *b5-43 [PID Out2 Monitor MAX Upper4 Dig]* to set maximum monitor value of *U5-14 [PID Out2 Upr4 Digits]* and *U5-15 [PID Out2 Lwr4 Digits]* at maximum frequency. **Note:** Used for *U5-14 [PID Out2 Upr4 Digits]* and *U5-15 [PID Out2 Lwr4 Digits]* only.	0.00 (0.00 - 99.99)
b5-45 (0164) RUN	PID Out2 Monitor MIN for Linear	Sets the minimum display value to show when at zero speed. Only effective when *b5-42 = 0 [PID Output 2 Calc Mode = Linear]*. **Note:** Used for *U5-14 [PID Out2 Upr4 Digits]* and *U5-15 [PID Out2 Lwr4 Digits]* only.	0.0 (0.0 - 999.9)

No. (Hex.)	Name	Description	Default (Range)
b5-46 (0165)	PID Unit Display Selection	Sets the units-text for the PID Display. 0 : "WC: inches of water column 1 : PSI: pounds per square inch 2 : GPM: gallons/min 3 : °F: Fahrenheit 4 : ft^3/min: cubic feet/min 5 : m^3/h: cubic meters/hour 6 : L/h: liters/hour 7 : L/s: liters/sec 8 : bar: bar 9 : Pa: Pascal 10 : °C: Celsius 11 : m: meters 12 : ft: feet 13 : L/min: liters/min 14 : m^3/min: cubic meters/min 15 : "Hg: Inch Mercury 16 : kPa: kilopascal 48 : %: Percent 49 : Custom(b5-68~70) 50 : None	48 (0 - 50)
b5-53 (0B8F) RUN	PID Integrator Ramp Limit	Sets the responsiveness of PID control when the PID feedback changes quickly.	0.0 Hz (0.0 - 10.0 Hz)
b5-61 (119A)	PID Trim Mode Lower Limit Sel	Sets the function that adjusts the PID output in relation to the frequency reference. 0 : Disabled 1 : Enabled	0 (0, 1)
b5-62 (119B)	PID Trim Mode Lower Limit Value	Sets the PID Trim Mode Lower Limit Value as a percentage of the maximum output frequency. **Note:** Parameter *A1-02 [Control Method Selection]* selects which parameter is the maximum output frequency. • *A1-02 ≠ 8 [EZOLV]*: *E1-04 [Maximum Output Frequency]* • *A1-02 = 8*: *E9-02 [Maximum Speed]*	0.00% (0.00 - 100.00%)
b5-68 (3C1F)	System Unit Custom Character 1	Sets the first character of the custom unit display when *b5-46 = 49 [PID Unit Display Selection = Custom (B5-68~70)]*.	41 (20 - 7A)
b5-69 (3C20)	System Unit Custom Character 2	Sets the second character of the custom unit display when *b5-46 = 49 [PID Unit Display Selection = Custom (B5-68~70)]*.	41 (20 - 7A)
b5-70 (3C21)	System Unit Custom Character 3	Sets the third character of the custom unit display when *b5-46 = 49 [PID Unit Display Selection = Custom (B5-68~70)]*.	41 (20 - 7A)
b5-71 (3C22)	Min PID Transducer Scaling	Sets the minimum PID level corresponding to the lowest analog input signal level. **Note:** • To enable this parameter, you must set *b5-71 < b5-38 [PID User Unit Display Scaling]*. If you set *b5-71 > b5-38*, the drive will disable all PID analog inputs. • Parameters *b5-46 [PID Unit Display Selection]*, *b5-38*, and *b5-39 [PID User Unit Display Digits]* set the unit, range, and resolution.	0.00 (-99.99 - +99.99)
b5-82 (31B0)	Feedback Loss 4 ~ 20mA Detect Sel	Sets the drive to do a 4 to 20 mA wire-break detection on the analog input set for PID feedback. 0 : Disabled 1 : Alarm Only 2 : Fault 3 : Run At b5-83	2 (0 - 3)
b5-83 (31B1) RUN	Feedback Loss GoTo Frequency	Sets the speed at which the drive will run if the drive detects a 4 to 20 mA wire-break on the PID Feedback and *b5-82 = 3 [Feedback Loss 4 ~ 20mA Detect Sel = Run At b5-83]*. **Note:** When *A1-02 = 8 [Control Method Selection = EZ Vector Control]*, the range is 0.0 to 120.0 Hz.	0.0 Hz (0.0 - 400.0 Hz)
b5-84 (31B2) RUN	Feedback Loss Loss Of Prime Lvl	Sets the level at which the drive will detect Loss of Prime in the pump. **Note:** • Loss of Prime condition occurs when the measured quantity set by *Y1-18 [Prime Loss Detection Method]* decreases to this level for the time set in *Y1-20 [Loss of Prime Time]* and the output frequency is at the *Y4-02 [Pre-Charge Frequency]* level. • The drive will respond to the Loss of Prime condition as specified by *Y1-22 [Loss of Prime Selection]*. • Display unit and scaling are dependent on System Units.	0.0 A (0.0 - 1000.0 A)

No. (Hex.)	Name	Description	Default (Range)
b5-85 (31B3) RUN	Feedback Loss GoTo Freq Timeout	When *b5-82 = 3 [Feedback Loss 4 ~ 20mA Detect Sel = Run At b5-83]* and the Feedback signal is lost, the drive will run at the *b5-83 [Feedback Loss Goto Frequency]* speed for this length of time, after which the drive will fault on *FDBKL [WIRE Break]*. **Note:** Set this parameter to 0.0 s to disable the function.	0 s (0 - 6000 s)
b5-86 (31B4) RUN	Feedback Loss Start Delay	When you initiate an AUTO Run command, the drive will wait for this length of time before it will fault on *FDBKL [WIRE Break]* or use parameter *b5-83 [Feedback Loss Goto Frequency]*.	0.0 s (0.0 - 120.0 s)

◆ b8: Energy Saving

No. (Hex.)	Name	Description	Default (Range)
b8-01 (01CC)	Energy Saving Control Selection	Sets the Energy-saving control function. 0 : Disabled 1 : Enabled	0 (0, 1)
b8-04 (01CF) Expert	Energy Saving Coefficient Value	Sets the Energy-saving control coefficient to maintain maximum motor efficiency. The default setting is for Yaskawa motors. **Note:** The minimum values and the maximum values are different for different drive models. • 2011 to 2024, 4005 to 4008: 0.0 - 2000.0 • 2031 to 2273, 4011 to 4302: 0.00 - 655.00	Determined by E2-11 and o2-04 (0.00 - 655.00)
b8-05 (01D0) Expert	Power Detection Filter Time	Sets the time constant to measure output power.	20 ms (0 - 2000 ms)
b8-06 (01D1) Expert	Search Operation Voltage Limit	Sets the voltage limit for Search Operation as a percentage of the motor rated voltage.	0% (0 - 100%)
b8-19 (0B40) Expert	E-Save Search Frequency	Sets the frequency of Energy-saving control search operations. Usually it is not necessary to change this setting.	Determined by A1-02 (10 - 300 Hz)
b8-20 (0B41) Expert	E-Save Search Width	Sets the amplitude of Energy-saving control search operations.	1.0 degrees (0.1 - 5.0 degrees)
b8-28 (0B8B) Expert	Over Excitation Action Selection	Sets the function for excitation operation. 0 : Disabled 1 : Enabled	0 (0, 1)
b8-29 (0B8C)	Energy Saving Priority Selection	Sets the priority of drive response between changes to the load or Energy-saving control. Enable this to prioritize energy-saving control. Disable this to prioritize tracking related to fast load changes, and prevent motor stall. 0 : Priority: Drive Response 1 : Priority: Energy Savings	0 (0, 1)

3.6 C: Tuning

◆ C1: Accel & Decel Time

No. (Hex.)	Name	Description	Default (Range)
C1-01 (0200) RUN	Acceleration Time 1	Sets the length of time to accelerate from zero to maximum output frequency.	30.0 s (0.1 - 6000.0 s)
C1-02 (0201) RUN	Deceleration Time 1	Sets the length of time to decelerate from maximum output frequency to zero.	30.0 s (0.1 - 6000.0 s)
C1-03 (0202) RUN	Acceleration Time 2	Sets the length of time to accelerate from zero to maximum output frequency.	30.0 s (0.1 - 6000.0 s)
C1-04 (0203) RUN	Deceleration Time 2	Sets the length of time to decelerate from maximum output frequency to zero.	30.0 s (0.1 - 6000.0 s)
C1-09 (0208) RUN	Fast Stop Time	Sets the length of time that the drive will decelerate to zero for a Fast Stop. **Note:** • Decelerating too quickly can cause an *ov [Overvoltage]* fault that shuts off the drive while the motor to coasts to a stop. Set a Fast Stop time in *C1-09* that prevents motor coasting and makes sure that the motor stops quickly and safely. • When *L2-29 = 0 [Kinetic Energy Backup Method = Single Drive KEB Ride-Thru 1]* and you do KEB Auto-Tuning, the drive will automatically set *C1-09*. If you must not change the Fast Stop time, do not do KEB Tuning.	10.0 s (0.1 - 6000.0 s)

◆ C2: S-Curve Characteristics

No. (Hex.)	Name	Description	Default (Range)
C2-01 (020B)	S-Curve Time @ Start of Accel	Sets the S-curve acceleration time at start.	Determined by A1-02 (0.00 - 10.00 s)
C2-02 (020C)	S-Curve Time @ End of Accel	Sets the S-curve acceleration time at completion.	0.20 s (0.00 - 10.00 s)
C2-03 (020D)	S-Curve Time @ Start of Decel	Sets the S-curve deceleration time at start.	0.20 s (0.00 - 10.00 s)
C2-04 (020E)	S-Curve Time @ End of Decel	Sets the S-curve deceleration time at completion.	0.00 s (0.00 - 10.00 s)

◆ C3: Slip Compensation

No. (Hex.)	Name	Description	Default (Range)
C3-01 (020F) RUN	Slip Compensation Gain	Sets the gain for the slip compensation function. Usually it is not necessary to change this setting. **Note:** Correctly set these parameters before you change the slip compensation gain: • *E2-01 [Motor Rated Current (FLA)]* • *E2-02 [Motor Rated Slip]* • *E2-03 [Motor No-Load Current]*	0.0 (0.0 - 2.5)
C3-02 (0210) RUN	Slip Compensation Delay Time	Sets the slip compensation delay time when speed is unstable or when the slip compensation response is too slow. Usually it is not necessary to change this setting.	Determined by A1-02 (0 - 10000 ms)
C3-21 (033E) RUN	Motor 2 Slip Compensation Gain	Sets the gain for the motor 2 slip compensation function. Usually it is not necessary to change this setting. **Note:** Correctly set these parameters before you change the slip compensation gain: • *E4-01 [Motor 2 Rated Current]* • *E4-02 [Motor 2 Rated Slip]* • *E4-03 [Motor 2 Rated No-Load Current]*	0.0 (0.0 - 2.5)

No. (Hex.)	Name	Description	Default (Range)
C3-22 (0241) RUN	Motor 2 Slip Comp Delay Time	Sets the slip compensation delay time for motor 2 when speed is unstable or when the slip compensation response is too slow. Usually it is not necessary to change this setting.	2000 (0 - 10000 ms)
C3-29 (1B5D) Expert	Slip Compensation Gain @ Low Spd	Sets the slip compensation gain at low speed. Usually it is not necessary to change this setting.	0.0 (0.0 - 2.5)

◆ C4: Torque Compensation

No. (Hex.)	Name	Description	Default (Range)
C4-01 (0215) RUN	Torque Compensation Gain	Sets the gain for the torque compensation function. Use this parameter value for motor 1 when you operate multiple motors. **Note:** If *A1-02 = 8 [Control Method Selection = EZOLV]*, you cannot change the setting while the drive is running.	Determined by A1-02 (0.00 - 2.50)
C4-02 (0216) RUN	Torque Compensation Delay Time	Sets the torque compensation delay time. Usually it is not necessary to change this setting. **Note:** If *A1-02 = 8 [Control Method Selection = EZOLV]*, you cannot change the setting while the drive is running.	Determined by A1-02 (0 - 60000 ms)
C4-07 (0341) RUN	Motor 2 Torque Compensation Gain	Sets the gain for motor 2 torque compensation function when you use the Motor Switch function.	1.00 (0.00 - 2.50)
C4-23 (1583) RUN Expert	Current Control Gain	Current control gain. Usually it is not necessary to change this parameter.	1.00 (0.50 - 2.50)

◆ C5: Auto Speed Regulator (ASR)

No. (Hex.)	Name	Description	Default (Range)
C5-01 (021B) RUN	ASR Proportional Gain 1	Sets the gain to adjust ASR response.	Determined by A1-02 (0.00 - 300.00)
C5-02 (021C) RUN	ASR Integral Time 1	Sets the ASR integral time.	Determined by A1-02 (0.000 - 60.000 s)
C5-03 (021D) RUN	ASR Proportional Gain 2	Sets the gain to adjust ASR response.	Determined by A1-02 (0.00 - 300.00)
C5-04 (021E) RUN	ASR Integral Time 2	Sets the ASR integral time.	Determined by A1-02 (0.000 - 60.000 s)
C5-06 (0220)	ASR Delay Time	Sets the filter time constant of the torque reference output from the speed loop. Usually it is not necessary to change this setting.	Determined by A1-02 (0.000 - 0.500 s)
C5-07 (0221)	ASR Gain Switchover Frequency	Sets the frequency where the drive will switch between these parameters: *C5-01 and C5-03 [ASR Proportional Gain 1/2]* *C5-02 and C5-04 [ASR Integral Time 1/2]*	Determined by A1-02 (Determined by A1-02)
C5-08 (0222)	ASR Integral Limit	Set the upper limit of the ASR integral amount as a percentage of the rated load.	400% (0 - 400%)

◆ C6: Carrier Frequency

No. (Hex.)	Name	Description	Default (Range)
C6-02 (0224)	Carrier Frequency Selection	Sets the carrier frequency for the transistors in the drive. 1 : 2.0 kHz 2 : 5.0 kHz 3 : 8.0 kHz 4 : 10.0 kHz 5 : 12.5 kHz 7 : Swing PWM1 (Audible Sound 1) 8 : Swing PWM2 (Audible Sound 2) 9 : Swing PWM3 (Audible Sound 3) A : Swing PWM4 (Audible Sound 4) B : Leakage Current Rejection PWM F : User Defined (C6-03 to C6-05) **Note:** • The carrier frequency for Swing PWM 1 to 4 is equivalent to 2.0 kHz. Swing PWM applies a special PWM pattern to decrease the audible noise. • When *A1-02 = 5 or 8 [Control Method Selection = OLV/PM or EZOLV]*, you cannot set to *7 to A* • Setting *B* uses a PWM pattern that decreases the leakage current that the drive detects over long wiring distances. This can help decrease alarm detection and decrease problems with the current monitor from leakage current over long wiring distances.	Determined by A1-02 and o2-04 (Determined by A1-02)
C6-03 (0225)	Carrier Frequency Upper Limit	Sets the upper limit of the carrier frequency. Set *C6-02 = F [Carrier Frequency Selection = User Defined (C6-03 to C6-05)]* to set this parameter.	Determined by C6-02 (1.0 - 12.5 kHz)
C6-04 (0226)	Carrier Frequency Lower Limit	Sets the lower limit of the carrier frequency. Set *C6-02 = F [Carrier Frequency Selection = User Defined (C6-03 to C6-05)]* to set this parameter.	Determined by C6-02 (1.0 - 12.5 kHz)
C6-05 (0227)	Carrier Freq Proportional Gain	Sets the proportional gain for the carrier frequency. Set *C6-02 = F [Carrier Frequency Selection = User Defined (C6-03 to C6-05)]* to set this parameter.	Determined by C6-02 (0 - 99)

3.7 d: Reference Settings

◆ d1: Frequency Reference

No. (Hex.)	Name	Description	Default (Range)
d1-01 (0280) RUN	Reference 1	Sets the frequency reference in the units from *o1-03 [Frequency Display Unit Selection*.	0.00 Hz (0.00 - 400.00 Hz)
d1-02 (0281) RUN	Reference 2	Sets the frequency reference in the units from *o1-03 [Frequency Display Unit Selection]*.	0.00 Hz (0.00 - 400.00 Hz)
d1-03 (0282) RUN	Reference 3	Sets the frequency reference in the units from *o1-03 [Frequency Display Unit Selection]*.	0.00 Hz (0.00 - 400.00 Hz)
d1-04 (0283) RUN	Reference 4	Sets the frequency reference in the units from *o1-03 [Frequency Display Unit Selection]*.	0.00 Hz (0.00 - 400.00 Hz)
d1-05 (0284) RUN	Reference 5	Sets the frequency reference in the units from *o1-03 [Frequency Display Unit Selection]*.	0.00 Hz (0.00 - 400.00 Hz)
d1-06 (0285) RUN	Reference 6	Sets the frequency reference in the units from *o1-03 [Frequency Display Unit Selection]*.	0.00 Hz (0.00 - 400.00 Hz)
d1-07 (0286) RUN	Reference 7	Sets the frequency reference in the units from *o1-03 [Frequency Display Unit Selection]*.	0.00 Hz (0.00 - 400.00 Hz)
d1-08 (0287) RUN	Reference 8	Sets the frequency reference in the units from *o1-03 [Frequency Display Unit Selection]*.	0.00 Hz (0.00 - 400.00 Hz)
d1-17 (0292) RUN	Jog Reference	Sets the Jog frequency reference in the units from *o1-03 [Frequency Display Unit Selection]*. Set *H1-xx = 6 [MFDI Function Selection = Jog Reference Selection]* to use the Jog frequency reference.	6.00 Hz (0.00 - 400.00 Hz)

◆ d2: Reference Limits

No. (Hex.)	Name	Description	Default (Range)
d2-01 (0289)	Frequency Reference Upper Limit	Sets maximum limit for all frequency references. The maximum output frequency is 100%. **Note:** Parameter *A1-02 [Control Method Selection]* selects which parameter is the maximum output frequency. • *A1-02 ≠ 8 [EZOLV]*: *E1-04 [Maximum Output Frequency]* • *A1-02 = 8*: *E9-02 [Motor Max Revolutions]*	100.0% (0.0 - 110.0%)
d2-02 (028A)	Frequency Reference Lower Limit	Sets minimum limit for all frequency references. The maximum output frequency is 100%. **Note:** Parameter *A1-02 [Control Method Selection]* selects which parameter is the maximum output frequency. • *A1-02 ≠ 8 [EZOLV]*: *E1-04 [Maximum Output Frequency]* • *A1-02 = 8*: *E9-02 [Motor Max Revolutions]*	0.0% (0.0 - 110.0%)
d2-03 (0293)	Analog Frequency Ref Lower Limit	Sets the lower limit for the master frequency reference (the first frequency of the multi-step speed reference) as a percentage. The maximum output frequency is 100%. **Note:** Parameter *A1-02 [Control Method Selection]* selects which parameter is the maximum output frequency. • *A1-02 ≠ 8*: *E1-04 [Maximum Output Frequency]* • *A1-02 = 8*: *E9-02 [Maximum Speed]*	0.0% (0.0 - 110.0%)

◆ d3: Jump Frequency

No. (Hex.)	Name	Description	Default (Range)
d3-01 (0294)	Jump Frequency 1	Sets the median value of the frequency band that the drive will avoid.	0.0 Hz (0.0 - 400.0 Hz)
d3-02 (0295)	Jump Frequency 2	Sets the median value of the frequency band that the drive will avoid.	0.0 Hz (0.0 - 400.0 Hz)
d3-03 (0296)	Jump Frequency 3	Sets the median value of the frequency band that the drive will avoid.	0.0 Hz (0.0 - 400.0 Hz)
d3-04 (0297)	Jump Frequency Width	Sets the width of the frequency band that the drive will avoid.	1.0 Hz (Determined by A1-02)

◆ d4: Frequency Ref Up/Down & Hold

No. (Hex.)	Name	Description	Default (Range)
d4-01 (0298)	Freq Reference Hold Selection	Sets the function that saves the frequency reference after a Stop command or when de-energizing the drive. Set *H1-xx [MFDI Function Selection]* to one of these values to enable this parameter: • *A [Accel/Decel Ramp Hold]* • *10/11 [Up/Down Command]* 0 : Disabled 1 : Enabled	0 (0, 1)
d4-10 (02B6)	Up/Down Freq Lower Limit Select	Sets the lower frequency limit for the Up/Down function. 0 : Greater of d2-02 or Analog 1 : d2-02	0 (0, 1)

◆ d6: Field Weakening

No. (Hex.)	Name	Description	Default (Range)
d6-01 (02A0)	Field Weakening Level	Sets the drive output voltage as a percentage of *E1-05 [Maximum Output Voltage]* when *H1-xx = 63 [Field Weakening]* is activated.	80% (0 - 100%)
d6-02 (02A1)	Field Weakening Frequency Limit	Sets the minimum output frequency to start field weakening.	0.0 Hz (0.0 - 400.0 Hz)

◆ d7: Offset Frequency

No. (Hex.)	Name	Description	Default (Range)
d7-01 (02B2) RUN	Offset Frequency 1	Uses *H1-xx = 44 [MFDI Function Select = Add Offset Frequency 1 (d7-01)]* as a percentage of the Maximum Output Frequency to add or subtract the set frequency to/from the frequency reference. **Note:** Parameter *A1-02 [Control Method Selection]* selects which parameter is the maximum output frequency. • *A1-02 ≠ 8 [EZOLV]*: *E1-04 [Maximum Output Frequency]* • *A1-02 = 8*: *E9-02 [Maximum Speed]*	0.0% (-100.0 - +100.0%)
d7-02 (02B3) RUN	Offset Frequency 2	Uses *H1-xx = 45 [MFDI Function Select = Add Offset Frequency 2 (d7-02)]* as a percentage of the Maximum Output Frequency to add or subtract the set frequency to/from the frequency reference. **Note:** Parameter *A1-02 [Control Method Selection]* selects which parameter is the maximum output frequency. • *A1-02 ≠ 8 [EZOLV]*: *E1-04 [Maximum Output Frequency]* • *A1-02 = 8*: *E9-02 [Maximum Speed]*	0.0% (-100.0 - +100.0%)
d7-03 (02B4) RUN	Offset Frequency 3	Uses *H1-xx = 46 [MFDI Function Select = Add Offset Frequency 3 (d7-03)]* as a percentage of the Maximum Output Frequency to add or subtract the set frequency to/from the frequency reference. **Note:** Parameter *A1-02 [Control Method Selection]* selects which parameter is the maximum output frequency. • *A1-02 ≠ 8 [EZOLV]*: *E1-04 [Maximum Output Frequency]* • *A1-02 = 8*: *E9-02 [Maximum Speed]*	0.0% (-100.0 - +100.0%)

3.8 E: Motor Parameters

◆ E1: V/f Pattern for Motor 1

No. (Hex.)	Name	Description	Default (Range)
E1-01 (0300)	Input AC Supply Voltage	Sets the drive input voltage. **NOTICE:** *Set parameter E1-01 to align with the drive input voltage (not motor voltage). If this parameter is incorrect, the protective functions of the drive will not operate correctly and it can cause damage to the drive.*	208 V Class: 240 V, 480 V Class: 480 V (208 V Class: 155 - 255 V, 480 V Class: 310 - 510 V)
E1-03 (0302)	V/f Pattern Selection	Sets the V/f pattern for the drive and motor. You can use one of the preset patterns or you can make a custom pattern. 0 : Const Trq, 50Hz base, 50Hz max 1 : Const Trq, 60Hz base, 60Hz max 2 : Const Trq, 50Hz base, 60Hz max 3 : Const Trq, 60Hz base, 72Hz max 4 : VT, 50Hz, 65% Vmid reduction 5 : VT, 50Hz, 50% Vmid reduction 6 : VT, 60 Hz, 65% Vmid reduction 7 : VT, 60Hz, 50% Vmid reduction 8 : High Trq, 50Hz, 25% Vmin boost 9 : High Trq, 50Hz, 65% Vmin boost A : High Trq, 60Hz, 25% Vmin boost B : High Trq, 60Hz, 65% Vmin boost C : High Freq, 60Hz base, 90Hz max D : High Freq, 60Hz base, 120Hz max E : High Freq, 60Hz base, 180Hz max F : Custom **Note:** • Set the correct V/f pattern for the application and operation area. An incorrect V/f pattern can decrease motor torque and increase current from overexcitation. • Parameter *A1-03 [Initialize Parameters]* will not initialize the value of *E1-03*.	F (Determined by A1-02)
E1-04 (0303)	Maximum Output Frequency	Sets the maximum output frequency for the V/f pattern.	Determined by A1-02 and E5-01 (Determined by A1-02 and E5-01)
E1-05 (0304)	Maximum Output Voltage	Sets the maximum output voltage for the V/f pattern.	208 V Class: 230.0 V, 480 V Class: 460.0 V (208 V Class: 0.0 - 255.0 V, 480 V Class: 0.0 - 510.0 V)
E1-06 (0305)	Base Frequency	Sets the base frequency for the V/f pattern.	Determined by A1-02 and E5-01 (0.0 - E1-04)
E1-07 (0306)	Mid Point A Frequency	Sets a middle output frequency for the V/f pattern.	Determined by A1-02 (0.0 - E1-04)
E1-08 (0307)	Mid Point A Voltage	Sets a middle output voltage for the V/f pattern.	Determined by A1-02 and o2-04 (208 V Class: 0.0 - 255.0 V, 480 V Class: 0.0 - 510.0 V)
E1-09 (0308)	Minimum Output Frequency	Sets the minimum output frequency for the V/f pattern.	Determined by A1-02 and E5-01 (Determined by A1-02, E1-04, and E5-01)
E1-10 (0309)	Minimum Output Voltage	Sets the minimum output voltage for the V/f pattern.	Determined by A1-02 (208 V Class: 0.0 - 255.0 V, 480 V Class: 0.0 - 510.0 V)
E1-11 (030A) Expert	Mid Point B Frequency	Sets a middle output frequency for the V/f pattern.	0.0 Hz (0.0 - E1-04)
E1-12 (030B) Expert	Mid Point B Voltage	Sets a middle point voltage for the V/f pattern.	0.0 V (208 V Class: 0.0 - 255.0 V, 480 V Class: 0.0 - 510.0 V)
E1-13 (030C) Expert	Base Voltage	Sets the base voltage for the V/f pattern.	0.0 V (208 V Class: 0.0 - 255.0 V, 480 V Class: 0.0 - 510.0 V)

◆ E2: Motor Parameters

No. (Hex.)	Name	Description	Default (Range)
E2-01 (030E)	Motor Rated Current (FLA)	Sets the motor rated current in amps.	Determined by o2-04 (10% to 200% of the drive rated current)
E2-02 (030F)	Motor Rated Slip	Sets motor rated slip.	Determined by o2-04 (0.000 - 20.000 Hz)
E2-03 (0310)	Motor No-Load Current	Sets the no-load current for the motor in amps when operating at the rated frequency and the no-load voltage.	Determined by o2-04 (0 to E2-01)
E2-04 (0311)	Motor Pole Count	Sets the number of motor poles.	4 (2 - 120)
E2-05 (0312)	Motor Line-to-Line Resistance	Sets the line-to-line resistance for the motor stator windings.	Determined by o2-04 (0.000 - 65.000 Ω)
E2-06 (0313)	Motor Leakage Inductance	Sets the voltage drop from motor leakage inductance when the motor is operating at the rated frequency and rated current. This value is a percentage of Motor Rated Voltage.	Determined by o2-04 (0.0 - 60.0%)
E2-10 (0317)	Motor Iron Loss	Sets the motor iron loss.	Determined by o2-04 (0 - 65535 W)
E2-11 (0318)	Motor Rated Power	Sets the motor rated output in the units from *o1-58 [Motor Power Unit Selection]*.	Determined by o2-04 (0.00 - 650.00 HP)

◆ E3: V/f Pattern for Motor 2

No. (Hex.)	Name	Description	Default (Range)
E3-01 (0319)	Motor 2 Control Mode Selection	Sets the control method for motor 2. **Note:** • Parameter *L1-01 [Motor Overload (oL1) Protection]* sets the protection operation of *oL1 [Motor Overload]* the same as Motor 1. • When you use parameter *A1-03 [Initialize Parameters]* to initialize the drive, this parameter is not reset. 0 : V/f Control	0 (0)
E3-04 (031A)	Motor 2 Maximum Output Frequency	Set the maximum output frequency for the motor 2 V/f pattern.	Determined by E3-01 (40.0 - 400.0 Hz)
E3-05 (031B)	Motor 2 Maximum Output Voltage	Sets the maximum output voltage for the motor 2 V/f pattern.	Determined by E3-01 (208 V Class: 0.0 - 255.0 V, 480 V Class: 0.0 - 510.0 V)
E3-06 (031C)	Motor 2 Base Frequency	Sets the base frequency for the motor 2 V/f pattern.	Determined by E3-01 (0.0 - E3-04)
E3-07 (031D)	Motor 2 Mid Point A Frequency	Sets a middle output frequency for the motor 2 V/f pattern.	Determined by E3-01 (0.0 - E3-04)
E3-08 (031E)	Motor 2 Mid Point A Voltage	Sets a middle output voltage for the motor 2 V/f pattern.	Determined by E3-01 (208 V Class: 0.0 - 255.0 V, 480 V Class: 0.0 - 510.0 V)
E3-09 (031F)	Motor 2 Minimum Output Frequency	Sets the minimum output frequency for the motor 2 V/f pattern.	Determined by E3-01 (0.0 - E3-04)
E3-10 (0320)	Motor 2 Minimum Output Voltage	Sets the minimum output voltage for the motor 2 V/f pattern.	Determined by E3-01 (208 V Class: 0.0 - 255.0 V, 480 V Class: 0.0 - 510.0 V)
E3-11 (0345) Expert	Motor 2 Mid Point B Frequency	Sets a middle output frequency for the motor 2 V/f pattern. Set this parameter to adjust the V/f pattern for the constant output range. Usually it is not necessary to change this parameter.	0.0 Hz (0.0 - E3-04)
E3-12 (0346) Expert	Motor 2 Mid Point B Voltage	Sets a middle output voltage for the motor 2 V/f pattern. Set this parameter to adjust the V/f pattern for the constant output range. Usually it is not necessary to change this parameter.	0.0 V (208 V Class: 0.0 - 255.0 V, 480 V Class: 0.0 - 510.0 V)
E3-13 (0347) Expert	Motor 2 Base Voltage	Sets the base voltage for the motor 2 V/f pattern. Set this parameter to adjust the V/f pattern for the constant output range. Usually it is not necessary to change this parameter.	0.0 V (208 V Class: 0.0 - 255.0 V, 480 V Class: 0.0 - 510.0 V)

◆ E4: Motor 2 Parameters

No. (Hex.)	Name	Description	Default (Range)
E4-01 (0321)	Motor 2 Rated Current	Sets the motor rated current for motor 2 in amps.	Determined by o2-04 (10% to 200% of the drive rated current)
E4-02 (0322)	Motor 2 Rated Slip	Sets the motor rated slip for motor 2.	Determined by o2-04 (0.000 - 20.000 Hz)
E4-03 (0323)	Motor 2 Rated No-Load Current	Sets the no-load current for motor 2 in amps when operating at the rated frequency and the no-load voltage.	Determined by o2-04 (Less than 0 - E4-01)
E4-04 (0324)	Motor 2 Motor Poles	Sets the number of poles for motor 2.	4 (2 - 120)
E4-05 (0325)	Motor 2 Line-to-Line Resistance	Sets the line-to-line resistance for the motor 2 stator windings.	Determined by o2-04 (0.000 - 65.000 Ω)
E4-06 (0326)	Motor 2 Leakage Inductance	Sets the voltage drop from motor 2 leakage inductance as a percentage of Motor Rated Voltage when motor 2 operates at the rated frequency and rated current.	Determined by o2-04 (0.0 - 60.0%)
E4-10 (0340)	Motor 2 Iron Loss	Sets the motor iron loss for motor 2.	Determined by o2-04 (0 - 65535 W)
E4-11 (0327)	Motor 2 Rated Power	Sets the motor rated power in the units from *o1-58 [Motor Power Unit Selection]*.	Determined by o2-04 (0.00 - 650.00 HP)

◆ E5: PM Motor Settings

No. (Hex.)	Name	Description	Default (Range)
E5-01 (0329)	PM Motor Code Selection	Sets the motor code for Yaskawa PM motors. The drive uses the motor code to automatically set some parameters to their correct settings.	FFFF (0000 - FFFF)
E5-02 (032A)	PM Motor Rated Power	Sets the PM motor rated output in the units set in *o1-58 [Motor Power Unit Selection]*.	Determined by o2-04 (0.13 - 650.00 HP)
E5-03 (032B)	PM Motor Rated Current (FLA)	Sets the PM motor rated current (FLA).	Determined by o2-04 (10% to 200% of the drive rated current)
E5-04 (032C)	PM Motor Pole Count	Sets the number of PM motor poles. **Note:** When *A1-02 = 5 or 8 [OLV/PM or EZOLV]*, the maximum value is 48.	4 (2 - 120)
E5-05 (032D)	PM Motor Resistance (ohms/phase)	Sets the resistance per phase of a PM motor. Set 50% of the line-to-line resistance.	0.100 Ω (0.000 - 65.000 Ω)
E5-06 (032E)	PM d-axis Inductance (mH/phase)	Sets the PM motor d-axis inductance.	1.00 mH (0.00 - 300.00 mH)
E5-07 (032F)	PM q-axis Inductance (mH/phase)	Sets the PM motor q-axis inductance.	1.00 mH (0.00 - 600.00 mH)
E5-09 (0331)	PM Back-EMF Vpeak (mV/(rad/s))	Sets the peak value of PM motor induced voltage.	0.0 mV/(rad/sec) (0.0 - 2000.0 mV/(rad/s))
E5-24 (0353)	PM Back-EMF L-L Vrms (mV/rpm)	Sets the RMS value for PM motor line voltage.	0.1 mV/min^{-1} (0.0 - 6500.0 mV/min^{-1})

◆ E9: Motor Setting

No. (Hex.)	Name	Description	Default (Range)
E9-01 (11E4)	Motor Type Selection	Sets the type of motor. 0 : Induction (IM) 1 : Permanent Magnet (PM) 2 : Synchronous Reluctance (SynRM)	0 (0 to 2)
E9-02 (11E5)	Maximum Speed	Sets the maximum speed of the motor.	Determined by E9-01 (40.0 - 120.0 Hz)

No. (Hex.)	Name	Description	Default (Range)
E9-03 (11E6)	Rated Speed	Sets the rated rotation speed of the motor.	Determined by E9-01 (100 - 7200 min^{-1})
E9-04 (11E7)	Base Frequency	Sets the rated frequency of the motor.	Determined by E9-01 (40.0 - 120.0 Hz)
E9-05 (11E8)	Base Voltage	Sets the rated voltage of the motor.	208 V Class: 230.0 V, 480 V Class: 460.0 V (208 V Class: 0.0 - 255.0 V, 480 V Class: 0.0 - 510.0 V)
E9-06 (11E9)	Motor Rated Current (FLA)	Sets the motor rated current in amps.	Determined by E9-01 and o2-04 (10% to 200% of the drive rated current)
E9-07 (11EA)	Motor Rated Power	Sets the motor rated output in the units from *o1-58 [Motor Power Unit Selection]*.	Determined by E9-02 and o2-04 (0.00 - 650.00 kW)
E9-08 (11EB)	Motor Pole Count	Sets the number of motor poles.	4 (2 to 120)
E9-09 (11EC)	Motor Rated Slip	Sets the motor rated slip.	0.000 Hz (0.000 - 20.000 Hz)
E9-10 (11ED)	Motor Line-to-Line Resistance	Sets the line-to-line resistance for the motor stator windings.	Determined by o2-04 (0.000 - 65.000 Ω)

3.9 F: Options

◆ F6: Communication Options

No. (Hex.)	Name	Description	Default (Range)
F6-01 (03A2)	Communication Error Selection	Sets the method to stop the motor or let the motor continue operating when the drive detects *bUS [Option Communication Error]*. 0 : Ramp to Stop 1 : Coast to Stop 2 : Fast Stop (Use C1-09) 3 : Alarm Only 4 : Alarm (Run at d1-04) 5 : Alarm - Ramp Stop	1 (0 - 5)
F6-02 (03A3)	Comm External Fault (EF0) Detect	Sets the conditions at which *EF0 [Option Card External Fault]* is detected. 0 : Always Detected 1 : Detected during RUN Only	0 (0, 1)
F6-03 (03A4)	Comm External Fault (EF0) Select	Sets the method to stop the motor or let the motor continue operating when the drive detects an *EF0 [Option Card External Fault]*. 0 : Ramp to Stop 1 : Coast to Stop 2 : Fast Stop (Use C1-09) 3 : Alarm Only	1 (0 - 3)
F6-06 (03A7)	Torque Reference/Limit by Comm	Sets the function that enables and disables the torque reference and torque limit received from the communication option. 0 : Disabled 1 : Enabled	0 (0, 1)
F6-07 (03A8)	Multi-Step Ref @ NetRef/ ComRef	Sets the function that enables and disables the multi-step speed reference when the freqency reference source is NetRef or ComRef (communication option card or MEMOBUS/Modbus communications). 0 : Disable Multi-Step References 1 : Enable Multi-Step References	0 (0, 1)
F6-08 (036A)	Comm Parameter Reset @Initialize	Sets the function to initialize *F6-xx and F7-xx parameters* when the drive is initialized with *A1-03 [Initialize Parameters]*. 0 : No Reset - Parameters Retained 1 : Reset Back to Factory Default	0 (0, 1)
F6-14 (03BB)	BUS Error Auto Reset	Sets the automatic reset function for *bUS [Option Communication Errors]*. 0 : Disable 1 : Enabled	0 (0, 1)
F6-15 (0B5B)	Comm. Option Parameters Reload	Sets the update method when you change *F6-xx, F7-xx [Communication Options]*. 0 : Reload at Next Power Cycle 1 : Reload Now 2 : Cancel Reload Request	0 (0 - 2)
F6-16 (0B8A)	Gateway Mode	Sets the gateway mode operation and the number of connected slave drives. 0 : Disabled 1 : Enabled: 1 Slave Drives 2 : Enabled: 2 Slave Drives 3 : Enabled: 3 Slave Drives 4 : Enabled: 4 Slave Drives	0 (0 to 4)

◆ F7: Ethernet Options

No. (Hex.)	Name	Description	Default (Range)
F7-01 (03E5)	IP Address 1	Sets the first octet of the IP Address for the device that is connecting to the network. Restart the drive after you change this parameter. **Note:** When *F7-13 = 0 [Address Mode at Startup = Static]*: • Use parameters *F7-01 to F7-04 [IP Address 4]* to set the IP Address. Be sure to set a different IP address for each drive on the network. • Also set parameters *F7-01 to F7-12*.	192 (0 - 255)
F7-02 (03E6)	IP Address 2	Sets the second octet of the IP Address for the device that is connecting to the network. Restart the drive after you change this parameter. **Note:** When *F7-13 = 0 [Address Mode at Startup = Static]*: • Use parameters *F7-01 to F7-04 [IP Address 4]* to set the IP Address. Be sure to set a different IP address for each drive on the network. • Also set parameters *F7-01 to F7-12*.	168 (0 - 255)
F7-03 (03E7)	IP Address 3	Sets the third octet of the IP Address for the device that is connecting to the network. Restart the drive after you change this parameter. **Note:** When *F7-13 = 0 [Address Mode at Startup = Static]*: • Use parameters *F7-01 to F7-04 [IP Address 4]* to set the IP Address. Be sure to set a different IP address for each drive on the network. • Also set parameters *F7-01 to F7-12*.	1 (0 - 255)
F7-04 (03E8)	IP Address 4	Sets the fourth octet of the IP Address for the device that is connecting to the network. Restart the drive after you change this parameter. **Note:** When *F7-13 = 0 [Address Mode at Startup = Static]*: • Use parameters *F7-01 to F7-04 [IP Address 4]* to set the IP Address. Be sure to set a different IP address for each drive on the network. • Also set parameters *F7-01 to F7-12*.	20 (0 - 255)
F7-05 (03E9)	Subnet Mask 1	Sets the first octet of the subnet mask of the connected network. **Note:** Set this parameter when *F7-13 = 0 [Address Mode at Startup = Static]*.	255 (0 - 255)
F7-06 (03EA)	Subnet Mask 2	Sets the second octet of the subnet mask of the connected network. **Note:** Set this parameter when *F7-13 = 0 [Address Mode at Startup = Static]*.	255 (0 - 255)
F7-07 (03EB)	Subnet Mask 3	Sets the third octet of the subnet mask of the connected network. **Note:** Set this parameter when *F7-13 = 0 [Address Mode at Startup = Static]*.	255 (0 - 255)
F7-08 (03EC)	Subnet Mask 4	Sets the fourth octet of the subnet mask of the connected network. **Note:** Set this parameter when *F7-13 = 0 [Address Mode at Startup = Static]*.	0 (0 - 255)
F7-09 (03ED)	Gateway Address 1	Sets the first octet of the gateway address of the connected network. **Note:** Set this parameter when *F7-13 = 0 [Address Mode at Startup = Static]*.	192 (0 - 255)
F7-10 (03EE)	Gateway Address 2	Sets the second octet of the gateway address of the connected network. **Note:** Set this parameter when *F7-13 = 0 [Address Mode at Startup = Static]*.	168 (0 - 255)
F7-11 (03EF)	Gateway Address 3	Sets the third octet of the gateway address of the connected network. **Note:** Set this parameter when *F7-13 = 0 [Address Mode at Startup = Static]*.	1 (0 - 255)
F7-12 (03F0)	Gateway Address 4	Sets the fourth octet of the gateway address of the connected network. **Note:** Set this parameter when *F7-13 = 0 [Address Mode at Startup = Static]*.	1 (0 - 255)

No. (Hex.)	Name	Description	Default (Range)
F7-13 (03F1)	Address Mode at Startup	Sets the method to set option card IP addresses. 0 : Static 1 : BOOTP 2 : DHCP **Note:** • The following setting values are available when using the PROFINET communication option card (SI-EP3). –0: Static –2: DHCP • When *F7-13 = 0*, set parameters *F7-01 to F7-12 [IP Address 1 to Gateway Address 4]* to set the IP Address. Be sure to set a different IP address for each drive on the network.	2 (0 - 2)
F7-14 (03F2)	Duplex Mode Selection	Sets the duplex mode setting method. 0 : Half/Half 1 : Auto/Auto 2 : Full/Full 3 : Half/Auto 4 : Half/Full 5 : Auto/Half 6 : Auto/Full 7 : Full/Half 8 : Full/Auto	1 (0 - 8)
F7-15 (03F3)	Communication Speed Selection	Sets the communications speed. 10 : 10/10 Mbps 100 : 100/100 Mbps 101 : 10/100 Mbps 102 : 100/10 Mbps	10 (10, 100 - 102)
F7-16 (03F4)	Timeout Value	Sets the detection time for a communications timeout. **Note:** Set this parameter to 0.0 to disable the connection timeout function.	0.0 s (0.0 - 30.0 s)
F7-17 (03F5)	EtherNet/IP Speed Scaling Factor	Sets the scaling factor for the speed monitor in the EtherNet/IP Class ID 2AH Object.	0 (-15 - +15)
F7-18 (03F6)	EtherNet/IP Current Scale Factor	Sets the scaling factor for the output current monitor in the EtherNet/IP Class ID 2AH Object.	0 (-15 - +15)
F7-19 (03F7)	EtherNet/IP Torque Scale Factor	Sets the scaling factor for the torque monitor in the EtherNet/IP Class ID 2AH Object.	0 (-15 - +15)
F7-20 (03F8)	EtherNet/IP Power Scaling Factor	Sets the scaling factor for the power monitor in the EtherNet/IP Class ID 2AH Object.	0 (-15 - +15)
F7-21 (03F9)	EtherNet/IP Voltage Scale Factor	Sets the scaling factor for the voltage monitor in the EtherNet/IP Class ID 2AH Object.	0 (-15 - +15)
F7-22 (03FA)	EtherNet/IP Time Scaling	Sets the scaling factor for the time monitor in the EtherNet/IP Class ID 2AH Object.	0 (-15 - +15)
F7-23 (03FB)	Dynamic Out Param 1 for CommCard	When you use an Ethernet/IP option, sets Output Assembly 116. The drive writes the values from Output Assembly 116 to the MEMOBUS/Modbus address register that is stored for each parameter. The drive will not write the values from Output Assembly 116 to the registers when the MEMOBUS/Modbus address is 0. When you use a PROFINET option, set this parameter to set to configurable output 1.	0
F7-24 (03FC)	Dynamic Out Param 2 for CommCard	When you use an Ethernet/IP option, sets Output Assembly 116. The drive writes the values from Output Assembly 116 to the MEMOBUS/Modbus address register that is stored for each parameter. The drive will not write the values from Output Assembly 116 to the registers when the MEMOBUS/Modbus address is 0. When you use a PROFINET option, set this parameter to set to configurable output 2.	0
F7-25 (03FD)	Dynamic Out Param 3 for CommCard	When you use an Ethernet/IP option, sets Output Assembly 116. The drive writes the values from Output Assembly 116 to the MEMOBUS/Modbus address register that is stored for each parameter. The drive will not write the values from Output Assembly 116 to the registers when the MEMOBUS/Modbus address is 0. When you use a PROFINET option, set this parameter to set to configurable output 3.	0
F7-26 (03FE)	Dynamic Out Param 4 for CommCard	Sets Output Assembly 116 when you use an Ethernet/IP option. The drive writes the values from Output Assembly 116 to the MEMOBUS/Modbus address register that is stored for each parameter. The drive will not write the values from Output Assembly 116 to the registers when the MEMOBUS/Modbus address is 0. When you use a ProfiNet option, set this parameter to set to configurable output 4.	0
F7-27 (03FF)	Dynamic Out Param 5 for CommCard	When you use an Ethernet/IP option, sets Output Assembly 116. The drive writes the values from Output Assembly 116 to the MEMOBUS/Modbus address register that is stored for each parameter. The drive will not write the values from Output Assembly 116 to the registers when the MEMOBUS/Modbus address is 0. When you use a PROFINET option, set this parameter to set to configurable output 5.	0

No. (Hex.)	Name	Description	Default (Range)
F7-28 (0370)	Dynamic Out Param 6 for CommCard	When you use an Ethernet/IP option, sets Output Assembly 116. The drive writes the values from Output Assembly 116 to the MEMOBUS/Modbus address register that is stored for each parameter. The drive will not write the values from Output Assembly 116 to the registers when the MEMOBUS/Modbus address is 0.	0
F7-29 (0371)	Dynamic Out Param 7 for CommCard	When you use an Ethernet/IP option, sets Output Assembly 116. The drive writes the values from Output Assembly 116 to the MEMOBUS/Modbus address register that is stored for each parameter. The drive will not write the values from Output Assembly 116 to the registers when the MEMOBUS/Modbus address is 0.	0
F7-30 (0372)	Dynamic Out Param 8 for CommCard	When you use an Ethernet/IP option, sets Output Assembly 116. The drive writes the values from Output Assembly 116 to the MEMOBUS/Modbus address register that is stored for each parameter. The drive will not write the values from Output Assembly 116 to the registers when the MEMOBUS/Modbus address is 0.	0
F7-31 (0373)	Dynamic Out Param 9 for CommCard	When you use an Ethernet/IP option, sets Output Assembly 116. The drive writes the values from Output Assembly 116 to the MEMOBUS/Modbus address register that is stored for each parameter. The drive will not write the values from Output Assembly 116 to the registers when the MEMOBUS/Modbus address is 0.	0
F7-32 (0374)	Dynamic Out Param 10 for CommCard	When you use an Ethernet/IP option, sets Output Assembly 116. The drive writes the values from Output Assembly 116 to the MEMOBUS/Modbus address register that is stored for each parameter. The drive will not write the values from Output Assembly 116 to the registers when the MEMOBUS/Modbus address is 0.	0
F7-33 (0375)	Dynamic In Param 1 for CommCard	Sets Input Assembly 166 when you use an Ethernet/IP option. The drive sends the values from the MEMOBUS/Modbus address registers stored for each parameter to Input Assembly 166. The drive returns the default register value for the option card when the MEMOBUS/Modbus address is 0 and the value sent to Input Assembly 166 is not defined. When you use a ProfiNet option, set this parameter to set to configurable input 1.	0
F7-34 (0376)	Dynamic In Param 2 for CommCard	Sets Input Assembly 166 when you use an Ethernet/IP option. The drive sends the values from the MEMOBUS/Modbus address registers stored for each parameter to Input Assembly 166. The drive returns the default register value for the option card when the MEMOBUS/Modbus address is 0 and the value sent to Input Assembly 166 is not defined. When you use a ProfiNet option, set this parameter to set to configurable input 2.	0
F7-35 (0377)	Dynamic In Param 3 for CommCard	Sets Input Assembly 166 when you use an Ethernet/IP option. The drive sends the values from the MEMOBUS/Modbus address registers stored for each parameter to Input Assembly 166. The drive returns the default register value for the option card when the MEMOBUS/Modbus address is 0 and the value sent to Input Assembly 166 is not defined. When you use a ProfiNet option, set this parameter to set to configurable input 3.	0
F7-36 (0378)	Dynamic In Param 4 for CommCard	Sets Input Assembly 166 when you use an Ethernet/IP option. The drive sends the values from the MEMOBUS/Modbus address registers stored for each parameter to Input Assembly 166. The drive returns the default register value for the option card when the MEMOBUS/Modbus address is 0 and the value sent to Input Assembly 166 is not defined. When you use a ProfiNet option, set this parameter to set to configurable input 4.	0
F7-37 (0379)	Dynamic In Param 5 for CommCard	Sets Input Assembly 166 when you use an Ethernet/IP option. The drive sends the values from the MEMOBUS/Modbus address registers stored for each parameter to Input Assembly 166. The drive returns the default register value for the option card when the MEMOBUS/Modbus address is 0 and the value sent to Input Assembly 166 is not defined. When you use a ProfiNet option, set this parameter to set to configurable input 5.	0
F7-38 (037A)	Dynamic In Param 6 for CommCard	Sets Input Assembly 166 when you use an Ethernet/IP option. The drive sends the values from the MEMOBUS/Modbus address registers stored for each parameter to Input Assembly 166. The drive returns the default register value for the option card when the MEMOBUS/Modbus address is 0 and the value sent to Input Assembly 166 is not defined.	0
F7-39 (037B)	Dynamic In Param 7 for CommCard	Sets Input Assembly 166 when you use an Ethernet/IP option. The drive sends the values from the MEMOBUS/Modbus address registers stored for each parameter to Input Assembly 166. The drive returns the default register value for the option card when the MEMOBUS/Modbus address is 0 and the value sent to Input Assembly 166 is not defined.	0
F7-40 (037C)	Dynamic In Param 8 for CommCard	Sets Input Assembly 166 when you use an Ethernet/IP option. The drive sends the values from the MEMOBUS/Modbus address registers stored for each parameter to Input Assembly 166. The drive returns the default register value for the option card when the MEMOBUS/Modbus address is 0 and the value sent to Input Assembly 166 is not defined.	0
F7-41 (037D)	Dynamic In Param 9 for CommCard	Sets Input Assembly 166 when you use an Ethernet/IP option. The drive sends the values from the MEMOBUS/Modbus address registers stored for each parameter to Input Assembly 166. The drive returns the default register value for the option card when the MEMOBUS/Modbus address is 0 and the value sent to Input Assembly 166 is not defined.	0
F7-42 (037E)	Dynamic In Param 10 for CommCard	Sets Input Assembly 166 when you use an Ethernet/IP option. The drive sends the values from the MEMOBUS/Modbus address registers stored for each parameter to Input Assembly 166. The drive returns the default register value for the option card when the MEMOBUS/Modbus address is 0 and the value sent to Input Assembly 166 is not defined.	0

3.10 H: Terminal Functions

◆ H1: Digital Inputs

No. (Hex.)	Name	Description	Default (Range)
H1-01 (0438)	Terminal S1 Function Selection	Sets the function for MFDI terminal S1. **Note:** The default setting is *F* when you initialize the drive for *3-Wire Initialization [A1-03 = 3330]*.	40 (1 - 1FF)
H1-02 (0439)	Terminal S2 Function Selection	Sets the function for MFDI terminal S2. **Note:** The default setting is *F* when you initialize the drive for *3-Wire Initialization [A1-03 = 3330]*.	F (1 - 1FF)
H1-03 (0400)	Terminal S3 Function Selection	Sets the function for MFDI terminal S3.	24 (0 - 1FF)
H1-04 (0401)	Terminal S4 Function Selection	Sets the function for MFDI terminal S4.	14 (0 - 1FF)
H1-05 (0402)	Terminal S5 Function Selection	Sets the function for MFDI terminal S5. **Note:** The default setting is *0* when the drive is initialized for *3-Wire Initialization [A1-03 = 3330]*.	3 (0 - 1FF)
H1-06 (0403)	Terminal S6 Function Selection	Sets the function for MFDI terminal S6. **Note:** The default setting is *3* when the drive is initialized for *3-Wire Initialization [A1-03 = 3330]*.	4 (0 - 1FF)
H1-07 (0404)	Terminal S7 Function Selection	Sets the function for MFDI terminal S7. **Note:** The default setting is *4* when the drive is initialized for *3-Wire Initialization [A1-03 = 3330]*.	6 (0 - 1FF)
H1-40 (0B54)	Mbus Reg 15C0h bit0 Input Func	Sets the MFDI function assigned to *bit 0* of the MEMOBUS register *15C0 (Hex.)*.	F (1 - 1FF)
H1-41 (0B55)	Mbus Reg 15C0h bit1 Input Func	Sets the MFDI function assigned to *bit 1* of the MEMOBUS register *15C0 (Hex.)*.	F (1 - 1FF)
H1-42 (0B56)	Mbus Reg 15C0h bit2 Input Func	Sets the MFDI function assigned to *bit 2* of the MEMOBUS register *15C0 (Hex.)*.	F (1 - 1FF)
H1-61 (39E1) RUN	Terminal S1 On-Delay Time	Sets the length of time necessary for Terminal S1 to be closed before the drive does the programmed function.	0.00 s (0.00 - 300.00 s)
H1-62 (39E2) RUN	Terminal S2 On-Delay Time	Sets the length of time necessary for Terminal S2 to be closed before the drive does the programmed function.	0.00 s (0.00 - 300.00 s)
H1-63 (39E3) RUN	Terminal S3 On-Delay Time	Sets the length of time necessary for Terminal S3 to be closed before the drive does the programmed function.	0.00 s (0.00 - 300.00 s)
H1-64 (39E4) RUN	Terminal S4 On-Delay Time	Sets the length of time necessary for Terminal S4 to be closed before the drive does the programmed function.	0.00 s (0.00 - 300.00 s)
H1-65 (39E5) RUN	Terminal S5 On-Delay Time	Sets the length of time necessary for Terminal S5 to be closed before the drive does the programmed function.	0.00 s (0.00 - 300.00 s)
H1-66 (39E6) RUN	Terminal S6 On-Delay Time	Sets the length of time necessary for Terminal S6 to be closed before the drive does the programmed function.	0.00 s (0.00 - 300.00 s)
H1-67 (39E7) RUN	Terminal S7 On-Delay Time	Sets the length of time necessary for Terminal S7 to be closed before the drive does the programmed function.	0.00 s (0.00 - 300.00 s)
H1-71 (39EB) RUN	Terminal S1 Off-Delay Time	Sets the length of time necessary for Terminal S1 to be open before the drive removes the programmed function.	0.00 s (0.00 - 300.00 s)
H1-72 (39EC) RUN	Terminal S2 Off-Delay Time	Sets the length of time necessary for Terminal S2 to be open before the drive removes the programmed function.	0.00 s (0.00 - 300.00 s)

No. (Hex.)	Name	Description	Default (Range)
H1-73 (39ED) RUN	Terminal S3 Off-Delay Time	Sets the length of time necessary for Terminal S3 to be open before the drive removes the programmed function.	0.00 s (0.00 - 300.00 s)
H1-74 (39EE) RUN	Terminal S4 Off-Delay Time	Sets the length of time necessary for Terminal S4 to be open before the drive removes the programmed function.	0.00 s (0.00 - 300.00 s)
H1-75 (39EF) RUN	Terminal S5 Off-Delay Time	Sets the length of time necessary for Terminal S5 to be open before the drive removes the programmed function.	0.00 s (0.00 - 300.00 s)
H1-76 (39F0) RUN	Terminal S6 Off-Delay Time	Sets the length of time necessary for Terminal S6 to be open before the drive removes the programmed function.	0.00 s (0.00 - 300.00 s)
H1-77 (39F1) RUN	Terminal S7 Off-Delay Time	Sets the length of time necessary for Terminal S7 to be open before the drive removes the programmed function.	0.00 s (0.00 - 300.00 s)

■ H1-xx: MFDI Setting Values

Setting Value	Function	Description
0	3-Wire Sequence	Sets the direction of motor rotation for 3-wire sequence.
3	Multi-Step Speed Reference 1	Uses speed references *d1-01 to d1-08* to set a multi-step speed reference.
4	Multi-Step Speed Reference 2	Uses speed references *d1-01 to d1-08* to set a multi-step speed reference.
5	Multi-Step Speed Reference 3	Uses speed references *d1-01 to d1-08* to set a multi-step speed reference.
6	Jog Reference Selection	Sets the drive to use the JOG Frequency Reference (JOG command) set in *d1-17 [Jog Reference]*. The JOG Frequency Reference (JOG command) overrides the *d1-01 to d1-08 [References 1 to 8]* settings.
7	Accel/Decel Time Selection 1	Sets the drive to use *Acceleration/Deceleration Time 1 [C1-01, C1-02]* or *Acceleration/Deceleration Time 2 [C1-03, C1-04]*.
8	Baseblock Command (N.O.)	Sets the command that stops drive output and coasts the motor to stop when the input is ON. ON : Baseblock (drive output stop) OFF : Normal operation
9	Baseblock Command (N.C.)	Sets the command that stops drive output and coasts the motor to stop when the input terminal is OFF. ON : Normal operation OFF : Baseblock (drive output stop)
A	Accel/Decel Ramp Hold	Momentarily pauses motor acceleration and deceleration when the terminal is turned ON, retains the output frequency that was stored in the drive at the time of the pause, and restarts motor operation.
B	Overheat Alarm (oH2)	Sets the drive to display an *oH2 [Drive Overheat Warning]* alarm when the input terminal is ON. The alarm does not have an effect on drive operation.
C	Analog Terminal Enable Selection	Sets the command that enables or disables the terminals selected in *H3-14 [Analog Input Terminal Enable Sel]*. ON : Input to the terminal selected with *H3-14* is enabled OFF : Input to the terminal selected with *H3-14* is disabled
E	ASR Integral Reset	Sets the command to reset the integral value and use PI control or P control for the speed control loop. ON : P control OFF : PI control
F	Not Used	Use this setting for unused terminals or to use terminals in through mode.
10	Up Command	Sets the command to use a push button switch to increase the drive frequency reference. You must also set *Setting 11 [Down Command]*. ON : Increases the frequency reference. OFF : Holds the current frequency reference.
11	Down Command	Sets the command to use a push button switch to decrease the drive frequency reference. You must also set *Setting 10 [Up Command]*. ON : Decreases the frequency reference. OFF : Holds the current frequency reference.
12	Forward Jog	Sets the command to operate the motor in the forward direction at the Jog Frequency set in *d1-17 [Jog Reference]*.
13	Reverse Jog	Sets the command to operate the motor in the reverse direction at the Jog Frequency set in *d1-17 [Jog Reference]*.

Setting Value	Function	Description
14	Fault Reset	Sets the command to reset the current fault when the Run command is inactive. **Note:** The drive ignores the fault reset command when the Run command is active. Remove the Run command before trying to reset a fault.
15	Fast Stop (N.O.)	Sets the command to ramp to stop in the deceleration time set in *C1-09 [Fast Stop Time]* when the input terminal is activated while the drive is operating.
16	Motor 2 Selection	Sets the command for the drive to operate motor 1 or motor 2. Stop the motors before switching. ON : Selects motor 2. OFF : Selects motor 1.
17	Fast Stop (N.C.)	Sets the command to ramp to stop in the deceleration time set in *C1-09 [Fast Stop Time]* when the input terminal is activated while the drive is operating.
18	Timer Function	Sets the command to start the timer function. Use this setting with *Timer Output [H2-xx = 12]*.
19	PID Disable	Sets the command to disable PID control when *b5-01 = 1 or 3 [PID Mode Setting = Standard or Fref + PID Trim]*. ON : PID control disabled OFF : PID control enabled
1B	Programming Lockout	Sets the command to prevent parameter changes when the terminal is OFF. ON : Programming Lockout OFF : Parameter Write Prohibit
1E	Reference Sample Hold	Sets the command to sample the frequency reference at terminals A1 or A2 and hold the frequency reference at that frequency.
20	External Fault (NO-Always-Ramp)	When the terminal activates, the drive ramps to stop in the selected deceleration time. Fault relay output terminal MA-MC will turn ON, and MB-MC will turn OFF. The drive always detects external faults whether the drive is stopped or running.
21	External Fault (NC-Always-Ramp)	When the terminal deactivates, the drive ramps to stop in the selected deceleration time. Fault relay output terminal MA-MC will turn ON, and MB-MC will turn OFF. The drive always detects external faults whether the drive is stopped or running.
22	External Fault (NO-@Run-Ramp)	When the terminal activates during run, the drive ramps to stop in the selected deceleration time. Fault relay output terminal MA-MC will turn ON, and MB-MC will turn OFF. The drive does not detect external faults while the drive is stopped.
23	External Fault (NC-@Run-Ramp)	When the terminal deactivates during run, the drive ramps to stop in the selected deceleration time. Fault relay output terminal MA-MC will turn ON, and MB-MC will turn OFF. The drive does not detect external faults while the drive is stopped.
24	External Fault (NO-Always-Coast)	When the terminal activates, the drive shuts off the output and the motor coasts to stop. Fault relay output terminal MA-MC will turn ON, and MB-MC will turn OFF. The drive always detects external faults whether the drive is stopped or running.
25	External Fault (NC-Always-Coast)	When the terminal deactivates, the drive shuts off the output and the motor coasts to stop. Fault relay output terminal MA-MC will turn ON, and MB-MC will turn OFF. The drive always detects external faults whether the drive is stopped or running.
26	External Fault (NO-@Run-Coast)	When the terminal activates during run, the drive shuts off the output and the motor coasts to stop. Fault relay output terminal MA-MC will turn ON, and MB-MC will turn OFF. The drive does not detect external faults while the drive is stopped.
27	External Fault (NC-@Run-Coast)	When the terminal deactivates during run, the drive shuts off the output and the motor coasts to stop. Fault relay output terminal MA-MC will turn ON, and MB-MC will turn OFF. The drive does not detect external faults while the drive is stopped.
28	External Fault (NO-Always-FStop)	When the terminal activates, the drive stops the motor in the deceleration time set to *C1-09 [Fast Stop Time]*. Fault relay output terminal MA-MC turns ON, and MB-MC turns OFF. Stopped drives and running drives will detect external faults.
29	External Fault (NC-Always-FStop)	When the terminal deactivates, the drive stops the motor in the deceleration time set to *C1-09 [Fast Stop Time]*. Fault relay output terminal MA-MC turns ON, and MB-MC turns OFF. Stopped drives and running drives will detect external faults.
2A	External Fault (NO-@Run-FStop)	When the terminal activates during run, the drive stops the motor in the deceleration time set to *C1-09 [Fast Stop Time]*. Fault relay output terminal MA-MC turns ON, and MB-MC turns OFF. Stopped drives will not detect external faults.
2B	External Fault (NC-@Run-FStop)	When the terminal deactivates during run, the drive stops the motor in the deceleration time set to *C1-09 [Fast Stop Time]*. Fault relay output terminal MA-MC turns ON, and MB-MC turns OFF. Stopped drives will not detect external faults.
2C	External Fault (NO-Always-Alarm)	When the terminal activates, the keypad shows *EFx [External Fault (Terminal Sx)]* and the output terminal set for *Alarm [H2-01 to H2-03 = 10]* activates. The drive continues operation. The drive always detects external faults whether the drive is stopped or running.
2D	External Fault (NC-Always-Alarm)	When the terminal deactivates, the keypad shows *EFx [External Fault (Terminal Sx)]* and the output terminal set for *Alarm [H2-01 to H2-03 = 10]* activates. The drive continues operation. The drive always detects external faults whether the drive is stopped or running.
2E	External Fault (NO-@Run-Alarm)	When the terminal activates during run, the keypad shows *EFx [External Fault (Terminal Sx)]* and the output terminal set for *Alarm [H2-01 to H2-03 = 10]* activates. The drive continues operation. The drive does not detect external faults while the drive is stopped.
2F	External Fault (NC-@Run-Alarm)	When the terminal deactivates during run, the keypad shows *EFx [External Fault (Terminal Sx)]* and the output terminal set for *Alarm [H2-01 to H2-03 = 10]* activates. The drive continues operation. The drive does not detect external faults while the drive is stopped.
30	PID Integrator Reset	Sets the command to reset and hold the PID control integral to 0 when the terminal is ON.
31	PID Integrator Hold	Sets the command to hold the integral value of the PID control while the terminal is activated.
34	PID Soft Starter Disable	Sets the PID soft starter function. ON : Disable OFF : Enabled
35	PID Input (Error) Invert	Sets the command to turn the terminal ON and OFF to switch the PID input level (polarity).

Setting Value	Function	Description
3E	PID Setpoint Selection 1	Sets the function to switch the PID setpoint to *YA-02 [Setpoint 2]* or *YA-04 [Setpoint 4]*. Set this function and *H1-xx = 3F [PID Setpoint Selection 2]* at the same time. **Note:** If you use this function and one of *H1-xx = 83 to 85 [Dedicated Multi-Setpoint YA-02 to YA-04]* at the same time, the drive will detect an *oPE03 [Multi-Function Input Setting Err]*. ON : *YA-02* or *YA-04* is PID setpoint. OFF : The frequency reference, *YA-01 [Setpoint 1]*, or *YA-03 [Setpoint 3]* is PID setpoint.
3F	PID Setpoint Selection 2	Sets the function to switch the PID setpoint to *YA-03 [Setpoint 3]* or *YA-04 [Setpoint 4]*. Set this function and *H1-xx = 3E [PID Setpoint Selection 1]* at the same time. **Note:** If you use this function and one of *H1-xx = 83 to 85 [Dedicated Multi-Setpoint YA-02 to YA-04]* at the same time, the drive will detect an *oPE03 [Multi-Function Input Setting Err]*. ON : *YA-03* or *YA-04* is PID setpoint. OFF : The frequency reference, *YA-01 [Setpoint 1]*, or *YA-02 [Setpoint 2]* is PID setpoint.
40	Forward RUN (2-Wire)	Sets the Forward Run command for 2-wire sequence 1. Set this function and *H1-xx = 41 [Reverse Run Command (2-Wire Seq)]* together. ON : Forward Run OFF : Run Stop **Note:** • If you turn ON the Forward Run command terminal and the Reverse Run command terminal, it will cause an *EF [FWD/REV Run Command Input Error]* alarm and the motor will ramp to stop. • Initialize the drive with a 2-wire sequence to set the Forward Run command to terminal S1. • This function will not operate at the same time as *H1-xx = 42, 43 [Run Command/FWD/REV Command (2-Wire Seq 2)]*.
41	Reverse RUN (2-Wire)	Sets the Forward Run command for 2-wire sequence 1. Set this function and *H1-xx = 40 [Forward Run Command (2-Wire Seq)]* together. ON : Reverse Run OFF : Run Stop **Note:** • If you turn ON the Forward Run command terminal and the Reverse Run command terminal, it will cause an *EF [FWD/REV Run Command Input Error]* alarm and the motor will ramp to stop. • Initialize the drive with a 2-wire sequence to set the Reverse Run command to terminal S2. • This function will not operate at the same time as *H1-xx = 42, 43 [Run Command/FWD/REV Command (2-Wire Seq 2)]*.
42	Run Command (2-Wire Sequence 2)	Sets the Run command for 2-wire sequence 2. Set this function and *H1-xx = 43 [FWD/REV Command (2-Wire Seq 2)]* together. ON : Run OFF : Stop **Note:** This function will not operate at the same time as *H1-xx = 40, 41 [Forward/Reverse Run Command (2-Wire Seq)]*.
43	FWD/REV (2-Wire Sequence 2)	Sets the direction of motor rotation for 2-wire sequence 2. Set this function and *H1-xx = 42 [Run Command (2-Wire Sequence 2)]* together. ON : Reverse run OFF : Forward run **Note:** This function will not operate at the same time as *H1-xx = 40, 41 [Forward/Reverse Run Command (2-Wire Seq)]*.
44	Add Offset Frequency 1 (d7-01)	Sets the function to add the offset frequency set in *d7-01 [Offset Frequency 1]* to the frequency reference when the terminal activates.
45	Add Offset Frequency 2 (d7-01)	Sets the function to add the offset frequency set in *d7-02 [Offset Frequency 2]* to the frequency reference when the terminal activates.
46	Add Offset Frequency 3 (d7-01)	Sets the function to add the offset frequency set in *d7-03 [Offset Frequency 3]* to the frequency reference when the terminal activates.
50	Motor Pre-heat 2	Sets the command to apply the motor pre-heat current.
51	Sequence Timer Disable	Sets the command to disable Sequence Timers. ON : Sequence Timer is Disabled
52	Sequence Timer Cancel	Sets the command to cancel the currently active Sequence Timer. ON : Cancel Active Sequence Timer
60	DC Injection Braking Command	Sets the command to use DC Injection Braking to stop the motor. **Note:** When *A1-02 = 8 [Control Method Selection = EZOLV]*, this function is available with a PM motor.
61	Speed Search from Fmax	Sets the function to start speed search using an external reference although *b3-01 = 0 [Speed Search Selection at Start = Disabled]*. **Note:** The drive will detect *oPE03 [Multi-Function Input Setting Err]* if you set *H1-xx = 61 and 62* at the same time.
62	Speed Search from Fref	Sets the function to use an external reference to start speed search although *b3-01 = 0 [Speed Search Selection at Start = Disabled]*. **Note:** The drive will detect *oPE03 [Multi-Function Input Setting Err]* if you set *H1-xx = 61 and 62* at the same time.
63	Field Weakening	Sets the function to send the Field Weakening Level and Field Weakening Frequency Limit commands set in *d6-01 [Field Weakening Level] and d6-02 [Field Weakening Frequency Limit]* when the input terminal is activated.

Setting Value	Function	Description
65	KEB Ride-Thru 1 Activate (N.C.)	Sets operation of the KEB1 function through the KEB Ride-Thru 1 (N.C.). ON : Normal operation OFF : Deceleration during momentary power loss
66	KEB Ride-Thru 1 Activate (N.O.)	Sets operation of the KEB1 function through the KEB Ride-Thru 1 (N.O.). ON : Deceleration during momentary power loss OFF : Normal operation
67	Communications Test Mode	Set the function for the drive to self-test RS-485 serial communications operation.
68	High Slip Braking (HSB) Activate	Sets the command to use high-slip braking to stop the motor.
69	Jog Run 2	Causes the drive to ramp to the *d1-17 [Jog Reference]* frequency. The forward/reverse command from the 3-wire or 2-wire 2 sequence sets the direction.
6A	Drive Enable	Sets the function to show *dnE [Drive Enabled]* on the keypad and ignore Run commands when the terminal is OFF.
6D	AUTO Command	Sets the command to operate the drive in AUTO Mode. ON : AUTO Mode OFF : OFF Mode or HAND Mode
6E	HAND Command	Sets the command to operate the drive in HAND Mode. ON : HAND Mode OFF : OFF Mode or AUTO Mode
70	Drive Enable 2	Sets the function to show *dnE [Drive Enabled]* on the keypad and ignore Run commands when the terminal is OFF. ON : Run command is accepted. OFF : Run command is disabled. When the drive is running, it stops according to *b1-03* setting.
77	ASR Gain (C5-03) Select	Sets the function to switch the ASR proportional gain set in *C5-01 [ASR Proportional Gain 1]* and *C5-03 [ASR Proportional Gain 2]*. ON : C5-03 OFF : C5-01
7A	KEB Ride-Thru 2 Activate (N.C.)	Sets operation of the KEB2 function through the KEB Ride-Thru 2 (N.C.). ON : Normal operation OFF : Deceleration during momentary power loss
7B	KEB Ride-Thru 2 Activate (N.O.)	Sets operation of the KEB2 function through the KEB Ride-Thru 2 (N.O.). ON : Deceleration during momentary power loss OFF : Normal operation
7C	Short Circuit Braking (N.O.)	Sets operation of Short Circuit Braking (N.O.). ON : Short Circuit Braking is enabled. OFF : Normal operation **Note:** When *A1-02 = 8 [Control Method Selection = EZOLV]*, this function is available only when you use a PM motor.
7D	Short Circuit Braking (N.C.)	Sets operation of Short Circuit Braking (N.C.). ON : Normal operation OFF : Short Circuit Braking is enabled. **Note:** When *A1-02 = 8 [Control Method Selection = EZOLV]*, this function is available only when you use a PM motor.
82	PI Switch to Aux	Sets *YF-xx [PI Auxiliary Control]* parameters as primary PI loop parameters and disables *b5-xx [PID Control]*. **Note:** When this input is active, *YF-xx [PI Auxiliary Control]* parameters will always be the primary PI loop parameters. Parameter *YF-20 [PI Aux Main PI Speed Control]* does not have an effect.
83	Dedicated Multi-Setpoint YA-02	Sets the function to set the PID setpoint to *YA-02 [Setpoint 2]*. **Note:** If you use this function and one of *H1-xx = 3E or 3F [PID Setpoint Selection 1 or 2]* at the same time, the drive will detect an *oPE03 [Multi-Function Input Setting Err]*. ON : *YA-02* is PID setpoint. OFF : *YA-01 [Setpoint 1]*, *YA-03 [Setpoint 3]*, or *YA-04 [Setpoint 4]* is PID setpoint.
84	Dedicated Multi-Setpoint YA-03	Sets the function to set the PID setpoint to *YA-03 [Setpoint 3]*. Set this function and *H1-xx = 83 [Dedicated Multi-Setpoint YA-02]* at the same time. **Note:** If you use this function and one of *H1-xx = 3E or 3F [PID Setpoint Selection 1 or 2]* at the same time, the drive will detect an *oPE03 [Multi-Function Input Setting Err]*. ON : *YA-03* is PID setpoint. OFF : *YA-01 [Setpoint 1]*, *YA-02 [Setpoint 2]*, or *YA-04 [Setpoint 4]* is PID setpoint.

Setting Value	Function	Description
85	Dedicated Multi-Setpoint YA-04	Sets the function to set the PID setpoint to *YA-04 [Setpoint 4]*. Set this function, *H1-xx = 83 [Dedicated Multi-Setpoint YA-02]*, and *H1-xx = 84 [Dedicated Multi-Setpoint YA-03]* at the same time. **Note:** If you use this function and one of *H1-xx = 3E or 3F [PID Setpoint Selection 1 or 2]* at the same time, the drive will detect an *oPE03 [Multi-Function Input Setting Err]*. ON : *YA-04* is PID setpoint. OFF : *YA-01 [Setpoint 1]*, *YA-02 [Setpoint 2]*, or *YA-03 [Setpoint 3]* is PID setpoint.
88	Thermostat Fault	Sets the drive to show the *VLTS [Thermostat Fault]* when the input terminal is ON. **Note:** This function is active when the drive is running.
90	DWEZ Digital Input 1	Sets digital input 1 to use in DriveWorksEZ. Refer to the DriveWorksEZ online manual for more information.
91	DWEZ Digital Input 2	Sets digital input 2 to use in DriveWorksEZ. Refer to the DriveWorksEZ online manual for more information.
92	DWEZ Digital Input 3	Sets digital input 3 to use in DriveWorksEZ. Refer to the DriveWorksEZ online manual for more information.
93	DWEZ Digital Input 4	Sets digital input 4 to use in DriveWorksEZ. Refer to the DriveWorksEZ online manual for more information.
94	DWEZ Digital Input 5	Sets digital input 5 to use in DriveWorksEZ. Refer to the DriveWorksEZ online manual for more information.
95	DWEZ Digital Input 6	Sets digital input 6 to use in DriveWorksEZ. Refer to the DriveWorksEZ online manual for more information.
96	DWEZ Digital Input 7	Sets digital input 7 to use in DriveWorksEZ. Refer to the DriveWorksEZ online manual for more information.
9F	DWEZ Disable	Sets operation of the DriveWorksEZ program saved in the drive. ON : Disable OFF : Enabled **Note:** Set *A1-07 = 2 [DriveWorksEZ Function Selection = Digital input]* to use this function.
A8	PI2 Control Disable	Sets the command to disable the PI2 Control function. Parameter *S3-12 [PI2 Control Disable Mode Sel]* sets the output performance. ON : Enabled OFF : Disabled
AA	PI2 Control Inverse Operation	Sets the command to change the sign of the PI2 Control input.
AB	PI2 Control Integral Reset	Sets the command to reset the PI2 Control integral value. **Note:** This input has priority over *H1-xx = AC [MFDI Function Selection = PI2 Control Integral Hold]*.
AC	PI2 Control Integral Hold	Sets the command to lock the PI2 Control integral value.
AD	Select PI2 Control PI Parameters	Sets the command to use the *S3-06 [PI2 Control Proportional Gain]* and *S3-07 [PI2 Control Integral Time]* values instead of the *b5-02 [Proportional Gain (P)]* and *b5-03 [Integral Time (I)]* values. Set *S3-01 = 0 [PI2 Control Enable Selection = Disabled]* to enable this function. **Note:** This multi-function input does not have an effect on PI2 Control. Use this input for the primary PI controller (*b5-xx*).
AF	Emergency Override FWD	Sets the command to use the speed set in *S6-02 [Emergency Override Ref Selection]* to run the drive in the forward direction.
B0	Emergency Override REV	Sets the command to use the speed set in *S6-02 [Emergency Override Ref Selection]* to run the drive in the reverse direction.
B1	Customer Safeties	Sets the command to show that customer safeties are in place.
B2	BAS Interlock	Sets the command to show that the dampers are open.
B8	Low City Pressure	Sets the command to show that there is not sufficient pressure at the inlet to the pump. OFF : Insufficient pressure is present on the inlet to the pump **Note:** When *Y1-01 = 3 [Multiplex Mode = Memobus Network]*, this function will activate on any drive in the network. An alarm condition will cause other drives in the network to stop the operation and show a “Network Drive Error” “Check Faulted Drive” message.
B9	Disable Pre-charge	Sets the command to disable the Pre-charge function. ON : Pre-charge function is disabled
188	!Thermostat Fault	Sets the drive to show the *VLTS [Thermostat Fault]* when the input terminal is OFF. **Note:** This function is active when the drive is running.

Setting Value	Function	Description
1A8	!PI2 Control Disable	Sets the command to disable the PI2 Control function. Parameter *S3-12 [PI2 Control Disable Mode Sel]* sets the output performance. ON : Disabled OFF : Enabled
1B8	!Low City Pressure	Sets the command to show that there is not sufficient pressure at the inlet to the pump. ON : Insufficient pressure is present on the inlet to the pump **Note:** When *Y1-01 = 3 [Multiplex Mode = Memobus Network]*, this function will activate on any drive in the network. An alarm condition will cause other drives in the network to stop the operation and show a "Network Drive Error" "Check Faulted Drive" message.

◆ H2: Digital Outputs

No. (Hex.)	Name	Description	Default (Range)
H2-01 (040B)	Term M1-M2 Function Selection	Sets the function for MFDO terminal M1-M2. **Note:** Set this parameter to *F* when the terminal is not being used or to use the terminal in through mode.	0 (0 - 1FF)
H2-02 (040C)	Term M3-M4 Function Selection	Sets the function for MFDO terminal M3-M4. **Note:** Set this parameter to *F* when the terminal is not being used or to use the terminal in through mode.	1 (0 - 1FF)
H2-03 (040D)	Term M5-M6 Function Selection	Sets the function for MFDO terminal M5-M6. **Note:** When you do not use this terminal, or when you will use the terminal in through mode, set this parameter to *F*.	2 (0 - 1FF)
H2-06 (0437)	Watt Hour Output Unit Selection	Sets the unit for the output signal when *H2-01 to H2-03 = 39 [MFDO Function Selection = Watt Hour Pulse Output]*. 0 : 0.1 kWh units 1 : 1 kWh units 2 : 10 kWh units 3 : 100 kWh units 4 : 1000 kWh units	0 (0 - 4)
H2-07 (0B3A)	Modbus Register 1 Address Select	Sets the address of the MEMOBUS/Modbus register output to the MFDO terminal.	0001 (0001 - 1FFF)
H2-08 (0B3B)	Modbus Register 1 Bit Select	Sets the bit of the MEMOBUS/Modbus register output to the MFDO terminal.	0000 (0000 - FFFF)
H2-09 (0B3C)	Modbus Register 2 Address Select	Sets the address of the MEMOBUS/Modbus register output to the MFDO terminal.	0001 (0001 - 1FFF)
H2-10 (0B3D)	Modbus Register 2 Bit Select	Sets the bit of the MEMOBUS/Modbus register output to the MFDO terminal.	0000 (0000 - FFFF)
H2-40 (0B58)	Mbus Reg 15E0h bit0 Output Func	Sets the MFDO for bit 0 of MEMOBUS register 15E0 (Hex.).	F (0 - 1FF)
H2-41 (0B59)	Mbus Reg 15E0h bit1 Output Func	Sets the MFDO for bit 1 of MEMOBUS register 15E0 (Hex.).	F (0 - 1FF)
H2-42 (0B5A)	Mbus Reg 15E0h bit2 Output Func	Sets the MFDO for bit 2 of MEMOBUS register 15E0 (Hex.).	F (0 - 1FF)
H2-60 (1B46) Expert	Term M1-M2 Secondary Function	Sets the second function for terminal M1-M2. Outputs the logical calculation results of the terminals assigned to functions by *H2-01 [Term M1-M2 Function Selection]*.	F (0 - FF)
H2-61 (1B47) Expert	Terminal M1-M2 Logical Operation	Sets the logical operation for the functions set in *H2-01 [Term M1-M2 Function Selection]* and *H2-60 [Term M1-M2 Secondary Function]*.	0 (0 - 8)
H2-62 (1B48) Expert	Terminal M1-M2 Delay Time	Sets the minimum on time used to output the logical calculation results from terminal M1-M2.	0.1 s (0.0 - 25.0 s)
H2-63 (1B49) Expert	Term M3-M4 Secondary Function	Sets the second function for terminal M3-M4. Outputs the logical calculation results of the terminals assigned to functions by *H2-02 [Term M3-M4 Function Selection]*.	F (0 - FF)

No. (Hex.)	Name	Description	Default (Range)
H2-64 (1B4A) Expert	Terminal M3-M4 Logical Operation	Sets the logical operation for the functions set in *H2-02 [Term M3-M4 Function Selection]* and *H2-63 [Term M3-M4 Secondary Function]*.	0 (0 - 8)
H2-65 (1B4B) Expert	Terminal M3-M4 Delay Time	Sets the minimum on time used to output the logical calculation results from terminal M3-M4.	0.1 s (0.0 - 25.0 s)
H2-66 (1B4C) Expert	Term M5-M6 Secondary Function	Sets the second function for terminal M5-M6. Outputs the logical calculation results of the terminals assigned to functions by *H2-03 [Terminal M5-M6 Function Select]*.	F (0 - FF)
H2-67 (1B4D) Expert	Terminal M5-M6 Logical Operation	Sets the logical operation for the functions set in *H2-03 [Term M5-M6 Function Selection]* and *H2-66 [Term M5-M6 Secondary Function]*.	0 (0 - 8)
H2-68 (1B4E) Expert	Terminal M5-M6 Delay Time	Sets the minimum on time used to output the logical calculation results from terminal M5-M6.	0.1 s (0.0 - 25.0 s)

■ H2-xx: MFDO Setting Values

Setting Value	Function	Description
0	During Run	The terminal activates when you input a Run command and when the drive is outputting voltage. ON : Drive is running OFF : Drive is stopping
1	Zero Speed	The terminal activates when the output frequency < *E1-09 [Minimum Output Frequency]*. **Note:** Parameter *E1-09* is the reference in all control methods. ON : Output frequency < *E1-09*. OFF : Output frequency ≥ *E1-09*.
2	Speed Agree 1	The terminal activates when the output frequency is in the range of the frequency reference ± *L4-02 [Speed Agree Detection Width]*. **Note:** The detection function operates in the two motor rotation directions. ON : The output frequency is in the range of "frequency reference ± *L4-02*". OFF : The output frequency does not align with the frequency reference although the drive is running.
3	User-Set Speed Agree 1	The terminal activates when the output frequency is in the range of *L4-01 [Speed Agree Detection Level]* ± *L4-02 [Speed Agree Detection Width]* and in the range of the frequency reference ± *L4-02*. **Note:** The detection function operates in the two motor rotation directions. The drive uses the *L4-01* value as the forward/reverse detection level. ON : The output frequency is in the range of "*L4-01* ± *L4-02*" and the range of frequency reference ± *L4-02*. OFF : The output frequency is not in the range of "*L4-01* ± *L4-02*" or the range of frequency reference ± *L4-02*.
4	Frequency Detection 1	The terminal deactivates when the output frequency > "*L4-01 [Speed Agree Detection Level]* + *L4-02 [Speed Agree Detection Width]*". After the terminal deactivates, the terminal stays deactivated until the output frequency is at the value of *L4-01*. **Note:** The detection function operates in the two motor rotation directions. The drive uses the *L4-01* value as the forward/reverse detection level. ON : The output frequency < *L4-01*, or the output frequency ≤ "*L4-01* + *L4-02*" OFF : The output frequency > "*L4-01* + *L4-02*"
5	Frequency Detection 2	The terminal activates when the output frequency > *L4-01 [Speed Agree Detection Level]*. After the terminal activates, the terminal stays activated until the output frequency is at the value of "*L4-01* - *L4-02 [Speed Agree Detection Width]*". **Note:** The detection function operates in the two motor rotation directions. The drive uses the *L4-01* value as the forward/reverse detection level. ON : The output frequency > *L4-01* OFF : The output frequency < "*L4-01* - *L4-02*", or the output frequency ≤ *L4-01*
6	Drive Ready	The terminal activates when the drive is ready and running.
7	DC Bus Undervoltage	The terminal activates when the DC bus voltage or control circuit power supply is at the voltage set in *L2-05 [Undervoltage Detection Lvl (Uv1)]* or less. The terminal also activates when there is a fault with the DC bus voltage. ON : The DC bus voltage ≤ *L2-05* OFF : The DC bus voltage > *L2-05*
8	During Baseblock (N.O.)	The terminal activates during baseblock. When the drive is in baseblock, the drive output transistor stops switching and does not make DC bus voltage. ON : During baseblock OFF : The drive is not in baseblock.

Setting Value	Function	Description
9	Frequency Reference from Keypad	Shows the selected frequency reference source. ON : The keypad is the frequency reference source. OFF : Parameter *b1-01 [Frequency Reference Selection 1]* is the frequency reference source.
B	Torque Detection 1 (N.O.)	The terminal activates when the drive detects overtorque or undertorque. ON : The output current/torque > *L6-02 [Torque Detection Level 1]*, or the output current/torque < *L6-02* for longer than the time set in *L6-03 [Torque Detection Time 1]*.
C	Frequency Reference Loss	The terminal activates when the drive detects a loss of frequency reference.
E	Fault	The terminal activates when the drive detects a fault. **Note:** The terminal will not activate for *CPF00* and *CPF01 [Control Circuit Error]* faults.
F	Not Used	Use this setting for unused terminals or to use terminals in through mode. Also use this setting as the PLC contact output via MEMOBUS/Modbus or the communication option. This signal does not function if you do not configure signals from the PLC.
10	Alarm	The terminal activates when the drive detects a minor fault.
11	Fault Reset Command Active	The terminal activates when the drive receives the Reset command from the control circuit terminal, serial communications, or the communication option.
12	Timer Output	Use this setting when the drive uses the timer function as an output terminal.
13	Speed Agree 2	The terminal activates when the output frequency is in the range of the frequency reference ± *L4-04 [Speed Agree Detection Width (+/-)]*. **Note:** The detection function operates in the two motor rotation directions. ON : The output frequency is in the range of "frequency reference ± *L4-04*". OFF : The output frequency is not in the range of "frequency reference ± *L4-04*".
14	User-Set Speed Agree 2	The terminal activates when the output frequency is in the range of *L4-03 [Speed Agree Detection Level (+/-)]* ± *L4-04 [Speed Agree Detection Width (+/-)]* and in the range of the frequency reference ± *L4-04*. **Note:** The detection level set in *L4-03* is a signed value. The drive will only detect in one direction. ON : The output frequency is in the range of "*L4-03* ± *L4-04*" and the range of frequency reference ± *L4-04*. OFF : The output frequency is not in the range of "*L4-03* ± *L4-04*" or the range of frequency reference ± *L4-04*.
15	Frequency Detection 3	The terminal deactivates when the output frequency > "*L4-03 [Speed Agree Detection Level (+/-)]* + *L4-04 [Speed Agree Detection Width (+/-)]*". After the terminal deactivates, the terminal stays deactivated until the output frequency is at the value of *L4-03*. **Note:** The detection level set in *L4-03* is a signed value. The drive will only detect in one direction. ON : The output frequency < *L4-03*, or the output frequency ≤ *L4-03* + *L4-04*. OFF : The output frequency > "*L4-03* + *L4-04*".
16	Frequency Detection 4	The terminal activates when the output frequency > *L4-03 [Speed Agree Detection Level (+/-)]*. After the terminal activates, the terminal stays activated until the output frequency is at the value of "*L4-03* - *L4-04*". **Note:** The detection level set in *L4-03* is a signed value. The drive will only detect in one direction. ON : The output frequency > *L4-03*. OFF : The output frequency < "*L4-03* - *L4-04*", or the output frequency ≤ *L4-03*.
17	Torque Detection 1 (N.C.)	The terminal deactivates when the drive detects overtorque or undertorque. OFF : The output current/torque > *L6-02 [Torque Detection Level 1]*, or the output current/torque < *L6-02* for longer than the time set in *L6-03 [Torque Detection Time 1]*.
18	Torque Detection 2 (N.O.)	The terminal activates when the drive detects overtorque or undertorque. ON : The output current/torque > *L6-05 [Torque Detection Level 2]*, or the output current/torque < *L6-05* for longer than the time set in *L6-06 [Torque Detection Time 2]*.
19	Torque Detection 2 (N.C.)	The terminal deactivates when the drive detects overtorque or undertorque. OFF : The output current/torque > *L6-05 [Torque Detection Level 2]*, or the output current/torque < *L6-05* for longer than the time set in *L6-06 [Torque Detection Time 2]*.
1A	During Reverse	The terminal activates when the motor operates in the reverse direction. ON : The motor is operating in the reverse direction. OFF : The motor is operating in the forward direction or the motor stopped.
1B	During Baseblock (N.C.)	The terminal deactivates during baseblock. When the drive is in baseblock, the drive output transistor stops switching and does not make DC bus voltage. ON : The drive is not in baseblock. OFF : During baseblock
1C	Motor 2 Selection	The terminal activates when you select motor 2. ON : Motor 2 Selection OFF : Motor 1 Selection
1E	Executing Auto-Restart	The terminal activates when the Auto Restart function is trying to restart after a fault.
1F	Motor Overload Alarm (oL1)	The terminal activates when the electronic thermal protection value of the motor overload protective function is a minimum of 90% of the detection level.

Setting Value	Function	Description
20	Drive Overheat Pre-Alarm (oH)	The terminal activates when the drive heatsink temperature is at the level set with *L8-02 [Overheat Alarm Level]*.
21	Safety Monitor Output Status	The terminal activates (safety stop state) when the safety circuit and safety diagnosis circuit are operating correctly and when terminals H1-HC and H2-HC are OFF (Open). ON : Safety stop state OFF : Safety circuit fault or RUN/READY
2F	Maintenance Notification	The terminal activates when drive components are at their estimated maintenance period. Tells you about the maintenance period for these items: • IGBT • Cooling Fan • Capacitor • Soft charge bypass relay
30	During Torque Limit	The terminal activates when the torque reference is the torque limit set with *L7 parameters*, *H3-02 or H3-10 [MFAI Function Selection]*.
37	During Frequency Output	The terminal activates when the drive outputs frequency. ON : The drive outputs frequency. OFF : The drive does not output frequency.
38	Drive Enabled	This terminal activates when the *H1-xx = 6A [Drive Enable]* terminal activates.
39	Watt Hour Pulse Output	Outputs the pulse that shows the watt hours.
3A	Drive Overheat Alarm	The terminal activates when the drive heatsink temperature is at the *L8-02 [Overheat Alarm Level]* setting while *L8-03 = 4 [Overheat Pre-Alarm Selection = Operate at Reduced Speed (L8-19)]* and the drive is running.
3D	During Speed Search	The terminal activates when the drive is doing speed search.
42	Pressure Reached	The terminal activates when the drive is at the Pressure Setpoint.
4A	During KEB Ride-Thru	The terminal activates during KEB Ride-Thru.
4B	During Short Circuit Braking	The terminal activates during Short Circuit Braking. **Note:** When *A1-02 = 8 [Control Method Selection = EZOLV]*, this function is available only when you use a PM motor.
4C	During Fast Stop	The terminal activates when the fast stop is in operation.
4D	oH Pre-Alarm Reduction Limit	The terminal activates when *L8-03 = 4 [Overheat Pre-Alarm Selection = Operate at Reduced Speed (L8-19)]* and *oH [Heatsink Overheat]* does not clear after the drive decreases the frequency for 10 cycles.
51	Sequence Timer 1	The terminal activates when Sequence Timer 1 is active.
52	Sequence Timer 2	The terminal activates when Sequence Timer 2 is active.
53	Sequence Timer 3	The terminal activates when Sequence Timer 3 is active.
54	Sequence Timer 4	The terminal activates when Sequence Timer 4 is active.
58	UL6 Underload Detected	The terminal activates when the drive detected *UL6 [Underload or Belt Break Detected]*.
60	Internal Cooling Fan Failure	The terminal activates when the drive detects a cooling fan failure in the drive.
61	Pole Position Detection Complete	The terminal activates when drive receives a Run command and the drive detects the motor magnetic pole position of the PM motor.
62	Modbus Reg 1 Status Satisfied	The terminal activates when the bit specified by *H2-08 [Modbus Register 1 Bit Select]* for the MEMOBUS register address set with *H2-07 [Modbus Register 1 Address Select]* activates.
63	Modbus Reg 2 Status Satisfied	The terminal activates when the bit specified by *H2-10 [Modbus Register 2 Bit Select]* for the MEMOBUS register address set with *H2-09 [Modbus Register 2 Address Select]* activates.
69	External Power 24V Supply	The terminal activates when there is an external 24V power supply between terminals PS-AC. ON : An external 24V power supply supplies power. OFF : An external 24V power supply does not supply power.
6A	Data Logger Error	The terminal activates when the drive detects a *LoG [Com Error / Abnormal SD card]*.
71	Low PI2 Control Feedback Level	The terminal activates when the PI2 Control Feedback Level is less than *S3-13 [PI2 Control Low Feedback Lvl]*.
72	High PI2 Control Feedback Level	The terminal activates when the PI2 Control Feedback Level is more than *S3-15 [PI2 Control High Feedback Lvl]*.
89	Output Current Lim	The terminal activates when the output current limit is limiting the drive output speed.
90	DWEZ Digital Outputs 1	Sets the digital output 1 to use in DriveWorksEZ. Refer to the DriveWorksEZ online manual for more information.
91	DWEZ Digital Outputs 2	Sets the digital output 2 to use in DriveWorksEZ. Refer to the DriveWorksEZ online manual for more information.
92	DWEZ Digital Outputs 3	Sets the digital output 3 to use in DriveWorksEZ. Refer to the DriveWorksEZ online manual for more information.

Setting Value	Function	Description
94	Loss of Prime	The terminal activates when the drive is in an *LOP [Loss of Prime]* condition.
95	Thermostat Fault	The terminal activates when the terminal set for *H1-xx = 88 [MFDI Function Selection = Thermostat Fault]* is active.
96	High Feedback	The terminal activates when the drive is in a High Feedback Condition as specified by *Y1-11 [High Feedback Level]* and *Y1-12 [High Feedback Lvl Fault Dly Time]* and when the drive detects an *HFB [High Feedback Sensed]* fault or an *HIFB [High Feedback Sensed]* alarm.
97	Low Feedback	The terminal activates when the drive is in a Low Feedback Condition as specified by *Y1-08 [Low Feedback Level]* and *Y1-09 [Low Feedback Lvl Fault Dly Time]* and when the drive detects an *LFB [Low Feedback Sensed]* fault or an *LOFB [High Feedback Sensed]* alarm.
9E	Low PI Auxiliary Control Level	The terminal activates when the PI Aux Feedback Level is less than *YF-09 [PI Aux Control Low Level Detect]* or if the drive detects an *LOAUX [Low PI Aux Feedback Level]* fault.
9F	High PI Auxiliary Control Level	The terminal activates when the PI Aux Feedback Level is more than *YF-12 [PI Aux Control High Level Detect]* or if the drive detects an *HIAUX [High PI Aux Feedback Level]* fault.
A9	RELAY Operator Control	The terminal changes to OFF or ON when you push the RELAY (F3) button. When the terminal is ON, push F3 to turn it OFF. When the terminal is OFF, push F3 to turn in ON.
AA	Utility Delay	The terminal activates when the drive is stopped and is waiting for the timer set in *Y4-17 [Utility Start Delay]* to expire.
AB	Thrust Mode	The terminal activates when the output frequency is between 0.0 Hz and the value set in *Y4-12 [Thrust Frequency]* and the Thrust Bearing function is active.
AC	Setpoint Not Maintained	The terminal activates when the drive detects *NMS [Setpoint Not Met]* condition.
B2	BAS Interlock	The terminal activates when the Run command is active or the drive is outputting the voltage. The drive will use this as an actuation signal for an external damper.
B8	Pump Fault	The terminal activates when one of these faults is active: *LFB [Low Feedback Sensed]*, *HFB [High Feedback Sensed]*, *NMS [Setpoint Not Met]*, or *EFx [External Fault (Terminal Sx)]*.
B9	Transducer Loss	The terminal activates when the current into the analog input associated with PID feedback is more than 21 mA or less than 3 mA, or an *FDBKL [WIRE Break]* Fault or an *FDBKL [Feedback Loss Wire Break]* Alarm is active.
BA	PI Auxiliary Control Active	The terminal activates when the PI Auxiliary Controller has an effect on the output speed.
BB	Differential Feedback Exceeded	The terminal activates when the difference between the PID Feedback and the value from the terminal set for *H3-xx = 2D [Differential Feedback]* is more than *Y4-18 [Differential Level]* for the time set in *Y4-19 [Differential Lvl Detection Time]*.
BC	Sleep Active	The terminal activates when the Sleep function is active and the drive is not operating. **Note:** The terminal will not activate for Sleep Boost function.
BD	Start Delay	The terminal activates when the Feedback is more than the start level or the Feedback is less than the Inverse PID and the start timer is timing. **Note:** You must set *Y1-04 [Sleep Wake-up Level]* $\neq 0$ and *Y1-05 [Sleep Wake-up Level Delay Time]* $\neq 0$ to use this function.
BE	Pre-Charge	The terminal activates when the drive is in Pre-Charge Mode.
C0	HAND Mode	The terminal activates when the drive is in HAND Mode operation.
C1	AUTO Mode	The terminal activates when the drive is in AUTO Mode operation.
C2	OFF Mode	The terminal activates when the drive is in OFF Mode operation.
C3	Main Feedback Lost	The terminal activates when the drive loses the main PID feedback.
C4	Backup Feedback Lost	The terminal activates when the drive loses the backup PID feedback.
100	!During Run	The terminal deactivates when you input a Run command and when the drive is outputting voltage. ON : Drive is stopping OFF : Drive is running
101	!Zero Speed	The terminal deactivates when the output frequency < *E1-09 [Minimum Output Frequency]*. **Note:** Parameter *E1-09* is the reference in all control methods. ON : Output frequency ≥ value of *E1-09*. OFF : Output frequency < value of *E1-09*.
102	!Speed Agree 1	The terminal deactivates when the output frequency is in the range of the frequency reference ± *L4-02 [Speed Agree Detection Width]*. **Note:** The detection function operates in the two motor rotation directions. ON : The output frequency does not align with the frequency reference although the drive is running. OFF : The output frequency is in the range of "frequency reference ± *L4-02*".

Setting Value	Function	Description
103	!User-Set Speed Agree 1	The terminal deactivates when the output frequency is in the range of *L4-01 [Speed Agree Detection Level]* ± *L4-02 [Speed Agree Detection Width]* and in the range of the frequency reference ± *L4-02*. **Note:** The detection function operates in the two motor rotation directions. The drive uses the *L4-01* value as the forward/reverse detection level. ON : The output frequency is not in the range of "*L4-01* ± *L4-02*" or the range of frequency reference ± *L4-02*. OFF : The output frequency is in the range of "*L4-01* ± *L4-02*" and the range of frequency reference ± *L4-02*.
104	!Frequency Detection 1	The terminal activates when the output frequency > "*L4-01 [Speed Agree Detection Level]* + *L4-02 [Speed Agree Detection Width]*". After the terminal activates, the terminal stays activated until the output frequency is at the value of *L4-01*. **Note:** The detection function operates in the two motor rotation directions. The drive uses the *L4-01* value as the forward/reverse detection level. ON : The output frequency > "*L4-01* + *L4-02*". OFF : The output frequency < *L4-01*, or the output frequency ≤ "*L4-01* + *L4-02*"
105	!Frequency Detection 2	The terminal deactivates when the output frequency > *L4-01 [Speed Agree Detection Level]*. After the terminal deactivates, the terminal stays deactivated until the output frequency is at the value of "*L4-01* - *L4-02 [Speed Agree Detection Width]*". **Note:** The detection function operates in the two motor rotation directions. The drive uses the *L4-01* value as the forward/reverse detection level. ON : The output frequency < "*L4-01* - *L4-02*", or the output frequency ≤ *L4-01* OFF : The output frequency > *L4-01*
106	!Drive Ready	The terminal deactivates when the drive is ready and running.
107	!DC Bus Undervoltage	The terminal deactivates when the DC bus voltage or control circuit power supply is at the voltage set in *L2-05 [Undervoltage Detection Lvl (Uv1)]* or less. The terminal also deactivates when there is a fault with the DC bus voltage. ON : The DC bus voltage > *L2-05* OFF : The DC bus voltage ≤ *L2-05*
108	!During Baseblock (N.O.)	The terminal deactivates during baseblock. When the drive is in baseblock, the drive output transistor stops switching and does not make DC bus voltage. ON : The drive is not in baseblock. OFF : During baseblock.
109	!Frequency Reference from Keypad	Shows the selected frequency reference source. ON : Parameter *b1-01 [Frequency Reference Selection 1]* is the frequency reference source. OFF : The keypad is the frequency reference source.
10B	!Torque Detection 1 (N.O.)	The terminal deactivates when the drive detects overtorque or undertorque. OFF : The output current/torque > *L6-02 [Torque Detection Level 1]*, or < *L6-02* for longer than the time set with *L6-03 [Torque Detection Time 1]*.
10C	!Frequency Reference Loss	The terminal deactivates when the drive detects a loss of frequency reference.
10E	!Fault	The terminal deactivates when the drive detects a fault. **Note:** The terminal will not deactivate for *CPF00* and *CPF01 [Control Circuit Error]* faults.
110	!Alarm	The terminal deactivates when the drive detects a minor fault.
111	!Fault Reset Command Active	The terminal deactivates when the drive receives the Reset command from the control circuit terminal, serial communications, or the communication option.
112	!Timer Output	Use this setting when the drive uses the timer function as an output terminal.
113	!Speed Agree 2	The terminal deactivates when the output frequency is in the range of the frequency reference ± *L4-04 [Speed Agree Detection Width (+/-)]*. **Note:** The detection function operates in the two motor rotation directions. ON : The output frequency is not in the range of "frequency reference ± *L4-04*". OFF : The output frequency is in the range of "frequency reference ± *L4-04*".
114	!User-Set Speed Agree 2	The terminal deactivates when the output frequency is in the range of *L4-03 [Speed Agree Detection Level (+/-)]* ± *L4-04 [Speed Agree Detection Width (+/-)]* and in the range of the frequency reference ± *L4-04*. **Note:** The detection level set in *L4-03* is a signed value. The drive will only detect in one direction. ON : The output frequency is not in the range of "*L4-03* ± *L4-04*" or the range of frequency reference ± *L4-04*. OFF : The output frequency is in the range of "*L4-03* ± *L4-04*" and the range of frequency reference ± *L4-04*.
115	!Frequency Detection 3	The terminal activates when the output frequency > "*L4-03 [Speed Agree Detection Level (+/-)]* + *L4-04 [Speed Agree Detection Width (+/-)]*". After the terminal activates, the terminal stays activated until the output frequency is at the value of *L4-03*. **Note:** The detection level set in *L4-03* is a signed value. The drive will only detect in one direction. ON : The output frequency > "*L4-03* + *L4-04*" OFF : The output frequency < *L4-03*, or the output frequency ≤ "*L4-03* + *L4-04*"

Setting Value	Function	Description
116	!Frequency Detection 4	The terminal deactivates when the output frequency > *L4-03 [Speed Agree Detection Level (+/-)]*. After the terminal deactivates, the terminal stays deactivated until the output frequency is at the value of "*L4-03 - L4-04*". **Note:** The detection level set in *L4-03* is a signed value. The drive will only detect in one direction. ON : The output frequency < "*L4-03 - L4-04*", or the output frequency ≤ *L4-03* OFF : The output frequency > *L4-03*
117	!Torque Detection 1 (N.C.)	The terminal activates when the drive detects overtorque or undertorque. ON : The output current/torque > *L6-02 [Torque Detection Level 1]*, or the output current/torque < *L6-02* for longer than the time set in *L6-03 [Torque Detection Time 1]*.
118	!Torque Detection 2 (N.O.)	The terminal deactivates when the drive detects overtorque or undertorque. OFF : The output current/torque > *L6-05 [Torque Detection Level 2]*, or the output current/torque < *L6-05* for longer than the time set in *L6-06 [Torque Detection Time 2]*.
119	!Torque Detection 2 (N.C.)	The terminal activates when the drive detects overtorque or undertorque. ON : The output current/torque > *L6-05 [Torque Detection Level 2]*, or the output current/torque < *L6-05* for longer than the time set in *L6-06 [Torque Detection Time 2]*.
11A	!During Reverse	The terminal deactivates when the motor operates in the reverse direction. ON : The motor is operating in the forward direction or the motor stopped. OFF : The motor is operating in the reverse direction.
11B	!During Baseblock (N.C.)	The terminal activates during baseblock. When the drive is in baseblock, the drive output transistor stops switching and does not make DC bus voltage. ON : During baseblock. OFF : The drive is not in baseblock.
11C	!Motor 2 Selected	The terminal deactivates when motor 2 is selected. ON : Motor 1 Selection OFF : Motor 2 Selection
11E	!Executing Auto-Restart	The terminal deactivates when the Auto Restart function is trying to restart after a fault.
11F	!Motor Overload Alarm (oL1)	The terminal deactivates when the electronic thermal protection value of the motor overload protective function is a minimum of 90% of the detection level.
120	!Drive Overheat Pre-Alarm (oH)	The terminal deactivates when the drive heatsink temperature is at the level set with *L8-02 [Overheat Alarm Level]*.
121	!Safe Torque OFF	The terminal deactivates (safety stop state) when the safety circuit and safety diagnosis circuit are operating correctly and when terminals H1-HC and H2-HC are OFF (Open). ON : Safety circuit fault or RUN/READY OFF : Safety stop state
12F	!Maintenance Notification	The terminal deactivates when drive components are at their estimated maintenance period. Tells the user about the maintenance period for these items: • IGBT • Cooling fan • Capacitor • Soft charge bypass relay
130	!During Torque Limit	The terminal deactivates when the torque reference is the torque limit set with *L7 parameters*, *H3-02, or H3-10 [MFAI Function Selection]*.
137	!During Frequency Output	The terminal deactivates when the drive outputs frequency. ON : The drive does not output frequency. OFF : The drive outputs frequency.
138	!Drive Enabled	This terminal deactivates when the *H1-xx = 6A [Drive Enable]* terminal deactivates.
139	!Watt Hour Pulse Output	Outputs the pulse that shows the watt hours.
13A	!Drive Overheat Alarm	The terminal deactivates when the drive heatsink temperature is at the *L8-02 [Overheat Alarm Level]* setting while *L8-03 = 4 [Overheat Pre-Alarm Selection = Operate at Reduced Speed (L8-19)]* and the drive is running.
13D	!During Speed Search	The terminal deactivates when the drive is doing speed search.
142	!Pressure Reached	The terminal deactivates when the drive is at the Pressure Setpoint.
14A	!During KEB Ride-Thru	The terminal deactivates during KEB Ride-Thru.
14B	!During Short Circuit Braking	The terminal deactivates during Short Circuit Braking. **Note:** When *A1-02 = 8 [Control Method Selection = EZOLV]*, this function is available only when you use a PM motor.
14C	!During Fast Stop	The terminal deactivates when the fast stop is in operation.
14D	!oH Pre-Alarm Reduction Limit	The terminal deactivates when *L8-03 = 4 [Overheat Pre-Alarm Selection = Operate at Reduced Speed (L8-19)]* and *oH [Heatsink Overheat]* does not clear after the drive decreases the frequency for 10 cycles.
151	!Sequence Timer 1	The terminal deactivates when Sequence Timer 1 is active.

Setting Value	Function	Description
152	!Sequence Timer 2	The terminal deactivates when Sequence Timer 2 is active.
153	!Sequence Timer 3	The terminal deactivates when Sequence Timer 3 is active.
154	!Sequence Timer 4	The terminal deactivates when Sequence Timer 4 is active.
158	!UL6 Underload Detected	The terminal deactivates when the drive detected *UL6 [Underload or Belt Break Detected]*.
160	!Internal Cooling Fan Failure	The terminal deactivates when the drive detects a cooling fan failure in the drive.
161	!Pole Position Detection Complete	The terminal deactivates when drive receives a Run command and the drive detects the motor magnetic pole position of the PM motor.
162	!Modbus Reg 1 Status Satisfied	The terminal deactivates when the bit specified by *H2-08 [Modbus Register 1 Bit Select]* for the MEMOBUS register address set with *H2-07 [Modbus Register 1 Address Select]* activates.
163	!Modbus Reg 2 Status Satisfied	The terminal deactivates when the bit specified by *H2-10 [Modbus Register 2 Bit Select]* for the MEMOBUS register address set with *H2-09 [Modbus Register 2 Address Select]* activates.
169	!External Power 24V Supply	The terminal deactivates when there is an external 24V power supply between terminals PS-AC. ON : An external 24V power supply does not supply power. OFF : An external 24V power supply supplies power.
16A	!Data Logger Error	The terminal deactivates when the drive detects *LoG [Com Error / Abnormal SD card]*.
171	!Low PI2 Control Feedback Level	The terminal deactivates when the PI2 Control Feedback Level is less than *S3-13 [PI2 Control Low Feedback Lvl]*.
172	!High PI2 Control Feedback Level	The terminal deactivates when the PI2 Control Feedback Level is more than *S3-15 [PI2 Control High Feedback Lvl]*.
189	!Output Current Lim	The terminal deactivates when the output current limit is limiting the drive output speed.
190	!DWEZ Digital Outputs 1	Sets the digital output 1 to use in DriveWorksEZ. Refer to the DriveWorksEZ online manual for more information.
191	!DWEZ Digital Outputs 2	Sets the digital output 2 to use in DriveWorksEZ. Refer to the DriveWorksEZ online manual for more information.
192	!DWEZ Digital Outputs 3	Sets the digital output 3 to use in DriveWorksEZ. Refer to the DriveWorksEZ online manual for more information.
194	!Loss of Prime	The terminal deactivates when the drive is in an *LOP [Loss of Prime]* condition.
195	!Thermostat Fault	The terminal deactivates when the terminal set for *H1-xx = 88 [MFDI Function Selection = Thermostat Fault]* is active.
196	!High Feedback	The terminal deactivates when the drive is in a High Feedback Condition as specified by *Y1-11 [High Feedback Level]* and *Y1-12 [High Feedback Lvl Fault Dly Time]* and when the drive detects an *HFB [High Feedback Sensed]* fault or an *HIFB [High Feedback Sensed]* alarm.
197	!Low Feedback	The terminal deactivates when the drive is in a Low Feedback Condition as specified by *Y1-08 [Low Feedback Level]* and *Y1-09 [Low Feedback Lvl Fault Dly Time]* and when the drive detects an *LFB [Low Feedback Sensed]* fault or an *LOFB [High Feedback Sensed]* alarm.
19E	!Low PI Auxiliary Control Level	The terminal deactivates when the PI Aux Feedback Level is less than *YF-09 [PI Aux Control Low Level Detect]* or if the drive detects an *LOAUX [Low PI Aux Feedback Level]* fault.
19F	!High PI Auxiliary Control Level	The terminal deactivates when the PI Aux Feedback Level is more than *YF-12 [PI Aux Control High Level Detect]* or if the drive detects an *HIAUX [High PI Aux Feedback Level]* fault.
1A9	!RELAY Operator Control	The terminal changes to OFF or ON when you push the RELAY (F3) button. When the terminal is ON, push F3 to turn it OFF. When the terminal is OFF, push F3 to turn in ON.
1AA	!Utility Delay	The terminal deactivates when the drive is stopped and is waiting for the timer set in *Y4-17 [Utility Start Delay]* to expire.
1AB	!Thrust Mode	The terminal deactivates when the output frequency is between 0.0 Hz and the value set in *Y4-12 [Thrust Frequency]* and the Thrust Bearing function is active.
1AC	!Setpoint Not Maintained	The terminal deactivates when the drive detects *NMS [Setpoint Not Met]* condition.
1B2	!BAS Interlock	The terminal deactivates when the Run command is active or the drive is outputting the voltage. The drive will use this as an actuation signal for an external damper.
1B8	!Pump Fault	The terminal deactivates when one of these faults is active: *LFB [Low Feedback Sensed]*, *HFB [High Feedback Sensed]*, *NMS [Setpoint Not Met]*, or *EFx [External Fault (Terminal Sx)]*.
1B9	!Transducer Loss	The terminal deactivates when the current into the analog input associated with PID feedback is more than 21 mA or less than 3 mA, or an *FDBKL [WIRE Break]* Fault or an *FDBKL [Feedback Loss Wire Break]* Alarm is active.
1BA	!PI Auxiliary Control Active	The terminal deactivates when the PI Auxiliary Controller has an effect on the output speed.
1BB	!Differential Feedback Exceeded	The terminal deactivates when the difference between the PID Feedback and the value from the terminal set for *H3-xx = 2D [Differential Feedback]* is more than *Y4-18 [Differential Level]* for the time set in *Y4-19 [Differential Lvl Detection Time]*.
1BC	!Sleep Active	The terminal deactivates when the Sleep function is active and the drive is not operating. **Note:** The terminal will not deactivate for Sleep Boost function.

Setting Value	Function	Description
1BD	!Start Delay	The terminal deactivates when the Feedback is more than the start level or the Feedback is less than the Inverse PID and the start timer is timing. **Note:** You must set *Y1-04 [Sleep Wake-up Level]* ≠ *0* and *Y1-05 [Sleep Wake-up Level Delay Time]* ≠ *0* to use this function.
1BE	!Pre-Charge	The terminal deactivates when the drive is in Pre-Charge Mode.
1C0	!HAND Mode	The terminal deactivates when the drive is in HAND Mode operation.
1C1	!AUTO Mode	The terminal deactivates when the drive is in AUTO Mode operation.
1C2	!OFF Mode	The terminal deactivates when the drive is in OFF Mode operation.
1C3	!Main Feedback Lost	The terminal deactivates when the drive loses the main PID feedback.
1C4	!Backup Feedback Lost	The terminal deactivates when the drive loses the backup PID feedback.

◆ H3: Analog Inputs

No. (Hex.)	Name	Description	Default (Range)
H3-01 (0410)	Terminal A1 Signal Level Select	Sets the input signal level for MFAI terminal A1. 0 : 0 to 10V (Lower Limit at 0) 2 : 4 to 20 mA 3 : 0 to 20 mA	0 (0 - 3)
H3-02 (0434)	Terminal A1 Function Selection	Sets the function for MFAI terminal A1.	0 (0 - 31)
H3-03 (0411) RUN	Terminal A1 Gain Setting	Sets the gain of the analog signal input to MFAI terminal A1.	100.0% (-999.9 - +999.9%)
H3-04 (0412) RUN	Terminal A1 Bias Setting	Sets the bias of the analog signal input to MFAI terminal A1.	0.0% (-999.9 - +999.9%)
H3-09 (0417)	Terminal A2 Signal Level Select	Sets the input signal level for MFAI terminal A2. 0 : 0-10V (LowLim=0) 2 : 4 to 20 mA 3 : 0 to 20 mA	2 (0 - 3)
H3-10 (0418)	Terminal A2 Function Selection	Sets the function for MFAI terminal A2. **Note:** The default setting for *H3-10* changes when *b5-01 [PID Mode Setting]* changes: • *b5-01 = 0 [Disabled]*: 0 • *b5-01* ≠ *0*: B	Determined by b5-01 (0 - 31)
H3-11 (0419) RUN	Terminal A2 Gain Setting	Sets the gain of the analog signal input to MFAI terminal A2.	100.0% (-999.9 - +999.9%)
H3-12 (041A) RUN	Terminal A2 Bias Setting	Sets the bias of the analog signal input to MFAI terminal A2.	0.0% (-999.9 - +999.9%)
H3-13 (041B)	Analog Input FilterTime Constant	Sets the time constant for primary delay filters on MFAI terminals.	0.03 s (0.00 - 2.00 s)
H3-14 (041C)	Analog Input Terminal Enable Sel	Sets which terminal or terminals to enable when *H1-xx = C [MFDI Function Selection = Analog Terminal Enable Selection]* is activated. 1 : Terminal A1 only 2 : Terminal A2 only 3 : Terminals A1 and A2	2 (1 - 3)
H3-16 (02F0)	Terminal A1 Offset	Sets the offset level for analog signals input to terminal A1. Usually it is not necessary to change this setting.	0 (-500 - +500)
H3-17 (02F1)	Terminal A2 Offset	Sets the offset level for analog signals input to terminal A2. Usually it is not necessary to change this setting.	0 (-500 - +500)
H3-40 (0B5C)	Mbus Reg 15C1h Input Function	Sets the MEMOBUS AI1 function.	F (4 - 2E)
H3-41 (0B5F)	Mbus Reg 15C2h Input Function	Sets the MEMOBUS AI2 function.	F (4 - 2E)

No. (Hex.)	Name	Description	Default (Range)
H3-42 (0B62)	Mbus Reg 15C3h Input Function	Sets the MEMOBUS AI3 function.	F (4 - 2E)
H3-43 (117F)	Mbus Reg Inputs FilterTime Const	Sets the time constant to apply a primary delay filter to the MEMOBUS analog input register values.	0.00 s (0.00 - 2.00 s)

■ H3-xx: MFAI Setting Values

Setting Value	Function	Description
0	Frequency Reference	The input value from the MFAI terminal set with this function becomes the master frequency reference.
1	Frequency Gain	The drive multiplies the analog frequency reference with the input value from the MFAI set with this function.
2	Auxiliary Frequency Reference 1	Sets Reference 2 through multi-step speed reference to enable the command reference (Auxiliary Frequency Reference 1) from the analog input terminal set here. This value is a percentage where the Maximum Output Frequency setting is a setting value of 100%. **Note:** Parameter *A1-02 [Control Method Selection]* selects which parameter is the maximum output frequency. • *A1-02 ≠ 8 [EZOLV]*: *E1-04 [Maximum Output Frequency]* • *A1-02 = 8*: *E9-02 [Maximum Speed]*
3	Auxiliary Frequency Reference 2	Sets Reference 3 through multi-step speed reference to enable the command reference (Auxiliary Frequency Reference 2) from the analog input terminal set here. This value is a percentage where the Maximum Output Frequency setting is a setting value of 100%. **Note:** Parameter *A1-02 [Control Method Selection]* selects which parameter is the maximum output frequency. • *A1-02 ≠ 8 [EZOLV]*: *E1-04 [Maximum Output Frequency]* • *A1-02 = 8*: *E9-02 [Maximum Speed]*
4	Output Voltage Bias	Set this parameter to input a bias signal and amplify the output voltage.
5	Accel/Decel Time Gain	Enters a signal to adjust the gain used for *C1-01 to C1-04 [Acceleration/Deceleration Times 1 and 2]* and *C1-09 [Fast Stop Time]* when the full scale analog signal (10 V or 20 mA) is 100%.
6	DC Injection Braking Current	Enters a signal to adjust the current level used for DC Injection Braking when the drive rated output current is 100%.
7	Torque Detection Level	Enters a signal to adjust the overtorque/undertorque detection level. **Note:** Use this function with *L6-01 [Torque Detection Selection 1]*. This parameter functions as an alternative to *L6-02 [Torque Detection Level 1]*.
8	Stall Prevent Level During Run	Enters a signal to adjust the stall prevention level during run if the drive rated current is 100%.
9	Output Frequency Lower Limit	Enters a signal to adjust the output frequency lower limit level as a percentage of the maximum output frequency. **Note:** Parameter *A1-02 [Control Method Selection]* selects which parameter is the maximum output frequency. • *A1-02 ≠ 8 [EZOLV]*: *E1-04 [Maximum Output Frequency]* • *A1-02 = 8*: *E9-02 [Maximum Speed]*
B	PID Feedback	Enter the PID feedback value as a percentage of the maximum output frequency. **Note:** Parameter *A1-02 [Control Method Selection]* selects which parameter is the maximum output frequency. • *A1-02 ≠ 8 [EZOLV]*: *E1-04 [Maximum Output Frequency]* • *A1-02 = 8*: *E9-02 [Maximum Speed]*
C	PID Setpoint	Enters the PID setpoint as a percentage of the maximum output frequency. **Note:** Parameter *A1-02 [Control Method Selection]* selects which parameter is the maximum output frequency. • *A1-02 ≠ 8 [EZOLV]*: *E1-04 [Maximum Output Frequency]* • *A1-02 = 8*: *E9-02 [Maximum Speed]*
D	Frequency Bias	Enters the bias value added to the frequency reference as a percentage of the maximum output frequency. **Note:** Parameter *A1-02 [Control Method Selection]* selects which parameter is the maximum output frequency. • *A1-02 ≠ 8 [EZOLV]*: *E1-04 [Maximum Output Frequency]* • *A1-02 = 8*: *E9-02 [Maximum Speed]*
E	Motor Temperature (PTC Input)	Uses the motor Positive Temperature Coefficient (PTC) thermistor to prevent heat damage to the motor as a percentage of the current value when the 10 V analog signal is input.
F	Not Used	Use this setting for unused terminals or to use terminals in through mode.
10	Forward Torque Limit	Enters the forward torque limit when the motor rated torque is 100%.
11	Reverse Torque Limit	Enters the load torque limit if the motor rated torque is 100%.
12	Regenerative Torque Limit	Enters the regenerative torque limit if the motor rated torque is 100%.

Setting Value	Function	Description
15	General Torque Limit	Enters the torque limit that is the same for all quadrants for forward, reverse, and regenerative operation if the motor rated torque is 100%.
16	Differential PID Feedback	Enters the PID differential feedback value if the full scale analog signal (10 V or 20 mA) is 100%.
1F	Not Used	Use this setting for unused terminals or to use terminals in through mode.
24	PID Feedback Backup	Enters the PID Feedback Backup signal for the drive to use when it loses the primary PID feedback set for *H3-xx = B [PID Feedback]*. **Note:** The full-scale of the analog signal goes from *b5-71 [Min PID Transducer Scaling]* to *b5-38 [PID User Unit Display Scaling]*.
25	PI2 Control Setpoint	Enters the PI2 Control setpoint level as a percentage of the *S3-02 [PI2 Control Transducer Scale]* value. **Note:** Parameters *S3-03 [PI2 Control Decimal Place Pos]* and *S3-04 [PI2 Control Unit Selection]* set the resolution and unit.
26	PI2 Control Feedback	Enters the PI2 Control feedback level as a percentage of the *S3-02 [PI2 Control Transducer Scale]* value. **Note:** Parameters *S3-03 [PI2 Control Decimal Place Pos]* and *S3-04 [PI2 Control Unit Selection]* set the resolution and unit.
27	PI Auxiliary Control Feedback	Enters the PI Auxiliary Control feedback value when *YF-01 = 1 [PI Aux Control Selection = Enabled]*. **Note:** • The full-scale of the analog signal goes from 0% to *YF-02 [PI Aux Control Transducer Scale]*. • Parameter *YF-22 [PI Aux Level Decimal Place Pos]* sets the resolution.
2B	Emergency Override PID Feedback	This input is the PID Feedback source when Emergency Override is running in PID mode (*S6-02 = 2 or 3 [Emergency Override Ref Selection = System PID Mode or Independent PID Mode]*). **Note:** • When *S6-02 = 2 [Emergency Override Ref Selection = System PID Mode]*, the full-scale of the analog signal goes from *b5-71 [Min PID Transducer Scaling]* to *b5-38 [PID User Unit Display Scaling]*. • When *S6-02 = 3 [Independent PID Mode]*, the full-scale of the analog signal goes from *b5-71* to *S6-03 [EMOVR Independent PID Scale]*. • When you set MEMOBUS register 3A93h bit 4, register 3A95h becomes the Emergency Override Feedback source.
2C	Emergency Override PID Setpoint	This input is the PID Setpoint source when Emergency Override is running in PID mode (*S6-02 = 2 or 3 [Emergency Override Ref Selection = System PID Mode or Independent PID Mode]*). **Note:** • When *S6-02 = 2 [Emergency Override Ref Selection = System PID Mode]*, the full-scale of the analog signal goes from *b5-71 [Min PID Transducer Scaling]* to *b5-38 [PID User Unit Display Scaling]*. • When *S6-02 = 3 [Independent PID Mode]*, the full-scale of the analog signal goes from *b5-71* to *S6-03 [EMOVR Independent PID Scale]*. • When you set MEMOBUS register 3A93h bit 5, register 3A96h becomes the Emergency Override Setpoint source.
2D	Differential Level Source	Enters a feedback value to calculate the Differential Level between the *Differential Level Source* feedback and the primary *PID Feedback [H3-xx = B]*. **Note:** The full-scale of the analog signal goes from *b5-71 [Min PID Transducer Scaling]* to *b5-38 [PID User Unit Display Scaling]*.
2E	HAND Frequency Ref or Setpoint	Enters the *S5-05 [HAND Frequency Reference]* value or the *S5-06 [HAND Setpoint]* value. When *S5-01 = 0 [HAND Frequency Reference Source = HAND Analog Input]* and *S5-03 = 0 [HAND Mode PI Selection = Disabled]*, the drive enters HAND Frequency Reference. When *b5-01 ≠ 0*, *S5-01 = 0*, and *S5-03 = 1 [Enabled]*, the drive enters HAND Setpoint. **Note:** • When PID is enabled, the full-scale of the analog signal goes from *b5-71 [Min PID Transducer Scaling]* to *b5-38 [PID User Unit Display Scaling]*. • When PID is disabled, the drive enters this analog signal as the percentage of the *E1-04 [Maximum Output Frequency]* value.
30	DWEZ Analog Input 1	Use with DriveWorksEZ. Refer to the DriveWorksEZ online manual for more information.
31	DWEZ Analog Input 2	Use with DriveWorksEZ. Refer to the DriveWorksEZ online manual for more information.

◆ H4: Analog Outputs

No. (Hex.)	Name	Description	Default (Range)
H4-01 (041D)	Terminal FM Analog Output Select	Sets the monitor number to send from MFAO terminal FM. Set the *x-xx* part of the *Ux-xx [Monitor]*. For example, set *H4-01 = 102* to monitor *U1-02 [Output Frequency]*.	102 (000 - 999)
H4-02 (041E) RUN	Terminal FM Analog Output Gain	Sets the gain of the monitor signal that is sent from MFAO terminal FM. Sets the analog signal output level from the terminal FM at 10 V or 20 mA as 100% when an output for monitoring items is 100%.	100.0% (-999.9 - +999.9%)
H4-03 (041F) RUN	Terminal FM Analog Output Bias	Sets the bias of the monitor signal that is sent from MFAO terminal FM. Set the level of the analog signal sent from terminal FM at 10 V or 20 mA as 100% when an output for monitoring items is 0%.	0.0% (-999.9 - +999.9%)

No. (Hex.)	Name	Description	Default (Range)
H4-04 (0420)	Terminal AM Analog Output Select	Sets the monitoring number to be output from the MFAO terminal AM. Set the *x-xx* part of the *Ux-xx [Monitor]*. For example, set *H4-04 = 103* to monitor *U1-03 [Output Current]*.	103 (000 - 999)
H4-05 (0421) RUN	Terminal AM Analog Output Gain	Sets the gain of the monitor signal that is sent from MFAO terminal AM. When an output for monitoring items is 0%, this parameter sets the analog signal output level from the AM terminal at 10 V or 20 mA as 100%.	50.0% (-999.9 - +999.9%)
H4-06 (0422) RUN	Terminal AM Analog Output Bias	Sets the bias of the monitor signal that is sent from MFAO terminal AM. When an output for monitoring items is 0%, this parameter sets the analog signal output level from the AM terminal at 10 V or 20 mA as 0%.	0.0% (-999.9 - +999.9%)
H4-07 (0423)	Terminal FM Signal Level Select	Sets the MFAO terminal FM output signal level. **Note:** Set jumper S5 on the control circuit terminal block accordingly when you change this parameter. 0 : 0 to 10 Vdc 2 : 4 to 20 mA	0 (0, 2)
H4-08 (0424)	Terminal AM Signal Level Select	Sets the MFAO terminal AM output signal level. **Note:** Set jumper S5 on the control circuit terminal block accordingly when you change this parameter. 0 : 0 to 10 Vdc 2 : 4 to 20 mA	0 (0, 2)
H4-20 (0B53)	Analog Power Monitor 100% Level	Sets the level at 10 V when you set *U1-08 [Output Power]* for analog output.	0.00 kW (0.00 - 650.00 kW)

◆ H5: Serial Communication

No. (Hex.)	Name	Description	Default (Range)
H5-01 (0425)	Drive Node Address	Sets the communication slave address for drives. **Note:** • Restart the drive after you change the parameter setting. • Setting 0 will not let the drive respond to MEMOBUS/Modbus communications. • When *Y1-01 = 3 [Multiplex Mode = Memobus Network]*, the setting range changes when the *Y9-25 [Highest Node Address]* setting changes.	1FH (0 - FFH)
H5-02 (0426)	Communication Speed Selection	Sets the communications speed for MEMOBUS/Modbus communications. **Note:** Re-energize the drive or set *H5-20 = 1 [Communication Parameters Reload = Reload Now]* after you change the parameter setting. 0 : 1200 bps 1 : 2400 bps 2 : 4800 bps 3 : 9600 bps 4 : 19.2 kbps 5 : 38.4 kbps 6 : 57.6 kbps 7 : 76.8 kbps 8 : 115.2 kbps	3 (0 - 8)
H5-03 (0427)	Communication Parity Selection	Sets the communications parity used for MEMOBUS/Modbus communications. **Note:** Re-energize the drive or set *H5-20 = 1 [Communication Parameters Reload = Reload Now]* after you change the parameter setting. 0 : No parity 1 : Even parity 2 : Odd parity	0 (0 - 2)
H5-04 (0428)	Communication Error Stop Method	Sets the motor Stopping Method when the drive detects a Modbus Communication Error condition. 0 : Ramp to Stop 1 : Coast to Stop 2 : Fast Stop (Use C1-09) 3 : Alarm Only 4 : Run at H5-34 (CE Go-To-Freq)	3 (0 - 4)
H5-05 (0429)	Comm Fault Detection Selection	Sets the function that detects *CE [Modbus Communication Error]* issues during MEMOBUS/Modbus communications. 0 : Disabled 1 : Enabled	1 (0, 1)

No. (Hex.)	Name	Description	Default (Range)
H5-06 (042A)	Drive Transmit Wait Time	Sets the time to wait to send a response message after the drive receives a command message from the master. **Note:** Restart the drive after changing the parameter setting.	5 ms (0 - 65 ms)
H5-08 (062D)	Communication Protocol Selection	Selects the communication protocol. 0 : Modbus/MEMOBUS 1 : Metasys/N2 2 : Apogee/P1 3 : BACnet	0 (0 - 3)
H5-09 (0435)	CE Detection Time	Sets the detection time for *CE [Modbus Communication Error]* issues when communication stops.	2.0 s (0.0 - 10.0 s)
H5-10 (0436)	Modbus Register 0025H Unit Sel	Sets the unit of measure used for the MEMOBUS/Modbus communications monitor register 0025H (output voltage reference monitor). 0 : 0.1 V units 1 : 1 V units	0 (0, 1)
H5-11 (043C)	Comm ENTER Command Mode	Sets the function to make the Enter command necessary to change parameters through MEMOBUS/Modbus communications. 0 : ENTER Command Required 1 : ENTER Command Not Required	0 (0, 1)
H5-12 (043D)	Run Command Method Selection	Sets the input method for the Run command when *b1-02 = 2 [Run Command Selection 1 = Serial Communications]*. 0 : FWD/Stop, REV/Stop 1 : Run/Stop, FWD/REV	0 (0, 1)
H5-14 (310D)	BACnet Device Obj ID LOW BITS	Sets the lower bits of the BACnet device object ID as a 4-digit hexadecimal number.	0001 (0000 - FFFF)
H5-15 (310E)	BACnet Device Obj ID HIGH BITS	Sets the upper bits of the BACnet device object ID as a 4-digit hexadecimal number.	0000 (0000 - 003F)
H5-18 (11A2)	Motor Speed Filter over Comms	Sets the filter time constant used when monitoring motor speed during MEMOBUS/Modbus communications or with a communication option.	0 ms (0 - 100 ms)
H5-20 (0B57)	Communication Parameters Reload	Sets the function to immediately enable updated MEMOBUS/Modbus communications parameters. 0 : Reload at Next Power Cycle 1 : Reload Now	0 (0, 1)
H5-22 (11CF)	Speed Search from MODBUS	Enables the MEMOBUS/Modbus communication register Speed Search function (bit0 of 15DFH). 0 : Disabled 1 : Enabled	0 (0, 1)
H5-23 (158D)	BACnet Max Master	Sets the maximum number of master MAC ID to scan to when the drive polls for the next node (Poll for Master).	7F (1 - 7F)
H5-24 (3DA0)	BACnet Max Info Frames	Sets the maximum number of information frames for BACnet.	3 (1 - 255)
H5-25 (1589) RUN	Function 5A Register 1 Selection	Returns the contents of the specified MEMOBUS/Modbus communications register when responding to the master device.	0044H (U1-05) (0000H - FFFFH)
H5-26 (158A) RUN	Function 5A Register 2 Selection	Returns the contents of the specified MEMOBUS/Modbus communications register when responding to the master device.	0045H (U1-06) (0000H - FFFFH)
H5-27 (158B) RUN	Function 5A Register 3 Selection	Returns the contents of the specified MEMOBUS/Modbus communications register when responding to the master device.	0042H (U1-03) (0000H - FFFFH)
H5-28 (158C) RUN	Function 5A Register 4 Selection	Returns the contents of the specified MEMOBUS/Modbus communications register when responding to the master device.	0049H (U1-10) (0000H - FFFFH)
H5-33 (3FB3)	Power-up CALL Alarm	Enables and disables *CALL [Serial Comm Transmission Error]* alarm detection. 0 : Disabled 1 : Enabled	1 (0, 1)
H5-34 (3FB4) RUN	Comm Error (CE) Go-To-Frequency	Sets the speed at which the drive will run when *H5-04 = 4 [Communication Error Stop Method = Run at H5-34]* and there is a *CE*.	0.0 Hz (0.0 - 400.0 Hz)

No. (Hex.)	Name	Description	Default (Range)
H5-35 (3FB5) RUN	Comm Error (CE) Go-To-Timeout	When *H5-04 = 4 [Communication Error Stop Method = Run at H5-34]* and a *CE* is present, the drive will run at the *H5-34 [Comm Error (CE) Go-To-Frequency]* speed for this length of time before it triggers a *CE* fault. **Note:** Set this parameter to 0 s to disable the time-out.	0 s (0 - 6000 s)
H5-36 (3FB6)	CE Fault Restart Select	Sets the drive to restart (*L5-01 [Number of Auto-Restart Attempts]*) after a *CE* fault. 0 : No Retry 1 : Retry	0 (0, 1)

◆ H7: Virtual MFIO selection

No. (Hex.)	Name	Description	Default (Range)
H7-00 (116F) Expert	Virtual MFIO selection	Sets the function to enable and disable the virtual I/O function. Set this parameter to 1 to operate the virtual I/O function. 0 : Disabled 1 : Enabled	0 (0, 1)
H7-01 (1185) Expert	Virtual Multi-Function Input 1	Sets the function that enters the virtual input set in *H7-10 [Virtual Multi-Function Output 1]*. **Note:** Settings *1B [Programming Lockout]* and *11B [!Programming Lockout]* are not available.	F (1 - 1B8)
H7-02 (1186) Expert	Virtual Multi-Function Input 2	Sets the function that enters the virtual input set in *H7-12 [Virtual Multi-Function Output 2]*. **Note:** Settings *1B [Programming Lockout]* and *11B [!Programming Lockout]* are not available.	F (1 - 1B8)
H7-03 (1187) Expert	Virtual Multi-Function Input 3	Sets the function that enters the virtual input set in *H7-14 [Virtual Multi-Function Output 3]*. **Note:** Settings *1B [Programming Lockout]* and *11B [!Programming Lockout]* are not available.	F (1 - 1B8)
H7-04 (1188) Expert	Virtual Multi-Function Input 4	Sets the function that enters the virtual input set in *H7-16 [Virtual Multi-Function Output 4]*. **Note:** Settings *1B [Programming Lockout]* and *11B [!Programming Lockout]* are not available.	F (1 - 1B8)
H7-10 (11A4) Expert	Virtual Multi-Function Output 1	Sets the function for virtual digital output 1.	F (0 - 1A7)
H7-11 (11A5) Expert	Virtual Output 1 Delay Time	Sets the minimum ON time for virtual digital output 1.	0.1 s (0.0 - 25.0 s)
H7-12 (11A6) Expert	Virtual Multi-Function Output 2	Sets the function for virtual digital output 2.	F (0 - 1A7)
H7-13 (11A7) Expert	Virtual Output 2 Delay Time	Sets the minimum ON time for virtual digital output 2.	0.1 s (0.0 - 25.0 s)
H7-14 (11A8) Expert	Virtual Multi-Function Output 3	Sets the function for virtual digital output 3.	F (0 - 1A7)
H7-15 (11A9) Expert	Virtual Output 3 Delay Time	Sets the minimum ON time for virtual digital output 3.	0.1 s (0.0 - 25.0 s)
H7-16 (11AA) Expert	Virtual Multi-Function Output 4	Sets the function for virtual digital output 4.	F (0 - 1A7)
H7-17 (11AB) Expert	Virtual Output 4 Delay Time	Sets the minimum ON time for virtual digital output 4.	0.1 s (0.0 - 25.0 s)
H7-30 (1177) Expert	Virtual Analog Input Selection	Sets the virtual analog input function.	F (0 - 31)

No. (Hex.)	Name	Description	Default (Range)
H7-31 (1178) RUN Expert	Virtual Analog Input Gain	Sets the virtual analog input gain.	100.0% (-999.9 - 999.9%)
H7-32 (1179) RUN Expert	Virtual Analog Input Bias	Sets the virtual analog input bias.	0.0% (-999.9 - 999.9%)
H7-40 (1163)	Virtual Analog Out Signal Select	Sets the signal level of the virtual analog output. 0 : 0 to 100% (Absolute Value) 1 : -100 to 100% 2 : 0 to 100% (Lower Limit at 0)	0 (0 - 2)
H7-41 (1164)	Virtual Analog Output Function	Sets the monitor to be output from the virtual analog output. Set the *x-xx* part of the *Ux-xx [Monitor]*. For example, set *H7-41 = 102* to monitor *U1-02 [Output Frequency]*.	102 (0 - 999)
H7-42 (1165)	Virtual Analog Output FilterTime	Sets the time constant for a primary filter of the virtual analog output.	0.00 s (0.00 - 2.00 s)

3.11 L: Protection Functions

◆ L1: Motor Protection

No. (Hex.)	Name	Description	Default (Range)
L1-01 (0480)	Motor Overload (oL1) Protection	Sets the motor overload protection with electronic thermal protectors. 0 : Disabled 1 : Variable Torque 4 : PM Variable Torque **Note:** When you connect only one motor to a drive, set *L1-01 = 1 or 4 [Variable Torque or PM Variable Torque]*. External thermal relays are not necessary in these conditions.	Determined by A1-02 (0 - 4)
L1-02 (0481)	Motor Overload Protection Time	Sets the operation time for the electronic thermal protector of the drive to prevent damage to the motor. Usually it is not necessary to change this setting.	1.0 min (0.1 - 5.0 min)
L1-03 (0482)	Motor Thermistor oH Alarm Select	Sets drive operation when the PTC input signal entered into the drive is at the *oH3 [Motor Overheat Alarm]* detection level. 0 : Ramp to Stop 1 : Coast to Stop 2 : Fast Stop (Use C1-09) 3 : Alarm Only	3 (0 - 3)
L1-04 (0483)	Motor Thermistor oH Fault Select	Sets the drive operation when the PTC input signal to the drive is at the *oH4 [Motor Overheat Fault (PTC Input)]* detection level. 0 : Ramp to Stop 1 : Coast to Stop 2 : Fast Stop (Use C1-09)	1 (0 - 2)
L1-05 (0484)	Motor Thermistor Filter Time	Sets the primary delay time constant for the PTC input signal entered to the drive. This parameter prevents accidental motor overheat faults.	0.20 s (0.00 - 10.00 s)
L1-08 (1103)	oL1 Current Level	Sets the reference current for the motor 1 thermal overload detection. When the current level > 0.0 A, you cannot set this value < 10% of drive rated current.	0.0 A (0.0 A or 10% to 150% of the drive rated current)
L1-09 (1104)	oL1 Current Level for Motor 2	Sets the reference current for the motor 2 thermal overload detection. When the current level > 0.0 A, you cannot set this value < 10% of drive rated current.	0.0 A (0.0 A or 10 to150% of the drive rated current)
L1-13 (046D)	Motor Overload Memory Selection	Sets the function that keeps the current electronic thermal protector value after power loss. 0 : Disabled 1 : Enabled 2 : Enabled, using RTC	2 (0 - 2)
L1-22 (0768) RUN	Leakage Current Filter Time1	Sets the leakage current detection reduction filter time constant during constant speed run. **Note:** You can set this parameter when *C6-02 = B [Carrier Frequency Selection = Leakage Current Detection Reduction Rate PWM]*.	Determined by C6-02 (0.0 - 60.0 s)
L1-23 (0769) RUN	Leakage Current Filter Time2	Sets the leakage current detection reduction filter time constant during acceleration/deceleration. **Note:** • You can set this parameter when *C6-02 = B [Carrier Frequency Selection = Leakage Current Detection Reduction Rate PWM]*. • When the setting value increases, the current monitor also starts up slowly. Examine the relevant sequence for problems.	Determined by C6-02 (0.0 - 60.0 s)

◆ L2: Power Loss Ride Through

No. (Hex.)	Name	Description	Default (Range)
L2-01 (0485)	Power Loss Ride Through Select	Sets the drive operation after a momentary power loss. 0 : Disabled 1 : Enabled for L2-02 Time 2 : Enabled while CPU Power Active	2 (0 - 2)
L2-02 (0486)	Power Loss Ride Through Time	Sets the maximum time that the drive will wait until it tries to restart after power loss.	Determined by o2-04 (0.0 - 25.5 s)
L2-03 (0487)	Minimum Baseblock Time	Sets the minimum time to continue the drive output block (baseblock) after a baseblock.	Determined by o2-04 (0.1 - 5.0 s)

No. (Hex.)	Name	Description	Default (Range)
L2-04 (0488)	Powerloss V/f Recovery Ramp Time	Sets the time for the drive output voltage to go back to the correct voltage after it completes speed searches.	Determined by o2-04 (0.0 - 5.0 s)
L2-05 (0489)	Undervoltage Detection Lvl (Uv1)	Sets the voltage at which the drive triggers a *Uv1 [DC Bus Undervoltage]* fault or at which it activates the KEB function. Usually it is not necessary to change this setting. **NOTICE:** *Damage to Equipment. When you set this parameter to a value lower than the default, you must install an AC reactor on the input side of the power supply. If you do not install an AC reactor, it will cause damage to the drive circuitry.*	Determined by o2-04 and E1-01 (208 V Class: 150 - 220 V, 480 V Class: 300 - 440 V)
L2-06 (048A) Expert	Kinetic Energy Backup Decel Time	Sets the deceleration time during KEB operation to decrease the maximum output frequency to 0. **Note:** When *L2-29 = 1 [Kinetic Energy Backup Method = Single Drive KEB Ride-Thru 2]* and you do KEB Auto-Tuning, the drive will automatically set this value.	0.0 s (0.0 - 6000.0 s)
L2-07 (048B) Expert	Kinetic Energy Backup Accel Time	Sets the acceleration time to return the frequency to the frequency reference before a power loss after canceling KEB operation.	0.0 s (0.0 - 6000.0 s)
L2-08 (048C) Expert	Frequency Gain at KEB Start	Sets the quantity of output frequency reduction used when KEB operation starts as a percentage of the motor rated slip before starting KEB operation.	100% (0 - 300%)
L2-09 (048D) Expert	KEB Minimum Frequency Level	Sets the quantity of output frequency reduction used as a percentage of *E2-02 [Motor Rated Slip]* when KEB operation starts.	20% (0 - 100%)
L2-10 (048E) Expert	Minimum KEB Time	Sets the minimum length of time to operate the KEB after the drive detects a momentary power loss.	50 ms (0 - 25500 ms)
L2-11 (0461) Expert	KEB DC Bus Voltage Setpoint	Sets the target value that controls the DC bus voltage to a constant level in Single Drive KEB Ride-Thru 2. Sets the DC bus voltage level that completes the KEB operation for all other KEB methods.	Determined by E1-01 (Determined by E1-01)
L2-29 (0475) Expert	Kinetic Energy Backup Method	Sets the KEB function operation mode. 0 : Single Drive KEB Ride-Thru 1 1 : Single Drive KEB Ride-Thru 2	0 (0 - 1)
L2-30 (045E) Expert	KEB Zero Speed Operation	Sets the operation when the output frequency decreases below the zero level (DC braking injection starting frequency) during KEB deceleration. 0 : Baseblock 1 : DC/SC Injection Braking	0 (0, 1)
L2-31 (045D) Expert	KEB Start Voltage Offset Level	Sets the KEB start voltage offset.	Determined by A1-02 (208 V Class: 0 - 100 V, 480 V Class: 0 - 200 V)

◆ L3: Stall Prevention

No. (Hex.)	Name	Description	Default (Range)
L3-01 (048F)	Stall Prevention during Accel	Sets the method of Stall Prevention During Acceleration. 0 : Disabled 1 : Enabled 2 : Intelligent (Ignore Decel Ramp)	1 (0 - 2)
L3-02 (0490)	Stall Prevent Level during Accel	Sets the output current level to activate the Stall Prevention function during acceleration as a percentage of the drive rated output current.	Determined by L8-38 (0 - 120%)
L3-03 (0491)	Stall Prevent Limit during Accel	Sets the lower limit for the stall prevention level used in the constant output range as a percentage of the drive rated output current.	50% (0 - 100%)
L3-04 (0492)	Stall Prevention during Decel	Sets the method that the drive will use to prevent overvoltage faults when decelerating. **Note:** The setting range changes when the *A1-02 [Control Method Selection]* value changes: • When *A1-02 = 5 [OLV/PM]*, the setting range is *0 to 2*. • When *A1-02 = 8 [EZOLV]*, the setting range is *0, 1*. 0 : Disabled 1 : General Purpose 2 : Intelligent (Ignore Decel Ramp) 4 : Overexcitation/High Flux	1 (Determined by A1-02)

No. (Hex.)	Name	Description	Default (Range)
L3-05 (0493)	Stall Prevention during RUN	Sets the function to enable and disable Stall Prevention During Run. **Note:** • An output frequency lower than 6 Hz will disable Stall Prevention during Run. The *L3-05* and *L3-06 [Stall Prevent Level during Run]* settings do not have an effect. • The default setting changes when the *A1-02 [Control Method]* value changes: –*A1-02 = 0, 5 [V/f, OLV/PM]*: 1 –*A1-02 = 8 [EZOLV]*: 3 0 : Disabled 1 : Deceleration Time 1 (C1-02) 2 : Deceleration Time 2 (C1-04) 3 : Intelligent (Ignore Decel Ramp)	Determined by A1-02 (0 - 3)
L3-06 (0494)	Stall Prevent Level during Run	Sets the output current level to enable the Stall Prevention function during operation as a percentage of the drive rated output current. **Note:** This parameter is applicable when *L3-05 = 1, 2 [Stall Prevention during RUN = Deceleration Time 1 (C1-02), Deceleration Time 2 (C1-04)]*.	Determined by L8-38 (5 - 120%)
L3-11 (04C7)	Overvoltage Suppression Select	Sets the overvoltage suppression function. 0 : Disabled 1 : Enabled	0 (0, 1)
L3-17 (0462)	DC Bus Regulation Level	Sets the target value for the DC bus voltage when the overvoltage suppression function and the Decel Stall Prevention function (Intelligent Stall Prevention) are active.	208 V Class: 375 V, 480 V Class: 750 V (208 V Class: 150 - 400 V, 480 V Class: 300 - 800 V)
L3-20 (0465) Expert	DC Bus Voltage Adjustment Gain	Sets the proportional gain used to control the DC bus voltage.	Determined by A1-02 (0.00 - 5.00)
L3-21 (0466) Expert	OVSuppression Accel/Decel P Gain	Sets the proportional gain to calculate acceleration and deceleration rates.	1.00 (0.10 - 10.00)
L3-22 (04F9)	PM Stall Prevention Decel Time	Sets the momentary deceleration time that the drive will use when it tries to accelerate a PM motor and detected motor stalls. This function is applicable when *L3-01 = 1 [Stall Prevent Select duringAccel = General Purpose]*.	0.0 s (0.0 - 6000.0 s)
L3-23 (04FD)	Stall P Reduction at Constant HP	Sets the function to automatically decrease the Stall Prevention Level during Run for constant output ranges. 0 : Use L3-06 for Entire Speed Range 1 : Automatic Reduction @ CHP Region	0 (0, 1)
L3-24 (046E) Expert	Motor Accel Time @ Rated Torque	Sets the motor acceleration time to reach the maximum frequency at the motor rated torque for stopped single-drive motors.	Determined by o2-04, E2-11, and E5-01 (0.001 - 10.000 s)
L3-25 (046F) Expert	Load Inertia Ratio	Sets the ratio between motor inertia and machine inertia.	1.0 (0.1 - 1000.0)
L3-26 (0455) Expert	Additional DC Bus Capacitors	Sets the capacity for external main circuit capacitors. Usually it is not necessary to change this setting. Sets this parameter when you use the KEB Ride-Thru function.	0 µF (0 to 65000 µF)
L3-27 (0456)	Stall Prevention Detection Time	Sets a delay time between reaching the Stall Prevention level and starting the Stall Prevention function.	50 ms (0 - 5000 ms)
L3-35 (0747) Expert	Speed Agree Width for Auto Decel	Sets the width for speed agreement when *L3-04 = 2 [Decel Stall Prevention Selection = Automatic Decel Reduction]*. Usually it is not necessary to change this setting.	0.00 Hz (0.00 - 1.00 Hz)

◆ L4: Speed Detection

No. (Hex.)	Name	Description	Default (Range)
L4-01 (0499)	Speed Agree Detection Level	Sets the level to detect speed agree or motor speed when *H2-01 to H2-03 = 2, 3, 4, 5 [MFDO Function Selection = Speed Agree 1, User-set Speed Agree 1, Frequency Detection 1, Frequency Detection 2]*.	0.0 Hz (0.0 - 400.0 Hz)
L4-02 (049A)	Speed Agree Detection Width	Sets the width to detect speed agree or motor speed when *H2-01 to H2-03 = 2, 3, 4, 5 [MFDO Function Selection = Speed Agree 1, User-set Speed Agree 1, Frequency Detection 1, Frequency Detection 2]*.	2.0 Hz (0.0 - 20.0 Hz)

No. (Hex.)	Name	Description	Default (Range)
L4-03 (049B)	Speed Agree Detection Level (+/-)	Sets the speed agree detection level or motor speed detection level when *H2-01 to H2-03 = 13, 14, 15, 16 [MFDO Function Selection = Speed Agree 2, User-set Speed Agree 2, Frequency Detection 3, Frequency Detection 4]*.	0.0 Hz (-400.0 - +400.0 Hz)
L4-04 (049C)	Speed Agree Detection Width (+/-)	Sets the width to detect speed agree or motor speed when *H2-01 to H2-03 = 13, 14, 15, 16 [MFDO Function Selection = Speed Agree 2, User-set Speed Agree 2, Frequency Detection 3, Frequency Detection 4]*.	2.0 Hz (0.0 - 20.0 Hz)
L4-05 (049D)	Fref Loss Detection Selection	Sets the operation when the drive detects a loss of frequency reference. 0 : Stop 1 : Run at (L4-06 x Last Reference)	1 (0, 1)
L4-06 (04C2)	Frequency Reference @Loss of Ref	Sets the frequency reference as a percentage to continue drive operation after it detects a frequency reference loss. The value is a percentage of the frequency reference before the drive detected the loss.	80.0% (0.0 - 100.0%)
L4-07 (0470)	Speed Agree Detection Selection	Sets the condition that activates speed detection. 0 : No Detection during Baseblock 1 : Detection Always Enabled	0 (0, 1)

◆ L5: Fault Restart

No. (Hex.)	Name	Description	Default (Range)
L5-01 (049E)	Number of Auto-Restart Attempts	Sets the number of times that the drive will try to restart.	0 (0 - 10 times)
L5-02 (049F)	Fault Contact at Restart Select	Sets the function that sends signals to the MFDO terminal set for *Fault [H2-xx = E]* while the drive is automatically restarting. 0 : Active Only when Not Restarting 1 : Always Active	0 (0, 1)
L5-04 (046C)	Interval Method Restart Time	Sets the time interval between each Auto Restart attempt.	10.0 s (0.5 - 3600.0 s)
L5-07 (0B2A)	Fault Reset Enable Select Grp1	Use these 4 digits to set the Auto Restart function for *oL1* to *oL4*. From left to right, the digits set *oL1*, *oL2*, *oL3*, and *oL4*, in order. 0000 : Disabled 0001 : Enabled (—/—/—/oL4) 0010 : Enabled (—/—/oL3/—) 0011 : Enabled (—/—/oL3/oL4) 0100 : Enabled (—/oL2/—/—) 0101 : Enabled (—/oL2/—/oL4) 0110 : Enabled (—/oL2/oL3/—) 0111 : Enabled (—/oL2/oL3/oL4) 1000 : Enabled (oL1/—/—/—) 1001 : Enabled (oL1/—/—/oL4) 1010 : Enabled (oL1/—/oL3/—) 1011 : Enabled (oL1/—/oL3/oL4) 1100 : Enabled (oL1/oL2/—/—) 1101 : Enabled (oL1/oL2/—/oL4) 1110 : Enabled (oL1/oL2/oL3/—) 1111 : Enabled (oL1/oL2/oL3/oL4)	1111 (0000 - 1111)

No. (Hex.)	Name	Description	Default (Range)
L5-08 (0B2B)	Fault Reset Enable Select Grp2	Use these 4 digits to set the Auto Restart function for *Uv1*, *ov*, *oH1*, and *GF*. From left to right, the digits set *Uv1*, *ov*, *oH1*, and *GF*, in order. 0000 : Disabled 0001 : Enabled (—/–/—/GF) 0010 : Enabled (—/–/oH1/–) 0011 : Enabled (—/–/oH1/GF) 0100 : Enabled (—/ov/—/–) 0101 : Enabled (—/ov/—/GF) 0110 : Enabled (—/ov/oH1/–) 0111 : Enabled (—/ov/oH1/GF) 1000 : Enabled (Uv1/–/—/–) 1001 : Enabled (Uv1/–/—/GF) 1010 : Enabled (Uv1/–/oH1/–) 1011 : Enabled (Uv1/–/oH1/GF) 1100 : Enabled (Uv1/ov/—/–) 1101 : Enabled (Uv1/ov/—/GF) 1110 : Enabled (Uv1/ov/oH1/–) 1111 : Enabled (Uv1/ov/oH1/GF)	1111 (0000 - 1111)
L5-40 (3670)	Low Feedback Flt Retry Selection	Sets the drive to do an Auto Restart when the drive detects an *LFB [Low Feedback Sensed]* fault. 0 : No Retry 1 : Retry	0 (0, 1)
L5-41 (3671)	Hi Feedback Flt Retry Selection	Sets the drive to do an Auto Restart when the drive detects an *HFB [High Feedback Sensed]* fault. 0 : No Retry 1 : Retry	0 (0, 1)
L5-42 (3672)	Feedback Loss Fault Retry Select	Sets the drive to try an Auto Restart when it drive detects an *FDBKL [WIRE Break]* fault. 0 : No Retry 1 : Retry	0 (0, 1)
L5-49 (3679)	Fault Retry Speed Search Select	Sets the drive to do a speed search at the start of a Fault Retry. 0 : Disabled 1 : Enabled	1 (0, 1)
L5-50 (367A)	Setpoint Not Met Fault Retry Sel	Sets the drive to try an Auto Restart when it detects an *NMS [SetPoint Not Met]* fault. 0 : No Retry 1 : Retry	0 (0, 1)
L5-51 (367B)	Loss of Prime Fault Retry Select	Sets the drive to try an Auto Restart if it detects an *LOP [Loss Of Prime]* fault. 0 : No Retry 1 : Retry	0 (0, 1)
L5-53 (3251)	Thermostat Fault Retry Selection	Sets the drive to try an Auto Restart if it detects a *VLTS [Thermostat Fault]* fault. **Note:** • To use this function, set *S5-01 ≠ 0 [HAND Frequency Reference Source ≠ HAND Analog Input]* • The drive will only restart after the Thermostat digital input de-activates and the *L5-04 [Interval Method Restart Time]* timer is expired. 0 : No Retry 1 : Retry	1 (0, 1)

◆ L6: Torque Detection

No. (Hex.)	Name	Description	Default (Range)
L6-01 (04A1)	Torque Detection Selection 1	Sets the speed range that detects overtorque and undertorque and the operation of drives (operation status) after detection. 0 : Disabled 1 : oL @ Speed Agree - Alarm only 2 : oL @ RUN - Alarm only 3 : oL @ Speed Agree - Fault 4 : oL @ RUN - Fault 5 : UL @ Speed Agree - Alarm only 6 : UL @ RUN - Alarm only 7 : UL @ Speed Agree - Fault 8 : UL @ RUN - Fault 9 : UL6 @ Speed Agree - Alarm only 10 : UL6 @ RUN - Alarm only 11 : UL6 @ Speed Agree - Fault 12 : UL6 @ RUN - Fault	0 (0 - 12)
L6-02 (04A2)	Torque Detection Level 1	Sets the detection level for Overtorque/Undertorque Detection 1. In V/f control, drive rated output current = 100% value. In vector control, motor rated torque = 100% value.	15% (0 - 300%)
L6-03 (04A3)	Torque Detection Time 1	Sets the detection time for Overtorque/Undertorque Detection 1.	10.0 s (0.0 - 10.0 s)
L6-04 (04A4)	Torque Detection Selection 2	Sets the speed range that detects overtorque and undertorque and the operation of drives (operation status) after detection. 0 : Disabled 1 : oL @ Speed Agree - Alarm only 2 : oL @ RUN - Alarm only 3 : oL @ Speed Agree - Fault 4 : oL @ RUN - Fault 5 : UL @ Speed Agree - Alarm only 6 : UL @ RUN - Alarm only 7 : UL @ Speed Agree - Fault 8 : UL @ RUN - Fault	0 (0 - 8)
L6-05 (04A5)	Torque Detection Level 2	Sets the detection level for Overtorque/Undertorque Detection 2. In V/f control, drive rated output current = 100% value. In vector control, motor rated torque = 100% value.	150% (0 - 300%)
L6-06 (04A6)	Torque Detection Time 2	Sets the detection time for Overtorque/Undertorque Detection 2.	0.1 s (0.0 - 10.0 s)
L6-13 (062E)	Motor Underload Curve Select	Sets the motor underload protection (*UL6 [Undertorque Detection 6]*) based on motor load and sets the level of *L6-02 [Torque Detection Level 1]* to refer to Fbase or Fmax. 0 : Base Frequency Enable 1 : Max Frequency Enable	0 (0, 1)
L6-14 (062F)	Motor Underload Level @ Min Freq	Sets the *UL6 [Undertorque Detection 6]* detection level at minimum frequency by percentage of drive rated current.	15% (0 - 300%)

◆ L7: Torque Limit

No. (Hex.)	Name	Description	Default (Range)
L7-01 (04A7) RUN	Forward Torque Limit	Sets the torque limit value for forward motoring as a percentage, where motor rated torque is the 100% value.	200% (0 - 300%)
L7-02 (04A8) RUN	Reverse Torque Limit	Sets the torque limit value for reversed motoring as a percentage, where motor rated torque is the 100% value.	200% (0 - 300%)
L7-03 (04A9) RUN	Forward Regenerative Trq Limit	Sets the torque limit value for forward regenerative conditions as a percentage of the motor rated torque.	200% (0 - 300%)

No. (Hex.)	Name	Description	Default (Range)
L7-04 (04AA) RUN	Reverse Regenerative Trq Limit	Sets the torque limit value for reversed regenerative conditions as a percentage of the motor rated torque.	200% (0 - 300%)
L7-16 (044D)	Torque Limit Process at Start	Assigns a time filter to allow the torque limit to build at start. 0 : Disabled 1 : Enabled	1 (0, 1)

◆ L8: Drive Protection

No. (Hex.)	Name	Description	Default (Range)
L8-02 (04AE)	Overheat Alarm Level	Sets the *oH* detection level temperature.	Determined by o2-04 (50 - 150 °C)
L8-03 (04AF)	Overheat Pre-Alarm Selection	Sets drive operation if it detects an *oH* alarm. 0 : Ramp to Stop 1 : Coast to Stop 2 : Fast Stop (Use C1-09) 3 : Alarm Only 4 : Operate at Reduced Speed (L8-19)	4 (0 - 4)
L8-05 (04B1)	Input Phase Loss Protection Sel	Sets the function to enable and disable input phase loss detection. 0 : Disable 1 : Enabled	1 (0, 1)
L8-07 (04B3)	Output Phase Loss Protection Sel	Sets the function to enable and disable output phase loss detection. The drive starts output phase loss detection when the output current decreases to less than 5% of the drive rated current. **Note:** The drive can incorrectly start output phase loss detection in these conditions: • The motor rated current is very small compared to the drive rating. • The drive is operating a PM motor with a small load. 0 : Disabled 1 : Fault when one phase is lost 2 : Fault when two phases are lost	1 (0 - 2)
L8-09 (04B5)	Output Ground Fault Detection	Sets the function to enable and disable ground fault protection. 0 : Disabled 1 : Enabled	Determined by o2-04 (0, 1)
L8-10 (04B6)	Heatsink Fan Operation Selection	Sets operation of the heatsink cooling fan. 0 : During Run, w/ L8-11 Off-Delay 1 : Always On 2 : On when Drive Temp Reaches L8-64	0 (0 - 2)
L8-11 (04B7)	Heatsink Fan Off-Delay Time	Sets the length of time that the drive will wait before it stops the cooling fan after it cancels the Run command when *L8-10 = 0 [Heatsink Fan Operation Selection = During Run, w/ L8-11 Off-Delay]*.	300 s (0 - 300 s)
L8-12 (04B8)	Ambient Temperature Setting	Sets the ambient temperature of the drive installation area. **Note:** The setting range changes when the *L8-35 [Installation Method Selection]* setting changes. • When *L8-35 = 0 or 2 [IP20/UL Open Type or IP20/UL Type 1]*: -10 °C ~ +60 °C • When *L8-35 = 1 or 3 [Side-by-Side Mounting or IP55/UL Type 12]*: -10 °C ~ +50 °C	40 °C (Determined by L8-35)
L8-15 (04BB)	Drive oL2 @ Low Speed Protection	Sets the function to decrease drive overload at low speeds to prevent damage to the main circuit transistor during low speed operation (at 6 Hz or slower) to prevent *oL2 [Drive Overloaded]*. **Note:** Contact Yaskawa or your nearest sales representative before disabling this function at low speeds. If you frequently operate drives with high output current in low speed ranges, it can cause heat stress and decrease the life span of drive IGBTs. 0 : Disabled (No Additional Derate) 1 : Enabled (Reduced oL2 Level)	1 (0, 1)
L8-18 (04BE)	Software Current Limit Selection	Set the software current limit selection function to prevent damage to the main circuit transistor caused by too much current. 0 : Disabled 1 : Enabled	0 (0, 1)
L8-19 (04BF)	Freq Reduction @ oH Pre-Alarm	Sets the ratio at which the drive derates the frequency reference during an *oH* alarm.	20.0% (10.0 - 100.0%)

No. (Hex.)	Name	Description	Default (Range)
L8-27 (04DD)	Overcurrent Detection Gain	Sets the PM motor overcurrent detection level as a percentage of the motor rated current value. **Note:** Parameter *A1-02 [Control Method Selection]* selects which parameter is the motor rated current. • *A1-02 ≠ 8 [EZOLV]*: *E5-03 [Motor Rated Current (FLA)]* • *A1-02 = 8*: *E9-06 [Motor Rated Current (FLA)]*	300.0% (0.0 - 1000.0%)
L8-29 (04DF)	Output Unbalance Detection Sel	Sets the function to detect *LF2*. 0 : Disabled 1 : Enabled	1 (0, 1)
L8-31 (04E1)	LF2 Detection Time	Sets the LF2 [Output Current Imbalance] detection time.	3 (1 – 100)
L8-35 (04EC)	Installation Method Selection	Sets the type of drive installation. 0 : IP20/UL Open Type 1 : Side-by-Side Mounting 2 : IP20/UL Type 1 3 : IP55/UL Type 12	Determined by the drive (0 - 3)
L8-38 (04EF)	Carrier Frequency Reduction	Sets the carrier frequency reduction function. The drive decreases the carrier frequency when the output current is more than a specified level. 1 : Enabled below 6 Hz 2 : Enabled for All Speeds 3 : Enable at Overload	Determined by A1-02 and o2-04 (1 - 3)
L8-41 (04F2)	High Current Alarm Selection	Sets the function to cause an *HCA [High Current Alarm]* when the output current is more than 150% of the drive rated current. 0 : Disabled 1 : Enabled	0 (0, 1)
L8-90 (0175) Expert	STPo Detection Level (Low Speed)	Sets the detection level that the control fault must be equal to or more than to cause an *STPo [Motor Step-Out Detected]*.	0 times (0 - 5000 times)
L8-97 (3104)	Carrier Freq Reduce during OH	Sets the function to decrease carrier frequency during oH pre-alarm. **Note:** When *A1-02 = 8 [Control Method Selection = EZOLV]*, this parameter is available only when *E9-01 = 0 [Motor Type Selection = Induction (IM)]*. 0 : Disabled 1 : Enabled	0 (0, 1)

◆ L9: Drive Protection 2

No. (Hex.)	Name	Description	Default (Range)
L9-16 (11DC) Expert	FAn1 Detect Time	Sets the detection time for *FAn1 [Drive Cooling Fan Fault]*. Yaskawa recommends that you do not change this parameter value.	4.0 s (0.0 - 30.0 s)

3.12 n: Special Adjustment

◆ n1: Hunting Prevention

No. (Hex.)	Name	Description	Default (Range)
n1-01 (0580)	Hunting Prevention Selection	Sets the function to prevent hunting. 0 : Disabled 1 : Enabled (Normal)	1 (0, 1)
n1-02 (0581) Expert	Hunting Prevention Gain Setting	Sets the performance of the hunting prevention function. Usually it is not necessary to change this parameter.	1.00 (0.00 - 2.50)
n1-03 (0582) Expert	Hunting Prevention Time Constant	Sets the primary delay time constant of the hunting prevention function. Usually it is not necessary to change this parameter.	Determined by o2-04 (0 - 500 ms)
n1-05 (0530) Expert	Hunting Prevent Gain in Reverse	Sets the performance of the hunting prevention function. This parameter adjusts Reverse run. Usually it is not necessary to change this parameter.	0.00 (0.00 - 2.50)
n1-13 (1B59) Expert	DC Bus Stabilization Control	Sets the oscillation suppression function for the DC bus voltage. 0 : Disabled 1 : Enabled	0 (0, 1)
n1-14 (1B5A) Expert	DC Bus Stabilization Time	Adjusts the responsiveness of the oscillation suppression function for the DC bus voltage. Set *n1-13 = 1 [DC Bus Stabilization Control = Enabled]* to enable this parameter.	100.0 ms (0.0 - 500.0 ms)

◆ n3: High Slip/Overexcite Braking

No. (Hex.)	Name	Description	Default (Range)
n3-01 (0588) Expert	HSB Deceleration Frequency Width	Sets the amount by which the output frequency is to be lowered during high-slip braking, as a percentage of *E1-04 [Maximum Output Frequency]*, which represents the 100% value.	5% (1 - 20%)
n3-02 (0589) Expert	HSB Current Limit Level	Sets the maximum current output during high-slip braking as a percentage, where *E2-01 [Motor Rated Current (FLA)]* is 100%. Also sets the current suppression to prevent exceeding drive overload tolerance.	Determined by L8-38 (0 - 200%)
n3-03 (058A) Expert	HSB Dwell Time at Stop	Sets the dwell time, a length of time when high-slip braking is ending and during which the motor speed decreases and runs at a stable speed. For a set length of time, the drive will hold the actual output frequency at the minimum output frequency set in *E1-09*.	1.0 s (0.0 - 10.0 s)
n3-04 (058B) Expert	HSB Overload Time	Sets the time used to detect *oL7 [High Slip Braking Overload]*, which occurs when the output frequency does not change during high-slip braking. Usually it is not necessary to change this parameter.	40 s (30 - 1200 s)
n3-13 (0531)	OverexcitationBraking (OEB) Gain	Sets the gain value that the drive multiplies by the V/f pattern output value during overexcitation deceleration to calculate the overexcitation level.	1.10 (1.00 - 1.40)
n3-21 (0579)	HSB Current Suppression Level	Sets the upper limit of the current that is suppressed at the time of overexcitation deceleration as a percentage of the drive rated current.	100% (0 - 150%)
n3-23 (057B)	Overexcitation Braking Operation	Sets the direction of motor rotation where the drive will enable overexcitation. 0 : Disabled 1 : Enabled Only when Rotating FWD 2 : Enabled Only when Rotating REV	0 (0 - 2)

◆ n7: EZ Drive

No. (Hex.)	Name	Description	Default (Range)
n7-01 (3111) Expert	Damping Gain for Low Frequency	Sets the oscillation suppression gain for the low speed range.	1.0 (0.1 - 10.0)
n7-05 (3115) Expert	Response Gain for Load Changes	Sets the response gain related to changes in the load.	50 (10 - 1000)
n7-07 (3117) Expert	Speed Calculation Gain1	Sets the speed calculation gain during usual operation. Usually it is not necessary to change this setting.	15.0 Hz (1.0 - 50.0 Hz)
n7-08 (3118) Expert	Speed Calculation Gain2	Sets the speed calculation gain during a speed search. **Note:** When *E9-01 = 1 [Motor Type Selection = Permanent Magnet (PM)]*, the default setting is 0 Hz and the setting range is 1.0 - 80.0 Hz.	25.0 Hz (1.0 - 50.0 Hz)
n7-10 (311A) Expert	Pull-in Current Switching Speed	Parameter *n8-51 [Pull-in Current @ Acceleration]*, is in effect when the output frequency is ≤ *n7-10*, where the speed is set as a percentage of rated speed. **Note:** • The value set in *n8-51 [Pull-in Current @ Acceleration]* is enabled for speeds that are not higher than *n7-10* during deceleration. The value set in *b8-01 [Energy Saving Control Selection]* is enabled for speeds higher than *n7-10*. • If there is a large quantity of oscillation when you operate in the low speed range, increase the setting value. • When it is most important to save energy in the low speed range, decrease the setting value.	10.0% (0.0 - 100.0%)
n7-11 (311B) Expert	Pull-in Current Switch Hysteresis Band	Sets the hysteresis level for Switching Speed set in *n7-10 [Pull-in Current Switching Speed]*. When the speed is lower than *n7-10 + n7-11* during acceleration, the drive enables pull-in current. **Note:** • The value set in *n8-51 [Pull-in Current @ Acceleration]* is enabled for speeds that are not higher than *n7-10 + n7-11* during acceleration. The value set in *b8-01 [Energy Saving Control Selection]* is enabled for speeds higher than *n7-10 + n7-11*. • If there is a large quantity of oscillation when you operate in the low speed range, increase the setting value. • When it is most important to save energy in the low speed range, decrease the setting value.	5.0% (1.0 - 20.0%)
n7-13 (311D) Expert	Pull-in Current Switching Time	Sets a time to enable the pull-in current commands. If there is a large quantity of oscillation at speeds around *n7-10 [Pull-in Current Switching Speed]*, decrease the setting in decrements of 20 ms.	100 ms (0 - 1000 ms)
n7-17 (3122)	Resistance TemperatureCorrection	Sets the function to adjust for changes in the motor resistance value caused by changes in the temperature. 0 : Invalid 1 : Valid (Only 1 time) 2 : Valid (Every time)	1 (0 to 2)

◆ n8: PM Motor Control Tuning

No. (Hex.)	Name	Description	Default (Range)
n8-23 (0556) Expert	ACR q Gain @PoleEst	Sets the proportional gain for current regulator q-axis control when the drive estimates the initial pole. Usually it is not necessary to change this setting.	0 (0 - 2000)
n8-24 (0557) Expert	ACR q Integral Time @PoleEst	Sets the integral time for current regulator q-axis control when the drive estimates the initial pole. Usually it is not necessary to change this setting.	0.0 ms (0.0 - 100.0 ms)
n8-25 (0558) Expert	ACR q Limit @PoleEst	Sets the q-axis limit of the current regulator when the drive estimates the initial pole. Usually it is not necessary to change this setting.	0% (0 - 150%)
n8-26 (0559) Expert	ACR d Gain @PoleEst	Sets the proportional gain for current regulator d-axis control when the drive estimates the initial pole. Usually it is not necessary to change this setting.	500 (0 - 2000)
n8-27 (055A) Expert	ACR d Integral Time @PoleEst	Sets the integral time for current regulator d-axis control when the drive estimates the initial pole. Usually it is not necessary to change this setting.	0.0 ms (0.0 - 100.0 ms)

No. (Hex.)	Name	Description	Default (Range)
n8-28 (055B) Expert	ACR d Lim @PoleEst	Sets the d-axis limit of the current regulator when the drive estimates the initial pole. Usually it is not necessary to change this setting.	100% (0 - 150%)
n8-35 (0562)	Initial Pole Detection Method	Sets how the drive detects the position of the rotor at start. **Note:** • When you operate an SPM motor, set *n8-35 = 0*. When you operate an IPM motor, set *n8-35 = 0 to 2*. • When you set *n8-35 = 1*, do High Frequency Injection Auto-Tuning. 0 : Pull-in 1 : High Frequency Injection	0 (0, 1)
n8-36 (0563)	HFI Frequency Level for L Tuning	Sets the injection frequency for high frequency injection. **Note:** • Set *n8-35 = 1 [Initial Pole Detection Method = High Frequency Injection]* to enable this parameter. • The drive automatically calculates this value when High Frequency Injection Auto-Tuning completes successfully.	500 Hz (200 - 1000 Hz)
n8-37 (0564) Expert	HFI Voltage Amplitude Level	Sets the high frequency injection amplitude as a percentage where 200 V = 100% for 208 V class drives and 400 V = 100% for a 480 V class drives. Usually it is not necessary to change this setting. **Note:** • Set *n8-35 = 1 [Initial Pole Detection Method = High Frequency Injection]* to enable this parameter. • The drive automatically calculates this value when High Frequency Injection Auto-Tuning completes successfully.	20.0% (0.0 - 50.0%)
n8-39 (0566)	HFI LPF Cutoff Freq	Sets the low-pass filter shut-off frequency for high frequency injection. **Note:** • Set *n8-35 = 1 [Initial Pole Detection Method = High Frequency Injection]* to enable this parameter. • The drive automatically calculates this value when High Frequency Injection Auto-Tuning completes successfully.	250 Hz (0 - 1000 Hz)
n8-41 (0568) Expert	HFI P Gain	Sets the response gain for the high frequency injection speed estimation. **Note:** • Set *n8-35 = 1 [Initial Pole Detection Method = High Frequency Injection]* to enable this parameter. • Set *n8-41 > 0.0* for IPM motors.	2.5 (-10.0 - +10.0)
n8-42 (0569) Expert	HFI I Time	Sets the integral time constant for the high frequency injection speed estimation. Usually it is not necessary to change this setting. **Note:** Set *n8-35 = 1 [Initial Pole Detection Method = High Frequency Injection]* to enable this parameter.	0.10 s (0.00 - 9.99 s)
n8-45 (0538)	Speed Feedback Detection Gain	Sets the internal speed feedback detection reduction unit gain as a magnification value. Usually it is not necessary to change this setting.	0.80 (0.00 - 10.00)
n8-46 (0539) Expert	PM Phase Compensation Gain	Sets the gain to compensate for phase differences. Usually it is not necessary to change this setting.	0.3 (0.0 - 10.0)
n8-47 (053A)	Pull-in Current Comp Filter Time	Sets the time constant the drive uses to align the pull-in current reference value with the actual current value. Usually it is not necessary to change this setting.	5.0 s (0.0 - 100.0 s)
n8-48 (053B)	Pull-in/Light Load Id Current	On the basis that parameter *E5-03 [Motor Rated Current (FLA)]* is the 100% value, this parameter sets the d-axis current that flows to the motor during run at constant speed as a percentage.	30% (0 - 200%)
n8-49 (053C)	Heavy Load Id Current	Sets the d-axis current to that the drive will supply to the motor to run it at a constant speed with a heavy load. Considers *E5-03 [PM Motor Rated Current (FLA)]* to be 100%. Usually it is not necessary to change this setting.	Determined by E5-01 (-200.0 - +200.0%)
n8-50 (053D)	Medium Load Iq Level (High)	Sets the load current level to start high efficiency control as a percentage of *E5-03 [PM Motor Rated Current (FLA)]*. Usually it is not necessary to change this setting.	80% (50 - 255%)
n8-51 (053E)	Pull-in Current @ Acceleration	Sets the pull-in current allowed to flow during acceleration/deceleration as a percentage of the motor rated current. **Note:** Parameter *A1-02 [Control Method Selection]* selects which parameter is the motor rated current. • *A1-02 = 5 [OLV/PM]*: *E5-03 [Motor Rated Current (FLA)]* • *A1-02 = 8 [EZOLV]*: *E9-06 [Motor Rated Current (FLA)]*	Determined by A1-02 (0 - 200%)
n8-52 (053F) Expert	ACR P Gain	Sets the proportional gain of the current regulator. Usually it is not necessary to change this setting.	10.0 (-100.0 - 100.0)
n8-54 (056D) Expert	Voltage Error Compensation Time	Sets the time constant that the drive uses when adjusting for voltage errors.	1.00 s (0.00 - 10.00 s)

No. (Hex.)	Name	Description	Default (Range)
n8-55 (056E)	Motor to Load Inertia Ratio	Sets the ratio between motor inertia and machine inertia. 0 : Below 1:10 1 : Between 1:10 and 1:30 2 : Between 1:30 and 1:50 3 : Beyond 1:50	0 (0 - 3)
n8-56 (056F) Expert	PM High Performance Selection	Usually it is not necessary to change this setting. Sets the high efficiency control method for IPM motor. 0 : Disabled 1 : Enabled (Vd) 2 : Enabled (Vd & Vq)	1 (0 - 2)
n8-62 (057D) Expert	Output Voltage Limit Level	Sets the output voltage limit to prevent saturation of the output voltage. Usually it is not necessary to change this parameter. **Note:** When *A1-02 = 8*, the default setting is: • 208 V Class: 230.0 V • 480 V Class: 460.0 V	208 V Class: 200.0 V, 480 V Class: 400.0 V (208 V Class: 0.0 - 240.0 V, 480 V Class: 0.0 - 480.0 V)
n8-63 (057E) Expert	Output Voltage Limit P Gain	Sets the proportional gain for output voltage control. Usually it is not necessary to change this setting.	1.00 (0.00 - 100.00)
n8-64 (057F) Expert	Output Voltage Limit I Time	Sets the integral time for output voltage control. Usually it is not necessary to change this setting.	0.040 s (0.000 - 5.000)
n8-65 (065C) Expert	Speed Fdbk Gain @ oV Suppression	Sets the gain of internal speed feedback detection suppression while the overvoltage suppression function is operating as a magnification value. Usually it is not necessary to change this parameter.	1.50 (0.00 - 10.00)
n8-66 (0235) Expert	Output Voltage Limit Filter Time	Sets the filter time constant for output voltage control. Usually it is not necessary to change this setting.	0.020 s (0.000 - 5.000)
n8-74 (05C3)	Light Load Iq Level	Set *n8-48 [Pull-in/Light Load Id Current]* to the percentage of load current (q-axis current) that you will apply, where *E5-03 [Motor Rated Current (FLA)] = a setting value of 100%.*	30% (0 - 255%)
n8-75 (05C4)	Medium Load Iq Level (low)	Set *n8-78 [Medium Load Id Current]* to the percentage of load current (q-axis current) that you will apply, where *E5-03 [Motor Rated Current (FLA)] = a setting value of 100%.*	50% (0 - 255%)
n8-76 (05CD) Expert	Id Switching Filter Time	Sets the filter time constant for d-axis current reference. Usually it is not necessary to change this setting.	200 ms (0 - 5000 ms)
n8-77 (05CE)	Heavy Load Iq Level	Set *n8-49 [Heavy Load Id Current]* to the percentage of load current (q-axis current) that you will apply, where *E5-03 [Motor Rated Current (FLA)] = a setting value of 100%.*	90% (0 - 255%)
n8-78 (05F4)	Medium Load Id Current	Sets the level of the pull-in current for mid-range loads.	0% (-200 - +200%)
n8-79 (05FE)	Pull-in Current @ Deceleration	Sets the pull-in current that can flow during deceleration as a percentage of the *E5-03 [PM Motor Rated Current (FLA)]*. **Note:** When *n8-79 = 0*, the drive will use the value set in *n8-51 [Pull-in Current @ Acceleration]*.	50% (0 - 200%)
n8-84 (02D3) Expert	Polarity Detection Current	Sets the current for processing an estimation of the initial motor magnetic pole as a percentage, where *E5-03 [PM Motor Rated Current]* is the 100% value.	100% (0 - 150%)
n8-91 (02F7)	Id Limit at Voltage Saturation	Sets the limit value of feedback output voltage limit Id operation. Enabled when *n8-87 = 0 [Output Voltage Control Selection = Speed Feedback Form]*. Usually it is not necessary to change this setting.	-50% (-200 - 0%)

3.13 o: Keypad-Related Settings

◆ o1: Keypad Display

No. (Hex.)	Name	Description	Default (Range)
o1-03 (0502)	Frequency Display Unit Selection	Sets the display units for the frequency reference and output frequency. 0 : 0.01Hz units 1 : 0.01% units 2 : min^{-1} (r/min) unit 3 : User Units (o1-09 -o1-11)	0 (0 - 3)
o1-05 (0504) RUN	LCD Contrast Adjustment	Sets the contrast of the LCD display on the keypad.	5 (0 - 10)
o1-09 (051C)	Freq. Reference Display Units	Sets the unit of display for the frequency reference parameters and frequency-related monitors when *o1-03 = 3 [Frequency Display Unit Selection = User Units (o1-09 ~ o1-11)]*. 0 : "WC: inches of water column 1 : PSI: pounds per square inch 2 : GPM: gallons/min 3 : °F: Fahrenheit 4 : ft^3/min: cubic feet/min 5 : m^3/h: cubic meters/hour 6 : L/h: liters/hour 7 : L/s: liters/sec 8 : bar: bar 9 : Pa: Pascal 10 : °C: Celsius 11 : m: meters 12 : ft: feet 13 : L/min: liters/min 14 : m^3/min: cubic meters/min 15 : "Hg: Inch Mercury 16 : kPa: kilopascal 48 : %: Percent 49 : Custom(o1-13~15) 50 : None	50 (0 - 50)
o1-10 (0520)	User Units Maximum Value	Sets the value that the drive shows as the maximum output frequency.	Determined by o1-03 (1 - 60000)
o1-11 (0521)	User Units Decimal Position	Sets the number of decimal places for frequency reference and monitor values. 0 : No Decimal Places (XXXXX) 1 : One Decimal Places (XXXX.X) 2 : Two Decimal Places (XXX.XX) 3 : Three Decimal Places (XX.XXX)	Determined by o1-03 (0 - 3)
o1-13 (3105)	Freq. Reference Custom Unit 1	Sets the first character of the custom unit display when *o1-03 = 3 [Frequency Display Unit Selection = User Units]* and *o1-09 = 49 [Freq. Reference Display Units = Custom (o1-13~15)]*.	41 (20 - 7A)
o1-14 (3106)	Freq. Reference Custom Unit 2	Sets the second character of the custom unit display when *o1-03 = 3 [Frequency Display Unit Selection = User Units]* and *o1-09 = 49 [Freq. Reference Display Units = Custom (o1-13~15)]*.	41 (20 - 7A)
o1-15 (3107)	Freq. Reference Custom Unit 3	Sets the third character of the custom unit display when *o1-03 = 3 [Frequency Display Unit Selection = User Units]* and *o1-09 = 49 [Freq. Reference Display Units = Custom (o1-13~15)]*.	41 (20 - 7A)
o1-17 (3109)	F3 Key Function Selection	Sets the action when you push the F3 key and the LCD display text above the F3 key. 0 : Standard (based on screen) 1 : MONITOR (shortcut) 4 : RLY (ON/OFF H2-XX = A9)	0 (0 - 4)
o1-18 (310A)	User Defined Parameter 1	Lets you set values to use as reference information.	0 (0 - 999)
o1-19 (310B)	User Defined Parameter 2	Lets you set values to use as reference information.	0 (0 - 999)
o1-24 (11AD) RUN	Custom Monitor 1	Sets Custom Monitor 1. You can set a maximum of 12 monitors as user monitors. This parameter is only available on an HOA keypad.	101 (0, 101 - 1299)

No. (Hex.)	Name	Description	Default (Range)
o1-25 (11AE) RUN	Custom Monitor 2	Sets Custom Monitor 2. You can set a maximum of 12 monitors as user monitors. This parameter is only available on an HOA keypad.	102 (0, 101 - 1299)
o1-26 (11AF) RUN	Custom Monitor 3	Sets Custom Monitor 3. You can set a maximum of 12 monitors as user monitors. This parameter is only available on an HOA keypad. **Note:** The default setting changes when *b5-01 [PID Mode Setting]* changes: • *b5-01 = 0 [Disabled]*: 103 • *b5-01 ≠ 0*: 501	Determined by b5-01 (0, 101 - 1299)
o1-27 (11B0) RUN	Custom Monitor 4	Sets Custom Monitor 4. You can set a maximum of 12 monitors as user monitors. This parameter is only available on an HOA keypad.	0 (0, 101 - 1299)
o1-28 (11B1) RUN	Custom Monitor 5	Sets Custom Monitor 5. You can set a maximum of 12 monitors as user monitors. This parameter is only available on an HOA keypad.	0 (0, 101 - 1299)
o1-29 (11B2) RUN	Custom Monitor 6	Sets Custom Monitor 6. You can set a maximum of 12 monitors as user monitors. This parameter is only available on an HOA keypad.	0 (0, 101 - 1299)
o1-30 (11B3) RUN	Custom Monitor 7	Sets Custom Monitor 7. You can set a maximum of 12 monitors as user monitors. This parameter is only available on an HOA keypad.	0 (0, 101 - 1299)
o1-31 (11B4) RUN	Custom Monitor 8	Sets Custom Monitor 8. You can set a maximum of 12 monitors as user monitors. This parameter is only available on an HOA keypad.	0 (0, 101 - 1299)
o1-32 (11B5) RUN	Custom Monitor 9	Sets Custom Monitor 9. You can set a maximum of 12 monitors as user monitors. This parameter is only available on an HOA keypad.	0 (0, 101 - 1299)
o1-33 (11B6) RUN	Custom Monitor 10	Sets Custom Monitor 10. You can set a maximum of 12 monitors as user monitors. This parameter is only available on an HOA keypad.	0 (0, 101 - 1299)
o1-34 (11B7) RUN	Custom Monitor 11	Sets Custom Monitor 11. You can set a maximum of 12 monitors as user monitors. This parameter is only available on an HOA keypad.	0 (0, 101 - 1299)
o1-35 (11B8) RUN	Custom Monitor 12	Sets Custom Monitor 12. You can set a maximum of 12 monitors as user monitors. This parameter is only available on an HOA keypad.	0 (0, 101 - 1299)
o1-36 (11B9) RUN	LCD Backlight Brightness	Sets the intensity of the HOA keypad backlight.	5 (1 - 5)
o1-37 (11BA) RUN	LCD Backlight ON/OFF Selection	Sets the automatic shut off function for the LCD backlight. 0 : OFF 1 : ON	0 (0, 1)
o1-38 (11BB) RUN	LCD Backlight Off-Delay	Sets the time until the LCD backlight automatically turns off.	60 s (10 - 300 s)
o1-39 (11BC) RUN	Show Initial Setup Screen	Sets the function to show the HOA keypad initial setup screen each time you energize the drive. This parameter is only available on an HOA keypad. 0 : No 1 : Yes	1 (0, 1)
o1-40 (11BD) RUN	Home Screen Display Selection	Sets the monitor display mode for the Home screen. This parameter is only available on an HOA keypad. 0 : Custom Monitor 1 : Bar Graph 2 : Analog Gauge 3 : Trend Plot	0 (0 - 3)
o1-41 (11C1) RUN	1st Monitor Area Selection	Sets the horizontal range used to display the monitor set in *o1-24 [Custom Monitor 1]* as a bar graph. This parameter is only available on an HOA keypad. 0 : +/- Area (- o1-42 ~ o1-42) 1 : + Area (0 ~ o1-42)	0 (0 - 1)

No. (Hex.)	Name	Description	Default (Range)
o1-42 (11C2) RUN	1st Monitor Area Setting	Sets the horizontal axis value used to display the monitor set in *o1-24 [Custom Monitor 1]* as a bar graph. This parameter is only available on an HOA keypad.	100.0% (0.0 - 100.0%)
o1-43 (11C3) RUN	2nd Monitor Area Selection	Selects the horizontal range used to display the monitor set in *o1-25 [Custom Monitor 2]* as a bar graph. This parameter is only available on an HOA keypad. 0 : +/- Area (- o1-44 ~ o1-44) 1 : + Area (0 ~ o1-44)	0 (0 - 1)
o1-44 (11C4) RUN	2nd Monitor Area Setting	Sets the horizontal axis value used to display the monitor set in *o1-25 [Custom Monitor 2]* as a bar graph. This parameter is only available on an HOA keypad.	100.0% (0.0 - 100.0%)
o1-45 (11C5) RUN	3rd Monitor Area Selection	Sets the horizontal range used to display the monitor set in *o1-26 [Custom Monitor 3]* as a bar graph. This parameter is only available on an HOA keypad. 0 : +/- Area (- o1-46 ~ o1-46) 1 : + Area (0 ~ o1-46)	0 (0 - 1)
o1-46 (11C6) RUN	3rd Monitor Area Setting	Sets the horizontal axis value used to display the monitor set in *o1-26 [Custom Monitor 3]* as a bar graph. This parameter is only available on an HOA keypad.	100.0% (0.0 - 100.0%)
o1-47 (11C7) RUN	Trend Plot 1 Scale Minimum Value	Sets the horizontal axis minimum value used to display the monitor set in *o1-24 [Custom Monitor 1]* as a trend plot. This parameter is only available on an HOA keypad.	-100.0% (-300.0 - +300.0%)
o1-48 (11C8) RUN	Trend Plot 1 Scale Maximum Value	Sets the horizontal axis maximum value used to display the monitor set in *o1-24 [Custom Monitor 1]* as a trend plot. This parameter is only available on an HOA keypad.	100.0% (-300.0 - +300.0%)
o1-49 (11C9) RUN	Trend Plot 2 Scale Minimum Value	Sets the horizontal axis minimum value used to display the monitor set in *o1-25 [Custom Monitor 2]* as a trend plot. This parameter is only available on an HOA keypad.	-100.0% (-300.0 - +300.0%)
o1-50 (11CA) RUN	Trend Plot 2 Scale Maximum Value	Sets the horizontal axis maximum value used to display the monitor set in *o1-25 [Custom Monitor 2]* as a trend plot. This parameter is only available on an HOA keypad.	100.0% (-300.0 - +300.0%)
o1-51 (11CB) RUN	Trend Plot Time Scale Setting	Sets the time scale (horizontal axis) to display the trend plot. When you change this setting, the drive automatically adjusts the data sampling time. This parameter is only available on an HOA keypad.	300 s (1 - 3600 s)
o1-55 (11EE) RUN	Analog Gauge Area Selection	Sets the range used to display the monitor set in *o1-24 [Custom Monitor 1]* as an analog gauge. This parameter is only available on an HOA keypad. 0 : +/- Area (- o1-56 ~ o1-56) 1 : + Area (0 ~ o1-56)	1 (0, 1)
o1-56 (11EF) RUN	Analog Gauge Area Setting	Sets the value used to display the monitor set in *o1-24 [Custom Monitor 1]* as an analog meter. This parameter is only available on an HOA keypad.	100.0% (0.0 - 100.0%)
o1-58 (3125)	Motor Power Unit Selection	Sets the setting unit for parameters that set the motor rated power. 0 : kW 1 : HP	1 (0, 1)
o1-80 (31BA)	Fault Screen Display	Sets a full-screen display message to show on the keypad when a fault or CPF occurs. 0 : OFF 1 : ON	1 (0, 1)
o1-81 (31BB)	Alarm Screen Display	Sets a full-screen display message to show on the keypad when an alarm occurs. 0 : OFF 1 : ON	0 (0, 1)
o1-82 (31BC)	Message Screen Display	Sets a full-screen display message to show on the keypad when a status message is active. 0 : OFF 1 : ON	0 (0, 1)

◆ o2: Keypad Operation

No. (Hex.)	Name	Description	Default (Range)
o2-02 (0506)	OFF Key Function Selection	Sets the function to use OFF on the keypad to stop the drive when the Run command source for the drive is REMOTE (external) and not assigned to the keypad. 0 : Disabled 1 : Enabled	1 (0, 1)
o2-03 (0507)	User Parameter Default Value	Sets the function to keep the settings of changed parameters as user parameter defaults to use during initialization. 0 : No change 1 : Set defaults 2 : Clear all	0 (0 - 2)
o2-04 (0508)	Drive Model (KVA) Selection	Sets the Drive Model code. Set this parameter after you replace the control board.	Determined by the drive (-)
o2-05 (0509)	Home Mode Freq Ref Entry Mode	Sets the function that makes it necessary to push ↵ to use the keypad to change the frequency reference value while in Drive Mode. 0 : ENTER Key Required 1 : Immediate / MOP-style	0 (0, 1)
o2-06 (050A)	Keypad Disconnect Detection	Sets the function that stops the drive if you disconnect the keypad connection cable from the drive or if you damage the cable while the keypad is the Run command source. 0 : Disabled 1 : Enabled	1 (0, 1)
o2-09 (050D)	Reserved	-	-
o2-19 (061F)	Parameter Write during Uv	Enables and disables the function to change parameter settings during a *Uv [DC Bus Undervoltage]* condition. Use this parameter with 24 V Power Supply option revision B or later. **Note:** If you enable this parameter and use a 24 V Power Supply option that is earlier than revision B, the parameter changes can possibly not write correctly and it can cause a *CPF06 [EEPROM Memory Data Error]* fault. 0 : Disabled 1 : Enabled	0 (0, 1)
o2-23 (11F8) RUN	External 24V Powerloss Detection	Sets the function to give a warning if the backup external 24 V power supply turns off when the main circuit power supply is in operation. 0 : Disable 1 : Enabled	0 (0, 1)
o2-24 (11FE)	LED Light Function Selection	Sets the function to show the LED status rings and keypad LED lamps. **Note:** When you use *A1-03 [Initialize Parameters]* to initialize the drive, the drive will not reset this parameter. 0 : Enable Status Ring & Keypad LED 1 : LED Status Ring Disable 2 : Keypad LED Light Disable	2 (0 - 2)
o2-26 (1563)	Alarm display at ext. 24V power	When you connect a backup external 24 V power supply, this parameter sets the function to trigger an alarm when the main circuit power supply voltage decreases. **Note:** The drive will not run when it is operating from one 24-V external power supply. 0 : No 1 : Yes	1 (0, 1)
o2-27 (1565)	bCE Detection Selection	Sets drive operation if the Bluetooth device is disconnected when you operate the drive in Bluetooth Mode. 0 : Ramp to Stop 1 : Coast to Stop 2 : Fast Stop (Use *C1-09*) 3 : Alarm Only 4 : No Alarm Display	3 (0 - 4)

◆ o3: Copy Keypad Function

No. (Hex.)	Name	Description	Default (Range)
o3-01 (0515)	Copy Keypad Function Selection	Sets the function that saves and copies drive parameters to a different drive with the keypad. 0 : Copy Select 1 : Backup (drive → keypad) 2 : Restore (keypad → drive) 3 : Verify (check for mismatch) 4 : Erase (backup data of keypad)	0 (0 - 4)
o3-02 (0516)	Copy Allowed Selection	Sets the copy function when *o3-01 = 1 [Copy Keypad Function Selection = Backup (drive → keypad)]*. 0 : Disabled 1 : Enabled	0 (0, 1)
o3-04 (0B3E)	Select Backup/Restore Location	Sets the storage location for drive parameters when you back up and restore parameters. This parameter is only available on an HOA keypad. 0 : Memory Location 1 1 : Memory Location 2 2 : Memory Location 3 3 : Memory Location 4	0 (0 - 3)
o3-05 (0BDA)	Select Items to Backup/ Restore	Sets which parameters the drive backs up, restores, and references. This parameter is only available on an HOA keypad. 0 : Standard Parameters 1 : Standard + DWEZ Parameters	1 (0, 1)
o3-06 (0BDE)	Auto Parameter Backup Selection	Sets the function that automatically backs up parameters. This parameter is only available on an HOA keypad. 0 : Disabled 1 : Enabled	1 (0, 1)
o3-07 (0BDF)	Auto Parameter Backup Interval	Sets the interval at which the automatic parameter backup function saves parameters from the drive to the keypad. **Note:** This parameter is only available when using an LCD keypad. 0 : Every 10 minutes 1 : Every 30 minutes 2 : Every 60 minutes 3 : Every 12 hours	1 (0 - 3)

◆ o4: Maintenance Monitors

No. (Hex.)	Name	Description	Default (Range)
o4-01 (050B)	Elapsed Operating Time Setting	Sets the initial value of the cumulative drive operation time in 10-hour units.	0 h (0 - 9999 h)
o4-02 (050C)	Elapsed Operating Time Selection	Sets the condition that counts the cumulative operation time. 0 : U4-01 Shows Total Power-up Time 1 : U4-01 Shows Total RUN Time	1 (0, 1)
o4-03 (050E)	Fan Operation Time Setting	Sets the value from which to start the cumulative drive cooling fan operation time in 10-hour units.	0 h (0 - 9999 h)
o4-05 (051D)	Capacitor Maintenance Setting	Sets the *U4-05 [CapacitorMaintenance]* monitor value.	0% (0 - 150%)
o4-07 (0523)	Softcharge Relay Maintenance Set	Sets the *U4-06 [PreChargeRelayMainte]* monitor value.	0% (0 - 150%)
o4-09 (0525)	IGBT Maintenance Setting	Sets the *U4-07 [IGBT Maintenance]* monitor value.	0% (0 - 150%)
o4-11 (0510)	Fault Trace/History Init (U2/ U3)	Resets the records of Monitors *U2-xx [Fault Trace]* and *U3-xx [Fault History]*. 0 : Disabled 1 : Enabled	0 (0, 1)
o4-12 (0512)	kWh Monitor Initialization	Resets the monitor values for *U4-10 [kWh, Lower 4 Digits]* and *U4-11 [kWh, Upper 5 Digits]*. 0 : No Reset 1 : Reset	0 (0, 1)

No. (Hex.)	Name	Description	Default (Range)
o4-13 (0528)	RUN Command Counter @ Initialize	Resets the monitor values for *U4-02 [Num of Run Commands]*, *U4-24 [Number of Runs (Low)]*, and *U4-25 [Number of Runs (High)]*. 0 : No Reset 1 : Reset	0 (0, 1)
o4-22 (154F) RUN	Time Format	Sets the time display format. This parameter is only available on an HOA keypad. 0 : 24 Hour Clock 1 : 12 Hour Clock 2 : 12 Hour JP Clock	1 (0 - 2)
o4-23 (1550) RUN	Date Format	Sets the date display format. This parameter is only available on an HOA keypad. 0 : YYYY/MM/DD 1 : DD/MM/YYYY 2 : MM/DD/YYYY	2 (0 - 2)
o4-24 (310F) RUN	bAT Detection Selection	Sets operation when the drive detects *bAT [Keypad Battery Low Voltage]* and *TiM [Keypad Time Not Set]*. 0 : Disable 1 : Enable (Alarm Detected) 2 : Enable (Fault Detected)	0 (0 - 2)

◆ o5: Log Function

No. (Hex.)	Name	Description	Default (Range)
o5-01 (1551) RUN	Log Start/Stop Selection	Sets the data log function. This parameter is only available on an HOA keypad. 0 : OFF 1 : ON	0 (0 - 1)
o5-02 (1552) RUN	Log Sampling Interval	Sets the data log sampling cycle. This parameter is only available on an HOA keypad.	100 ms (100 - 60000 ms)
o5-03 (1553) RUN	Log Monitor Data 1	Sets the data log monitor. This parameter is only available on an HOA keypad.	101 (000, 101 - 1299)
o5-04 (1554) RUN	Log Monitor Data 2	Sets the data log monitor. This parameter is only available on an HOA keypad.	102 (000, 101 - 1299)
o5-05 (1555) RUN	Log Monitor Data 3	Sets the data log monitor. This parameter is only available on an HOA keypad.	103 (000, 101 - 1299)
o5-06 (1556) RUN	Log Monitor Data 4	Sets the data log monitor. This parameter is only available on an HOA keypad.	107 (000, 101 - 1299)
o5-07 (1557) RUN	Log Monitor Data 5	Sets the data log monitor. This parameter is only available on an HOA keypad.	108 (000, 101 - 1299)
o5-08 (1558) RUN	Log Monitor Data 6	Sets the data log monitor. This parameter is only available on an HOA keypad. **Note:** When *A1-02 = 0 or 5 [Control Method Selection = V/f, OLV/PM]*, the default setting is *0*.	105 (000, 101 - 1299)
o5-09 (1559) RUN	Log Monitor Data 7	Sets the data log monitor. This parameter is only available on an HOA keypad.	000 (000, 101 - 1299)
o5-10 (155A) RUN	Log Monitor Data 8	Sets the data log monitor. This parameter is only available on an HOA keypad.	000 (000, 101 - 1299)
o5-11 (155B) RUN	Log Monitor Data 9	Sets the data log monitor. This parameter is only available on an HOA keypad.	000 (000, 101 - 1299)
o5-12 (155C) RUN	Log Monitor Data 10	Sets the data log monitor. This parameter is only available on an HOA keypad.	000 (000, 101 - 1299)

3.14 q: DriveWorksEZ Parameters

◆ q1-01 to qx-xx: Reserved for DriveWorksEZ

No. (Hex.)	Name	Description	Default (Range)
q1-01 to qx-xx (1600 - xxxx)	Reserved for DriveWorksEZ	These parameters are reserved for use with DriveWorksEZ.	Refer to "DriveWorksEZ Operation Manual".

3.15 r: DWEZ Connection 1-20

◆ r1-01 to r1-40: DriveWorksEZ Connection Parameters 1 to 20 (Upper / Lower)

No. (Hex.)	Name	Description	Default (Range)
r1-01 to r1-40: (1840 - 1867)	DriveWorksEZ Connection Parameters 1 to 20 (Upper / Lower)	DriveWorksEZ Connection Parameters 1 to 20 (Upper / Lower)	0 (0 - FFFFH)

3.16 S: Special Applications

◆ S1: Dynamic Noise Control

No. (Hex.)	Name	Description	Default (Range)
S1-01 (3200)	Dynamic Noise Control	Sets the function that decreases the output voltage in variable torque applications to decrease audible noise. 0 : Disabled 1 : Enabled	1 (0, 1)
S1-02 (3201)	Voltage Reduction Rate	Sets the rate at which the drive will decrease the output voltage as a percentage of the V/f pattern when operating with no load.	50.0% (50.0 - 100.0%)
S1-03 (3202)	Voltage Restoration Level	Sets the level at which the drive will start to restore the voltage as a percentage of the drive rated torque.	20.0% (0.0 - 90.0%)
S1-04 (3203)	Voltage Restoration Off Level	Sets the level at which voltage restoration for the V/f pattern is complete as a percentage of the drive rated torque. If the output is more than *S1-04*, the drive will control the voltage as specified by the V/f pattern setting. **Note:** The lower limit of this parameter is the value of *S1-03 [Voltage Restoration Level]* + 10.0%.	50.0% (10.0 - 100.0%)
S1-05 (3204)	Volt Restore Sensitivity Time K	Sets the level of sensitivity of the output torque and LPF time constant for the voltage reduction rate. You can adjust the level of sensitivity with the load response.	1.000 s (0.000 - 3.000 s)
S1-06 (3205)	Volt Restore Impact Load Time K	Sets the voltage restoration time constant when you add an impact load.	0.050 s (0.000 - 1.000 s)
S1-07 (324C)	Output Phase Loss Level	Decreases the output phase loss level when Dynamic Noise control is active.	100.0% (10.0 - 100.0%)

◆ S2: Sequence Run Timers

No. (Hex.)	Name	Description	Default (Range)
S2-01 (3206)	Timer 1 Start Time	Sets the start time for timer 1. **Note:** • Default is when *o4-22 = 1 [Time Format = 12 Hour Clock]*. When *o4-22 = 0 [24 Hour Clock]*, default is 00:00. When *o4-22 = 2 [12 Hour JP Clock]*, default is 00:00 AM. • Range is when *o4-22 = 1*. When *o4-22 = 0*, range is 00:00 to 24:00. When *o4-22 = 2*, range is 00:00 AM to 11:59 PM.	12:00 (12:00 AM - 11:59 PM)
S2-02 (3207)	Timer 1 Stop Time	Sets the stop time for timer 1. **Note:** • Default is when *o4-22 = 1 [Time Format = 12 Hour Clock]*. When *o4-22 = 0 [24 Hour Clock]*, default is 00:00. When *o4-22 = 2 [12 Hour JP Clock]*, default is 00:00 AM. • Range is when *o4-22 = 1*. When *o4-22 = 0*, range is 00:00 to 24:00. When *o4-22 = 2*, range is 00:00 AM to 11:59 PM.	12:00 (12:00 AM - 11:59 PM)
S2-03 (3208)	Timer 1 Day Selection	Sets the days for which sequence timer 1 is active. 0 : Timer Disabled 1 : Daily 2 : Mon - Fri 3 : Sat - Sun 4 : Monday 5 : Tuesday 6 : Wednesday 7 : Thursday 8 : Friday 9 : Saturday 10 : Sunday	0 (0 - 10)
S2-04 (3209)	Timer 1 Sequence Selection	Sets the drive response when sequence timer 1 is active. 0 : Digital Out Only 1 : Run 2 : Run - PID Disable 3 : Allow Alternation	0 (0 - 3)

No. (Hex.)	Name	Description	Default (Range)
S2-05 (320A)	Timer 1 Reference Source	Selects the frequency reference source to run the drive when sequence timer 1 is active (only applicable when *S2-04 > 0 [Timer 1 Sequence Selection ≠ Digital Out Only]*). 0 : Operator (d1-01/YA-01) 1 : Operator (d1-02/YA-02) 2 : Operator (d1-03/YA-03) 3 : Operator (d1-04/YA-04) 4 : Terminals 5 : Serial Com 6 : Option PCB 8 : Set by b1-01 **Note:** For reference source 0 to 3, the drive will use *d1-xx* frequency reference when PID mode is disabled and *YA-xx* setpoint when PID is enabled.	0 (0 - 8)
S2-06 (320B)	Timer 2 Start Time	Sets the start time for timer 2. **Note:** • Default is when *o4-22 = 1 [Time Format = 12 Hour Clock]*. When *o4-22 = 0 [24 Hour Clock]*, default is 00:00. When *o4-22 = 2 [12 Hour JP Clock]*, default is 00:00 AM. • Range is when *o4-22 = 1*. When *o4-22 = 0*, range is 00:00 to 24:00. When *o4-22 = 2*, range is 00:00 AM to 11:59 PM.	12:00 (12:00 AM - 11:59 PM)
S2-07 (320C)	Timer 2 Stop Time	Sets the stop time for timer 2. **Note:** • Default is when *o4-22 = 1 [Time Format = 12 Hour Clock]*. When *o4-22 = 0 [24 Hour Clock]*, default is 00:00. When *o4-22 = 2 [12 Hour JP Clock]*, default is 00:00 AM. • Range is when *o4-22 = 1*. When *o4-22 = 0*, range is 00:00 to 24:00. When *o4-22 = 2*, range is 00:00 AM to 11:59 PM.	12:00 (12:00 AM - 11:59 PM)
S2-08 (320D)	Timer 2 Day Selection	Sets the days for which sequence timer 2 is active. 0 : Timer disabled 1 : Daily 2 : Mon - Fri 3 : Sat - Sun 4 : Monday 5 : Tuesday 6 : Wednesday 7 : Thursday 8 : Friday 9 : Saturday 10 : Sunday	0 (0 - 10)
S2-09 (320E)	Timer 2 Sequence Selection	Sets the drive response when sequence timer 2 is active. 0 : Digital Out Only 1 : Run 2 : Run - PID Disable 3 : Allow Alternation	0 (0 - 3)
S2-10 (320F)	Timer 2 Reference Source	Selects the frequency reference source to run the drive when sequence timer 2 is active (only applicable when *S2-09 > 0 [Timer 2 Sequence Selection ≠ 0]*). 0 : Operator (d1-01/YA-01) 1 : Operator (d1-02/YA-02) 2 : Operator (d1-03/YA-03) 3 : Operator (d1-04/YA-04) 4 : Terminals 5 : Serial Com 6 : Option PCB 8 : Set by b1-01 **Note:** For reference source 0 to 3, the drive will use *d1-xx* frequency reference when PID mode is disabled and *YA-xx* setpoint when PID is enabled.	0 (0 - 8)
S2-11 (3210)	Timer 3 Start Time	Sets the start time for timer 3. **Note:** • Default is when *o4-22 = 1 [Time Format = 12 Hour Clock]*. When *o4-22 = 0 [24 Hour Clock]*, default is 00:00. When *o4-22 = 2 [12 Hour JP Clock]*, default is 00:00 AM. • Range is when *o4-22 = 1*. When *o4-22 = 0*, range is 00:00 to 24:00. When *o4-22 = 2*, range is 00:00 AM to 11:59 PM.	12:00 (12:00 AM - 11:59 PM)
S2-12 (3211)	Timer 3 Stop Time	Sets the stop time for timer 3. **Note:** • Default is when *o4-22 = 1 [Time Format = 12 Hour Clock]*. When *o4-22 = 0 [24 Hour Clock]*, default is 00:00. When *o4-22 = 2 [12 Hour JP Clock]*, default is 00:00 AM. • Range is when *o4-22 = 1*. When *o4-22 = 0*, range is 00:00 to 24:00. When *o4-22 = 2*, range is 00:00 AM to 11:59 PM.	12:00 (12:00 AM - 11:59 PM)

No. (Hex.)	Name	Description	Default (Range)
S2-13 (3212)	Timer 3 Day Selection	Sets the days for which sequence timer 3 is active. 0 : Timer Disabled 1 : Daily 2 : Mon - Fri 3 : Sat - Sun 4 : Monday 5 : Tuesday 6 : Wednesday 7 : Thursday 8 : Friday 9 : Saturday 10 : Sunday	0 (0 - 10)
S2-14 (3213)	Timer 3 Sequence Selection	Sets the drive response when sequence timer 3 is active. 0 : Digital Out Only 1 : Run 2 : Run - PID Disable 3 : Allow Alternation	0 (0 - 3)
S2-15 (3214)	Timer 3 Reference Source	Selects the frequency reference source to run the drive when sequence timer 3 is active (only applicable when *S2-14 > 0 [Timer 3 Sequence Selection ≠ Digital Out Only]*). 0 : Operator (d1-01/YA-01) 1 : Operator (d1-02/YA-02) 2 : Operator (d1-03/YA-03) 3 : Operator (d1-04/YA-04) 4 : Terminals 5 : Serial Com 6 : Option PCB 8 : Set by b1-01 **Note:** For reference source 0 to 3, the drive will use *d1-xx* frequency reference when PID mode is disabled and *YA-xx* setpoint when PID is enabled.	0 (0 - 8)
S2-16 (3215)	Timer 4 Start Time	Sets the start time for timer 4. **Note:** • Default is when *o4-22 = 1 [Time Format = 12 Hour Clock]*. When *o4-22 = 0 [24 Hour Clock]*, default is 00:00. When *o4-22 = 2 [12 Hour JP Clock]*, default is 00:00 AM. • Range is when *o4-22 = 1*. When *o4-22 = 0*, range is 00:00 to 24:00. When *o4-22 = 2*, range is 00:00 AM to 11:59 PM.	12:00 (12:00 AM - 11:59 PM)
S2-17 (3216)	Timer 4 Stop Time	Sets the stop time for timer 4. **Note:** • Default is when *o4-22 = 1 [Time Format = 12 Hour Clock]*. When *o4-22 = 0 [24 Hour Clock]*, default is 00:00. When *o4-22 = 2 [12 Hour JP Clock]*, default is 00:00 AM. • Range is when *o4-22 = 1*. When *o4-22 = 0*, range is 00:00 to 24:00. When *o4-22 = 2*, range is 00:00 AM to 11:59 PM.	12:00 (12:00 AM - 11:59 PM)
S2-18 (3217)	Timer 4 Day Selection	Sets the days for which sequence timer 4 is active. 0 : Timer disabled 1 : Daily 2 : Mon - Fri 3 : Sat - Sun 4 : Monday 5 : Tuesday 6 : Wednesday 7 : Thursday 8 : Friday 9 : Saturday 10 : Sunday	0 (0 - 10)

No. (Hex.)	Name	Description	Default (Range)
S2-19 (3218)	Timer 4 Sequence Selection	Sets the drive response when sequence timer 4 is active. 0 : Digital Out Only 1 : Run 2 : Run - PID Disable 3 : Allow Alternation	0 (0 - 3)
S2-20 (3219)	Timer 4 Reference Source	Selects the frequency reference source to run the drive when sequence timer 4 is active (only applicable when *S2-19 > 0 [Timer 4 Sequence Selection ≠ Digital Out Only]*). 0 : Operator (d1-01/YA-01) 1 : Operator (d1-02/YA-02) 2 : Operator (d1-03/YA-03) 3 : Operator (d1-04/YA-04) 4 : Terminals 5 : Serial Com 6 : Option PCB 8 : Set by b1-01 **Note:** For reference source 0 to 3, the drive will use *d1-xx* frequency reference when PID mode is disabled and *YA-xx* setpoint when PID is enabled.	0 (0 - 8)

◆ S3: PI2 Control

No. (Hex.)	Name	Description	Default (Range)
S3-01 (321A)	PI2 Control Enable Selection	Sets when the PI Auxiliary Control function is enabled: 0 : Disabled 1 : Always 2 : Drive Running 3 : Motor Running	0 (0 - 3)
S3-02 (321B) RUN	PI2 Control Transducer Scale	Sets the full scale (10 V or 20 mA) output of the pressure transducer that is connected to the analog input terminals programmed for PI2 (Setpoint or Feedback). **Note:** Parameters *S3-04 [PI2 Control Unit Selection]*, *S3-03 [PI2 Control Decimal Place Pos]*, and *S3-02 [PI2 Control Transducer Scale]* set the unit, resolution, and upper limit.	100.00 (1.00 - 600.00)
S3-03 (321C) RUN	PI2 Control Decimal Place Pos	Sets the decimal place display for secondary PI units. 0 : No Decimal Places (XXXXX) 1 : One Decimal Places (XXXX.X) 2 : Two Decimal Places (XXX.XX) 3 : Three Decimal Places (XX.XXX)	2 (0 - 3)
S3-04 (321D) RUN	PI2 Control Unit Selection	Sets the units displayed for the PI2 Control parameters and monitor. 0 : "WC: inches of water column 1 : PSI: pounds per square inch 2 : GPM: gallons/min 3 : °F: Fahrenheit 4 : ft³/min: cubic feet/min 5 : m³/h: cubic meters/hour 6 : L/h: liters/hour 7 : L/s: liters/sec 8 : bar: bar 9 : Pa: Pascal 10 : °C: Celsius 11 : m: meters 12 : ft: feet 13 : L/min: liters/min 14 : m³/min: cubic meters/min 15 : "Hg: Inch Mercury 16 : kPa: kilopascal 48 : %: Percent 49 : Custom(S3-18~20) 50 : None	48 (0 - 50)
S3-05 (321E) RUN	PI2 Control Setpoint	Sets the PI2 Control target setpoint. **Note:** Parameters *S3-04 [PI2 Control Unit Selection]*, *S3-03 [PI2 Control Decimal Place Pos]*, and *S3-02 [PI2 Control Transducer Scale]* set the unit, resolution, and upper limit.	0.00 (0.00 - 600.00)

No. (Hex.)	Name	Description	Default (Range)
S3-06 (321F) RUN	PI2 Control Proportional Gain	Sets the proportional gain of the PI2 Control. Set this parameter to 0.00 to disable proportional control.	1.00 (0.00 - 25.00)
S3-07 (3220) RUN	PI2 Control Integral Time	Sets the integral time for the suction pressure control. Set this parameter to 0.00 to disable the integrator.	1.0 s (0.0 - 360.0 s)
S3-08 (3221) RUN	PI2 Control Integral Max Limit	Sets the maximum output possible from the integrator.	100.0% (0.0 - 100.0%)
S3-09 (3222) RUN	PI2 Control Output Upper Limit	Sets the maximum output possible from the PI Auxiliary Control function.	100.0% (0.0 - 100.0%)
S3-10 (3223) RUN	PI2 Control Output Lower Limit	Sets the minimum output possible from the PI Auxiliary Control function.	0.0% (-100.0 - +100.0%)
S3-11 (3224)	PI2 Control Output Level Sel	Sets the PI2 controller output direction. 0 : Direct Acting (Normal Output) 1 : Inverse Acting (Reverse Output)	0 (0, 1)
S3-12 (3225) RUN	PI2 Control Disable Mode Sel	Sets what *U5-20 [PI2 Control Output]* will output when disabled. 0 : No Output (0%) 1 : Lower Limit (S3-10) 2 : Setpoint	0 (0 - 2)
S3-13 (3226) RUN	PI2 Control Low Feedback Lvl	Sets the secondary PI low feedback detection level. **Note:** Parameters *S3-04 [PI2 Control Unit Selection]*, *S3-03 [PI2 Control Decimal Place Pos]*, and *S3-02 [PI2 Control Transducer Scale]* set the unit, resolution, and upper limit.	0.00 (0.00 - 600.00)
S3-14 (3227) RUN	PI2 Control Low Feedback Time	Sets the secondary PI low feedback detection delay time in seconds.	1.0 s (0.0 - 25.5 s)
S3-15 (3228) RUN	PI2 Control High Feedback Lvl	Sets the secondary PI high feedback detection level. **Note:** Parameters *S3-04 [PI2 Control Unit Selection]*, *S3-03 [PI2 Control Decimal Place Pos]*, and *S3-02 [PI2 Control Transducer Scale]* set the unit, resolution, and upper limit.	100.00 (0.00 - 600.00)
S3-16 (3229) RUN	PI2 Control High Feedback Time	Sets the secondary PI high feedback detection delay time in seconds.	1.0 s (0.0 - 25.5 s)
S3-17 (322A) RUN	PI2 Control Feedback Det Sel	Sets when the low and high feedback detection multifunction outputs (71h and 72h) for PI2 Control are active. 0 : While PI2 Control Enabled 1 : Always **Note:** Feedback level detection compares PI2 Control Feedback from analog input *H3-xx = 26 [MFAI Function Selection = PI2 Control Feedback]* to these parameters: • *S3-13 [PI2 Control Low Feedback Lvl]* for low feedback level detection • *S3-15 [PI2 Control High Feedback Lvl]* for high feedback level detection	0 (0, 1)
S3-18 (322B) RUN	PI2 Control Custom Unit 1	Sets the first character of the PI2 Control custom unit display when *S3-04 = 49 [PI2 Control Unit Selection = Custom(S3-18~20)]*.	41 (20 - 7A)
S3-19 (322C) RUN	PI2 Control Custom Unit 2	Sets the second character of the PI2 Control custom unit display when *S3-04 = 49 [PI2 Control Unit Selection = Custom(S3-18~20)]*.	41 (20 - 7A)
S3-20 (322D) RUN	PI2 Control Custom Unit 3	Sets the third character of the PI2 Control custom unit display when *S3-04 = 49 [PI2 Control Unit Selection = Custom(S3-18~20)]*.	41 (20 - 7A)

◆ S5: Hand/Off/Auto Operation

No. (Hex.)	Name	Description	Default (Range)
S5-01 (322F)	HAND Frequency Reference Source	Sets the frequency reference source when HAND Mode is active. 0 : HAND Analog Input 1 : HAND Ref S5-05 or PID SP S5-06 2 : Set by b1-01	1 (0 - 2)
S5-02 (3230)	HAND/AUTO Switchover During Run	Sets the function to enable or disable switching between HAND and AUTO Mode during run. 0 : Disabled 1 : Enabled	1 (0, 1)
S5-03 (3231) RUN	HAND Mode PID Selection	Sets the function to enable or disable PI function when HAND mode is active. 0 : Disabled 1 : Enabled **Note:** If *b5-01 = 0 [PID Mode Setting = Disabled]*, the drive disables Hand Mode PID.	0 (0, 1)
S5-04 (3232)	HAND-OFF-AUTO Behavior	Sets the drive behavior when the drive is in HAND Mode, OFF Mode, or AUTO Mode. 0 : Legacy 1 : Normal **Note:** When you set this parameter to 1, the drive will always be in AUTO Mode when you energize the drive.	1 (0, 1)
S5-05 (3233) RUN	HAND Frequency Reference	Sets the frequency reference when HAND Mode is active, PID is disabled and *S5-01 = 1 [HAND Frequency Reference Source = HAND Ref S5-05 or PID SP S5-06]*.	0.00 Hz (0.00 - 400.00 Hz)
S5-06 (3234) RUN	HAND Setpoint	Sets the System Setpoint when HAND Mode is active, PID is enabled and *S5-01 = 1 [HAND Frequency Reference Source = HAND Ref S5-05 or PID SP S5-06]*. **Note:** Parameters *b5-46 [PID Unit Display Selection]*, *b5-38 [PID User Unit Display Scaling]*, and *b5-39 [PID User Unit Display Digits]* set the unit, range, and resolution.	0.0 (0.0 - 6000.0)
S5-07 (3235)	Operation HAND Key	Sets the HAND key on the HOA keypad to let you switch between HAND Mode and AUTO Mode. 0 : Disabled 1 : Enabled	1 (0, 1)
S5-08 (3D31) RUN	HAND Reference Prime Loss Level	Sets the level at which the drive will detect the Loss of Prime in the pump. **Note:** • If these conditions occur at the same time, the drive will detect *LOP [Loss of Prime]*: – The monitor set by *Y1-18 [Prime Loss Detection Method]* ≤ *S5-08* for longer than *Y1-20 [Prime Loss Time]* – Output frequency ≥ *S5-05 [HAND Frequency Reference]* • The drive response to the Loss of Prime condition changes when the *Y1-22 [Prime Loss Selection]* setting changes. • Parameter *Y1-18 [Prime Loss Detection Method]* sets the units for this parameter.	0.0 (0.0 - 1000.0)
S5-10 (3280) RUN	AUTO Key Memory at Power Down	Sets the function to keep the AUTO Mode status when you de-energize the drive. 0 : Disabled 1 : Enabled w/ Memory 2 : AUTO Mode	2 (0 - 2)

◆ S6: Protection

No. (Hex.)	Name	Description	Default (Range)
S6-01 (3236)	Emergency Override Speed	Sets the speed command for emergency override mode when *S6-02 = 0 [Emergency Override Ref Selection = Use S6-01 Reference]*. **Note:** • When *A1-02 = 8 [Control Method Selection = EZOLV]*, *E1-09 [Minimum Output Frequency]* (*E9-04 [Base Frequency]*) sets the lower limit, and *E1-04 [Maximum Output Frequency]* (*E9-02 [Maximum Speed]*) sets the upper limit. • Parameter default is lower-limited to *E1-09* (*E9-04* when *A1-02 = 8*). The default setting will automatically increase when *E1-09* (*E9-04*) > *S6-01*.	1.50 Hz (1.50 - 60.00 Hz)
S6-02 (3237)	Emergency Override Ref Selection	Sets the Emergency Override Speed Source: 0 : Use S6-01 Reference 1 : Use Frequency Reference 2 : System PID Mode 3 : Independent PID Mode	0 (0 - 3)

No. (Hex.)	Name	Description	Default (Range)
S6-03 (323A)	EMOVR Independent PID Scale	Sets the scaling on the Emergency PID Feedback and Setpoint (if programmed) Analog Inputs. **Note:** • *S6-05 [EMOVR Independent PID Unit Digit]* sets the resolution for this parameter. • *S6-04 [EMOVR Independent PID Unit]* sets the units for this parameter.	100.00 (0.10 - 600.00)
S6-04 (323B)	EMOVR Independent PID Unit	0 : "WC: inches of water column 1 : PSI: pounds per square inch 2 : GPM: gallons/min 3 : °F: Fahrenheit 4 : ft^3/min: cubic feet/min 5 : m^3/h: cubic meters/hour 6 : L/h: liters/hour 7 : L/s: liters/sec 8 : bar: bar 9 : Pa: Pascal 10 : °C: Celsius 11 : m: meters 12 : ft: feet 13 : L/min: liters/min 14 : m^3/min: cubic meters/min 15 : "Hg: Inch Mercury 16 : kPa: kilopascal 48 : %: Percent 49 : Custom(b5-68~70) 50 : None	48 (0 - 50)
S6-05 (323C)	EMOVR Independent PID Unit Digit	Sets the number of digits for *S6-06 [EMOVR PID Setpoint]* when *S6-02 = 3[Emergency Override Ref Selection = Independent PID Mode]*. 0 : No Decimal Places (XXXXX) 1 : One Decimal Places (XXXX.X) 2 : Two Decimal Places (XXX.XX) 3 : Three Decimal Places (XX.XXX)	2 (0 - 3)
S6-06 (323D) RUN	EMOVR PID Setpoint	Sets the PID Setpoint when *S6-02 = 3[Emergency Override Ref Selection = Independent PID Mode]*. **Note:** When *S6-02 = 3*: units and resolution are dependent on *S6-04 [EMOVR Independent PID Unit]* and *S6-05 [EMOVR Independent PID Unit Digit]*. Value is internally limited to 300% of *S6-03 [EMOVR Independent PID Scale]*.	0.00 (0 - 600.00)
S6-07 (323E)	EMOVR Fault Suppression Mode	Sets the drive to let Emergency Override disable faults during operation. 0 : Fault Suppression 1 : Test Mode	0 (0, 1)
S6-08 (323F)	EMOVR Drive Enable Input Mode	Sets whether the Drive Enable Input (if programmed) must be inactive (drive is disabled) for Emergency Override to function. 0 : Drive Enable Status Ignored 1 : EMOVRun Only When Drive Disabled **Note:** You must program Drive Enable to a Digital Input for this parameter to have an effect.	0 (0, 1)
S6-09 (3240)	Emergency Override Min Speed	When Emergency Override is active, the output frequency is lower-limited to this value. **Note:** When *A1-02 = 8 [Control Method Selection = EZOLV]*, the range is 0.00 to 120.00 Hz.	0.00 Hz (0.00 - 400.00 Hz)
S6-10 (3241)	Emergency Override Max Speed	When Emergency Override is active, the output frequency is upper-limited to this value. **Note:** • When *A1-02 = 8 [Control Method Selection = EZOLV]*, the range is 0.00 to 120.00 Hz. • Set this parameter to 0.00 Hz to disable the limit.	0.00 Hz (0.00 - 400.00)

No. (Hex.)	Name	Description	Default (Range)
S6-11 (3242) Expert	EMOVR Drive Protection Fault ON	Sets the bit to enable fault detection during Emergency Override. bit 0 : Uv1 - DC Bus Undervoltage bit 1 : CoF - Current Offset Fault bit 2 : dWF1 - EEPROM Memory DWEZ Data Error bit 3 : Err - EEPROM Write Error bit 4 : Reserved bit 5 : Reserved bit 6 : oL2 - Drive Overload bit 7 : oPr - Operator Connection bit 8 : PF - Input Phase Loss bit 9 : Reserved bit 10 : Reserved bit 11 : oH - Heatsink Overheat bit 12 : oH1 - Heatsink Overheat bit 13 : OD - Output Disconnect bit 14 : FAn1 - Cooling Fan Fault bit 15 : ov2 - DC Bus Overvoltage 2 **Note:** The drive sets the bits in Hex.	0 (0 - FFFF)
S6-12 (3243) Expert	EMOVR Motor Protection Fault ON	Sets the bit to enable fault detection during Emergency Override. bit 0 : LF - Output Phase Loss bit 1 : LF2 - Output Current Imbalance bit 2 : oH3 - Motor Overheat PTC Input bit 3 : oH4 - Motor Overheat PTC Input bit 4 : Reserved bit 5 : oL1 - Motor Overload bit 6 : oL3 - Overtorque Detection 1 bit 7 : oL4 - Overtorque Detection 2 bit 8 : oL7 - High Slip Braking Overload bit 9 : Reserved bit 10 : UL3 - Undertorque Detection 1 bit 11 : UL4 - Undertorque Detection 2 bit 12 : UL6 - Motor Underload bit 13 : Reserved bit 14 : oS - Overspeed bit 15 : dEv: Speed Deviation **Note:** The drive sets the bits in Hex.	0 (0 - FFFF)
S6-13 (3244) Expert	EMOVR Option Fault ON	Sets the bit to enable fault detection during Emergency Override. bit 0 : bUS - Option Communication bit 1 : CE - Communication Error bit 2 : E5 - SI-T3 Watch Dog Timer bit 3 : EF0 - Option Card External Fault bit 4 : PE1 - PLC Fault 1 bit 5 : PE2 - PLC Fault 2 bit 6 : nSE - Node Setup Error bit 7 to 15 : Reserved **Note:** The drive sets the bits in Hex.	0 (0 - FFFF)
S6-14 (3245) Expert	EMOVR Application 1 Fault ON	Sets the bit to enable fault detection during Emergency Override. bit 0 : EFx - External Faults bit 1 : Reserved bit 2 : HLCE - High Level Communications Error bit 3 : bAT - HOA Keypad Battery Voltage Low bit 4 : TiM - Keypad Time Not Set bit 5 : bCE - Bluetooth Communication Fault bit 6 : dWF2 - DriveWorksEZ Fault 2 bit 7 : dWF3 - DriveWorksEZ Fault 3 bit 8 : dWFL - DriveWorksEZ Fault bit 9 : MSL - Net Master Lost bit 10 : VLTS - Thermostat Fault bit 11 to 15 : Reserved **Note:** The drive sets the bits in Hex.	0 (0 - FFFF)

No. (Hex.)	Name	Description	Default (Range)
S6-16 (3247)	EMOVR Customer Safety Mode	Sets the status for the customer safety input (when programmed) that must occur for Emergency Override to function. 0 : Customer Safety Ignored 1 : EMOVRun Only When Safety OK 2 : EMOVRun Only When Safety NOT OK **Note:** You must set a customer safety to a Digital Input for this parameter to have an effect.	0 (0 - 2)
S6-17 (3248)	EMOVR BAS Interlock Mode	Sets the status for the BAS Interlock input (when programmed) that must occur for Emergency Override to function. 0 : BAS Interlock Ignored 1 : EMOVRun Only When Interlock OK 2 : EMOVRun When Interlock NOT OK **Note:** Parameter has no effect if BAS Interlock is not programmed to a Digital Input.	0 (0 - 2)
S6-23 (324E)	OV2 Detect Time	Sets the detection time of *ov2 [DC Bus Overvoltage 2]* in 0.1 s increments. **Note:** Set this parameter to 0.0 s to disable *ov2* detection.	10.0 s (0.0 - 1200.0 s)

3.17 T: Motor Tuning

◆ T0: Tuning Mode Selection

No. (Hex.)	Name	Description	Default (Range)
T0-00 (1197)	Tuning Mode Selection	Sets the type of Auto-Tuning. 0 : Motor Parameter Tuning	0 (0)

◆ T1: Induction Motor Auto-Tuning

No. (Hex.)	Name	Description	Default (Range)
T1-00 (0700)	Motor 1/Motor 2 Selection	Sets which motor to tune when motor 1/2 switching is enabled. You can only use the keypad to set this parameter. You cannot use external input terminals to set it. **Note:** This parameter is available when *H1-xx = 16 [Motor 2 Selection]*. The keypad will not show this parameter when *H1-xx ≠ 16*. 1 : Motor 1 (sets E1-xx, E2-xx) 2 : Motor 2 (sets E3-xx, E4-xx)	1 (1, 2)
T1-01 (0701)	Auto-Tuning Mode Selection	Sets the type of Auto-Tuning. 0 : Rotational Auto-Tuning 2 : Stationary Line-Line Resistance	0 (0, 2)
T1-02 (0702)	Motor Rated Power	Uses the units set in *o1-58 [Motor Power Unit Selection]* to set the motor rated output power.	Determined by o2-04 (0.00 - 650.00 HP)
T1-03 (0703)	Motor Rated Voltage	Sets the rated voltage (V) of the motor. Enter the base speed voltage for constant output motors.	Determined by o2-04 (208 V Class: 0.0 - 255.5 V, 480 V Class: 0.0 - 511.0 V)
T1-04 (0704)	Motor Rated Current	Sets the rated current (A) of the motor.	Determined by o2-04 (10% to 200% of the drive rated current)
T1-05 (0705)	Motor Base Frequency	Sets the base frequency (Hz) of the motor.	60.0 Hz (0.0 - 400.0 Hz)
T1-06 (0706)	Number of Motor Poles	Sets the number of motor poles.	4 (2 to 120)
T1-07 (0707)	Motor Base Speed	Sets the motor base speed for Auto-Tuning (min^{-1} (r/min)).	1750 min^{-1} (r/min) (0 - 24000 min^{-1} (r/min))
T1-11 (070B)	Motor Iron Loss	Sets the iron loss for calculating the energy-saving coefficient.	Determined by E2-11 or E4-11 (0 - 65535 W)

◆ T2: PM Motor Auto-Tuning

No. (Hex.)	Name	Description	Default (Range)
T2-01 (0750)	PM Auto-Tuning Selection	Sets the type of Auto-Tuning for PM motors. 0 : Manual Entry w/ Motor Data Sheet 1 : Stationary (Ld, Lq, R) 2 : Stationary (R Only) 4 : Rotational (Ld, Lq, R, back-EMF) 5 : High Frequency Injection	0 (0 - 5)
T2-02 (0751)	PM Motor Code Selection	Enter the PM motor code as specified by the rotation speed and motor output.	FFFF (0000 - FFFF)
T2-03 (0752)	PM Motor Type	Sets the type of PM motor the drive will operate. 0 : IPM motor 1 : SPM motor	1 (0, 1)
T2-04 (0730)	PM Motor Rated Power	Uses the units set in *o1-58 [Motor Power Unit Selection]* to set the PM motor rated output power.	Determined by o2-04 (0.00 - 650.00 HP)

No. (Hex.)	Name	Description	Default (Range)
T2-05 (0732)	PM Motor Rated Voltage	Sets the rated voltage (V) of the motor.	208 V Class: 230.0 V, 480 V Class: 460.0 V (208 V Class: 0.0 - 255.0 V, 480 V Class: 0.0 - 510.0 V)
T2-06 (0733)	PM Motor Rated Current	Sets the rated current (A) of the motor.	Determined by o2-04 (10% to 200% of the drive rated current)
T2-07 (0753)	PM Motor Base Frequency	Sets the base frequency (Hz) of the motor.	60.0 Hz (0.0 - 400.0 Hz)
T2-08 (0734)	Number of PM Motor Poles	Sets the number of motor poles.	4 (2 - 48)
T2-10 (0754)	PM Motor Stator Resistance	Sets the stator resistance for each motor phase. **Note:** This parameter does not set line-to-line resistance.	Determined by T2-02 (0.000 - 65.000 Ω)
T2-11 (0735)	PM Motor d-Axis Inductance	Sets the d-axis inductance of the motor on a per phase basis.	Determined by T2-02 (0.00 - 600.00 mH)
T2-12 (0736)	PM Motor q-Axis Inductance	Sets the q-Axis inductance of the motor on a per phase basis.	Determined by T2-02 (0.00 - 600.00 mH)
T2-13 (0755)	Back-EMF Units Selection	Sets the units that the drive uses to set the induced voltage constant. 0 : mV/(rev/min) 1 : mV/(rad/sec)	0 (0, 1)
T2-14 (0737)	Back-EMF Voltage Constant (Ke)	Sets the motor induced voltage constant (Ke).	Determined by T2-13 (0.0 - 2000.0)
T2-15 (0756)	Pull-In Current Level	Sets the level of the pull-in current as a percentage of *E5-03 [PM Motor Rated Current (FLA)]*. Usually it is not necessary to change this setting.	30% (0 - 120%)

◆ T4: EZ Tuning

No. (Hex.)	Name	Description	Default (Range)
T4-01 (3130)	EZ Tuning Mode Selection	Sets the type of Auto-Tuning for EZOLV control. 0 : Motor Parameter Setting 1 : Line-to-Line Resistance	0 (0, 1)
T4-02 (3131)	Motor Type Selection	Sets the type of motor. 0 : Induction (IM) 1 : Permanent Magnet (PM) 2 : Synchronous Reluctance (SynRM)	0 (0, 1, 2)
T4-03 (3132)	Motor Max Revolutions	Sets the maximum motor revolutions (min^{-1}).	- ((40 to 120 Hz) × 60 × 2 / E9-08)
T4-04 (3133)	Motor Rated Revolutions	Sets rated rotation speed (min^{-1}) of the motor.	- ((40 Hz to 120 Hz) × 60 × 2/ E9-08)
T4-05 (3134)	Motor Rated Frequency	Sets the rated frequency (Hz) of the motor.	Determined by E9-01 and o2-04 (40.0 - 120.0 Hz)
T4-06 (3135)	Motor Rated Voltage	Sets the rated voltage (V) of the motor.	208 V Class: 230.0 V, 480 V Class: 460.0 V (208 V Class: 0.0 - 255.0 V, 480 V Class: 0.0 - 510.0 V)
T4-07 (3136)	Motor Rated Current	Sets the rated current (A) of the motor.	Determined by o2-04 (10% to 200% of the drive rated current)
T4-08 (3137)	Motor Rated Capacity	Sets the motor rated power in the units set in *o1-58 [Motor Power Unit Selection]*.	Determined by E9-10 (0.10 - 650.00 HP)
T4-09 (3138)	Number of Poles	Sets the number of motor poles.	Determined by E9-01 (2 - 48)

3.18 U: Monitors

◆ U1: Operation Status Monitors

No. (Hex.)	Name	Description	MFAO Signal Level
U1-01 (0040)	Frequency Reference	Shows the frequency reference value. Parameter *o1-03 [Keypad Display Unit Selection]* sets the display units. Unit: 0.01 Hz	10 V = Maximum frequency (0 V to +10 V)
U1-02 (0041)	Output frequency	Shows the output frequency. Parameter *o1-03 [Keypad Display Unit Selection]* sets the display units. Unit: 0.01 Hz	10 V = Maximum frequency (0 V to +10 V)
U1-03 (0042)	Output Current	Shows the output current. The keypad shows the value of *U1-03* in amperes (A). When you use serial communications to show the monitor, the current is "8192 = drive rated current (A)". Use the formula: "Numerals being displayed / 8192 × drive rated current (A)" to use the serial communication current value shown in the monitor. Unit: Determined by the drive model. • 0.01 A: 2011 to 2046, 4005 to 4014 • 0.1 A: 2059 to 2273, 4021 to 4302	10 V = Drive rated current
U1-04 (0043)	Control Method	Shows the drive control method. 0 : V/f Control 5 : PM Open Loop Vector 8 : EZ Vector Control	No signal output available
U1-05 (0044)	Motor Speed	Shows the detected motor speed. Parameter *o1-03 [Keypad Display Unit Selection]* sets the display units. Unit: 0.01 Hz	10 V = Maximum frequency (0 V to +10 V)
U1-06 (0045)	Output Voltage Ref	Shows the output voltage reference. Unit: 0.1 V	208 V class: 10 V = 200 Vrms 480 V class: 10 V = 400 Vrms
U1-07 (0046)	DC Bus Voltage	Shows the DC bus voltage. Unit: 1 V	208 V class: 10 V = 400 V 480 V class: 10 V = 800 V
U1-08 (0047)	Output Power	Shows the internally-calculated output power. When you change *A1-02 [Control Method Selection]*, it will also change the signal level of the analog output. • A1-02 = 0: Drive capacity (kW) • A1-02 = 5: *PM Motor Rated Power [E5-02]* (kW) • A1-02 = 8: *Motor Rated Power [E9-07]* (kW) Unit: Determined by the drive model. • 0.01 kW: 2011 to 2046, 4005 to 4014 • 0.1 kW: 2059 to 2273, 4021 to 4302	10 V: Drive capacity (motor rated power) kW (-10 V to +10 V)
U1-09 (0048)	Torque Reference	Shows the internal torque reference value. Unit: 0.1%	10 V = Motor rated torque (0 V to +10 V)
U1-10 (0049)	Input Terminal Status	Shows the status of the MFDI terminal where 1 = (ON) and 0 = (OFF). For example, *U1-10* shows "00000011" when terminals S1 and S2 are ON. bit0 : Terminal S1 (MFDI 1) bit1 : Terminal S2 (MFDI 2) bit2 : Terminal S3 (MFDI 3) bit3 : Terminal S4 (MFDI 4) bit4 : Terminal S5 (MFDI 5) bit5 : Terminal S6 (MFDI 6) bit6 : Terminal S7 (MFDI 7) bit7 : Not used (normal value of 0).	No signal output available

No. (Hex.)	Name	Description	MFAO Signal Level
U1-11 (004A)	Output Terminal Status	Shows the status of the MFDO terminal where 1 = (ON) and 0 = (OFF). For example, *U1-11* shows "00000011" when terminals M1 and M3 are ON. **Note:** When *H2-xx = 100 to 1C4 [Inverse Output of Function]*, the monitor will show the value before inversion. bit 0 : Terminals M1-M2 bit 1 : Terminals M3-M4 bit 2 : Terminals M5-M6 bit 3 : Not used (normal value of 0). bit 4 : Not used (normal value of 0). bit 5 : Not used (normal value of 0). bit 6 : Not used (normal value of 0). bit 7 : Fault relay MA/MB-MC	No signal output available
U1-12 (004B)	Drive Status	Shows drive status where 1 = ON and 0 = OFF. For example, *U1-12* shows "00000101" during run with the Reverse Run command. bit0 : During Run bit1 : During zero-speed bit2 : During reverse bit3 : During fault reset signal input bit4 : During speed agreement bit5 : Drive ready bit6 : During minor fault detection bit7 : During fault detection	No signal output available
U1-13 (004E)	Terminal A1 Level	Shows the signal level of terminal A1. Unit: 0.1%	10 V = 100% (0 V to +10 V)
U1-14 (004F)	Terminal A2 Level	Shows the signal level of terminal A2. Unit: 0.1%	10 V = 100% (0 V to +10 V)
U1-16 (0053)	SFS Output Frequency	Shows the output frequency after soft start. Shows the frequency with acceleration and deceleration times and S-curves. Parameter *o1-03 [Keypad Display Unit Selection]* sets the display units. Unit: 0.01 Hz	10 V = Maximum frequency (0 V to +10 V)
U1-18 (0061)	oPE Fault Parameter	Shows the parameter number that caused the *oPE02 [Parameter Range Setting Error]* or *oPE08 [Parameter Selection Error]*.	No signal output available
U1-19 (0066)	MEMOBUS/Modbus Error Code	Shows the contents of the MEMOBUS/Modbus communication error where 1 = "error" and 0 = "no error". For example, *U1-19* shows "00000001" when there is a CRC error. bit0 : CRC Error bit1 : Data Length Error bit2 : Not used (normal value of 0). bit3 : Parity Error bit4 : Overrun Error bit5 : Framing Error bit6 : Timed Out bit7 : Not used (normal value of 0).	No signal output available
U1-25 (004D)	SoftwareNumber Flash	Shows the FLASH ID.	No signal output available
U1-26 (005B)	SoftwareNumber ROM	Shows the ROM ID.	No signal output available
U1-50 (1199) Expert	Virtual Analog Input	Shows the virtual analog input value.	Determined by H7-40
U1-60 (1089)	System Setpoint	Shows the PID Setpoint. Unit: 0.01% **Note:** Parameters *b5-46 [PID Unit Display Selection]*, *b5-38 [PID User Unit Display Scaling]*, and *b5-39 [PID User Unit Display Digits]* set the unit, range, and resolution.	No signal output available
U1-61 (108A)	System Feedback	Shows the PID Feedback. Unit: 0.01% **Note:** Parameters *b5-46 [PID Unit Display Selection]*, *b5-38 [PID User Unit Display Scaling]*, and *b5-39 [PID User Unit Display Digits]* set the unit, range, and resolution.	No signal output available

No. (Hex.)	Name	Description	MFAO Signal Level
U1-64 (108D)	Motor Speed	Shows the absolute value of the parameter *U1-02 [Output Frequency]* converted to RPM. Unit: 1 RPM	No signal output available
U1-99 (3BAE)	Anti-No-Flow Timer	Shows the value of the anti-no-flow timer. When this value is at the *Y2-24 [Anti-No-Flow Detection Time]* setting, the anti-no-flow feature starts to decrease the output frequency. Unit: 0.1 s	No signal output available

◆ U2: Fault Trace

No. (Hex.)	Name	Description	MFAO Signal Level
U2-01 (0080)	Current Fault	Shows the fault that the drive has when viewing the monitor.	No signal output available
U2-02 (0081)	Previous Fault	Shows the fault that occurred most recently.	No signal output available
U2-03 (0082)	Freq Reference@Fault	Shows the frequency reference at the fault that occurred most recently. Use *U1-01 [Frequency Reference]* to monitor the frequency reference value. Unit: 0.01 Hz	No signal output available
U2-04 (0083)	Output Freq @ Fault	Shows the output frequency at the fault that occurred most recently. Use *U1-02 [Output Frequency]* to monitor the actual output frequency. Unit: 0.01 Hz	No signal output available
U2-05 (0084)	Output Current@Fault	Shows the output current at the fault that occurred most recently. Use *U1-03 [Output Current]* to monitor the output current. The keypad shows the value of *U1-03* in amperes (A). When you use serial communications to show the monitor, the current is "8192 = drive rated current (A)". Use the formula: "Numerals being displayed / 8192 × drive rated current (A)" to use the serial communication current value shown in the monitor. Unit: Determined by the drive model. • 0.01 A: 2011 to 2046, 4005 to 4014 • 0.1 A: 2059 to 2273, 4021 to 4302	No signal output available
U2-06 (0085)	Motor Speed @ Fault	Shows the motor speed at the fault that occurred most recently. Use *U1-05 [Motor Speed]* to monitor the motor speed. Unit: 0.01 Hz	No signal output available
U2-07 (0086)	Output Voltage@Fault	Shows the output voltage reference at the fault that occurred most recently. Use *U1-06 [Output Voltage Ref]* to monitor the output voltage reference. Unit: 0.1 V	No signal output available
U2-08 (0087)	DC Bus Voltage@Fault	Shows the DC bus voltage at the fault that occurred most recently. Use *U1-07 [DC Bus Voltage]* to monitor the DC bus voltage. Unit: 1 V	No signal output available
U2-09 (0088)	Output Power @ Fault	Shows the output power at the fault that occurred most recently. Use *U1-08 [Output Power]* to monitor the output power. Unit: 0.1 kW	No signal output available
U2-10 (0089)	Torque Ref @ Fault	Shows the torque reference at the fault that occurred most recently as a percentage of the motor rated torque. Use *U1-09 [Torque Reference]* to monitor the torque reference. Unit: 0.1%	No signal output available
U2-11 (008A)	Input Terminal Status @ Fault	Shows the status of the MFDI terminals at the most recent fault where 1 = (ON) and 0 = (OFF). For example, *U2-11* shows "00000011" when terminals S1 and S2 are ON. Use *U1-10 [Input Terminal Status]* to monitor the MFDI terminal status. bit 0 : Terminal S1 bit 1 : Terminal S2 bit 2 : Terminal S3 bit 3 : Terminal S4 bit 4 : Terminal S5 bit 5 : Terminal S6 bit 6 : Terminal S7 bit 7 : Not used (normal value of 0).	No signal output available

No. (Hex.)	Name	Description	MFAO Signal Level
U2-12 (008B)	Output Terminal Status @ Fault	Shows the status of the MFDO terminals at the most recent fault where 1 = (ON) and 0 = (OFF). For example, *U2-12* shows "00000011" when terminals M1 and M3 are ON. Use *U1-11 [Output Terminal Status]* to monitor the MFDO terminal status. bit 0 : Terminals M1-M2 bit 1 : Terminals M3-M4 bit 2 : Terminals M5-M6 bit 3 : Not used (normal value of 0). bit 4 : Not used (normal value of 0). bit 5 : Not used (normal value of 0). bit 6 : Not used (normal value of 0). bit 7 : Fault relay MA/MB-MC	No signal output available
U2-13 (008C)	Operation Status @ Fault	Shows the status of the MFDO terminals at the most recent fault where 1 = (ON) and 0 = (OFF). For example, *U2-13* shows "00000001" during run. Use *U1-12 [Drive Status]* to monitor the MFDO terminal status. bit0 : During Run bit1 : During zero-speed bit2 : During reverse bit3 : During fault reset signal input bit4 : During speed agreement bit5 : Drive ready bit6 : During minor fault detection bit7 : During fault detection	No signal output available
U2-14 (008D)	Elapsed Time @ Fault	Shows the cumulative operation time of the drive at the fault that occurred most recently. Use *U4-01 [Cumulative Ope Time]* to monitor the cumulative operation time. Unit: 1 h	No signal output available
U2-15 (07E0)	SFS Output @ Fault	Shows the output frequency after soft start at the fault that occurred most recently. Use *U1-16 [SFS Output Frequency]* to monitor the output frequency after soft start. Unit: 0.01 Hz	No signal output available
U2-16 (07E1)	q-Axis Current@Fault	Shows the q-Axis current of the motor at the fault that occurred most recently. Use *U6-01 [Iq Secondary Current]* to monitor the q-Axis current of the motor. Unit: 0.1 %	No signal output available
U2-17 (07E2)	d-Axis Current@Fault	Shows the d-Axis current of the motor at the fault that occurred most recently. Use *U6-02 [Id ExcitationCurrent]* to monitor the d-Axis current of the motor. Unit: 0.1 %	No signal output available
U2-20 (008E)	Heatsink Temp @Fault	Shows the heatsink temperature at the fault that occurred most recently. Use *U4-08 [Heatsink Temperature]* to monitor the temperature of the heatsink. Unit: 1 °C	No signal output available
U2-21 (1166) Expert	STPo Detect @ Fault	Monitors conditions to detect *STPo [Motor Step-Out Detected]* faults. The bit for each condition is shown as ON or OFF. bit0 : Excessive current bit1 : Induced voltage deviation bit2 : d-axis current deviation bit3 : Motor lock at startup bit4 : Acceleration stall continue bit5 : Acceleration stall repeat bit6 : Not used (normal value of 0). bit7 : Not used (normal value of 0).	No signal output available
U2-30 (3008)	Fault 1 YYYY	Shows the year when the most recent fault occurred.	No signal output available
U2-31 (3009)	Fault 1 MMDD	Shows the month and day when the most recent fault occurred.	No signal output available
U2-32 (300A)	Fault 1 HHMM	Shows the time when the most recent fault occurred.	No signal output available

◆ U3: Fault History

No. (Hex.)	Name	Description	MFAO Signal Level
U3-01 (0090)	1st MostRecent Fault	Shows the fault history of the most recent fault. **Note:** The drive saves this fault history to two types of registers at the same time for the MEMOBUS/Modbus communications.	No signal output available
U3-02 (0091)	2nd MostRecent Fault	Shows the fault history of the second most recent fault. **Note:** The drive saves this fault history to two types of registers at the same time for the MEMOBUS/Modbus communications.	No signal output available
U3-03 (0092)	3rd MostRecent Fault	Shows the fault history of the third most recent fault. **Note:** The drive saves this fault history to two types of registers at the same time for the MEMOBUS/Modbus communications.	No signal output available
U3-04 (0093)	4th MostRecent Fault	Shows the fault history of the fourth most recent fault. **Note:** The drive saves this fault history to two types of registers at the same time for the MEMOBUS/Modbus communications.	No signal output available
U3-05 (0804)	5th MostRecent Fault	Shows the fault history of the fifth most recent fault.	No signal output available
U3-06 (0805)	6th MostRecent Fault	Shows the fault history of the sixth most recent fault.	No signal output available
U3-07 (0806)	7th MostRecent Fault	Shows the fault history of the seventh most recent fault.	No signal output available
U3-08 (0807)	8th MostRecent Fault	Shows the fault history of the eighth most recent fault.	No signal output available
U3-09 (0808)	9th MostRecent Fault	Shows the fault history of the ninth most recent fault.	No signal output available
U3-10 (0809)	10th MostRecentFault	Shows the fault history of the tenth most recent fault.	No signal output available
U3-11 (0094)	ElapsedTime@1stFault	Shows the cumulative operation time when the most recent fault occurred. **Note:** The drive saves this cumulative operation time to two types of registers at the same time for the MEMOBUS/Modbus communications. Unit: 1 h	No signal output available
U3-12 (0095)	ElapsedTime@2ndFault	Shows the cumulative operation time when the second most recent fault occurred. **Note:** The drive saves this cumulative operation time to two types of registers at the same time for the MEMOBUS/Modbus communications. Unit: 1 h	No signal output available
U3-13 (0096)	ElapsedTime@3rdFault	Shows the cumulative operation time when the third most recent fault occurred. **Note:** The drive saves this cumulative operation time to two types of registers at the same time for the MEMOBUS/Modbus communications. Unit: 1 h	No signal output available
U3-14 (0097)	ElapsedTime@4thFault	Shows the cumulative operation time when the fourth most recent fault occurred. **Note:** The drive saves this cumulative operation time to two types of registers at the same time for the MEMOBUS/Modbus communications. Unit: 1 h	No signal output available
U3-15 (080E)	ElapsedTime@5thFault	Shows the cumulative operation time when the fifth most recent fault occurred. Unit: 1 h	No signal output available
U3-16 (080F)	ElapsedTime@6thFault	Shows the cumulative operation time when the sixth most recent fault occurred. Unit: 1 h	No signal output available
U3-17 (0810)	ElapsedTime@7thFault	Shows the cumulative operation time when the seventh most recent fault occurred. Unit: 1 h	No signal output available
U3-18 (0811)	ElapsedTime@8thFault	Shows the cumulative operation time when the eighth most recent fault occurred. Unit: 1 h	No signal output available
U3-19 (0812)	ElapsedTime@9thFault	Shows the cumulative operation time when the ninth most recent fault occurred. Unit: 1 h	No signal output available

No. (Hex.)	Name	Description	MFAO Signal Level
U3-20 (0813)	ElapsedTime@10 Fault	Shows the cumulative operation time when the tenth most recent fault occurred. Unit: 1 h	No signal output available
U3-21 (300B)	Fault 1 YYYY	Shows the year when the most recent fault occurred.	No signal output available
U3-22 (300C)	Fault 1 MMDD	Shows the month and day when the most recent fault occurred.	No signal output available
U3-23 (300D)	Fault 1 HHMM	Shows the time when the most recent fault occurred.	No signal output available
U3-24 (300E)	Fault 2 YYYY	Shows the year when the second most recent fault occurred.	No signal output available
U3-25 (300F)	Fault 2 MMDD	Shows the month and day when the second most recent fault occurred.	No signal output available
U3-26 (3010)	Fault 2 HHMM	Shows the time when the second most recent fault occurred.	No signal output available
U3-27 (3011)	Fault 3 YYYY	Shows the year when the third most recent fault occurred.	No signal output available
U3-28 (3012)	Fault 3 MMDD	Shows the month and day when the third most recent fault occurred.	No signal output available
U3-29 (3013)	Fault 3 HHMM	Shows the time when the third most recent fault occurred.	No signal output available
U3-30 (3014)	Fault 4 YYYY	Shows the year when the fourth most recent fault occurred.	No signal output available
U3-31 (3015)	Fault 4 MMDD	Shows the month and day when the fourth most recent fault occurred.	No signal output available
U3-32 (3016)	Fault 4 HHMM	Shows the time when the fourth most recent fault occurred.	No signal output available
U3-33 (3017)	Fault 5 YYYY	Shows the year when the fifth most recent fault occurred.	No signal output available
U3-34 (3018)	Fault 5 MMDD	Shows the month and day when the fifth most recent fault occurred.	No signal output available
U3-35 (3019)	Fault 5 HHMM	Shows the time when the fifth most recent fault occurred.	No signal output available
U3-36 (301A)	Fault 6 YYYY	Shows the year when the sixth most recent fault occurred.	No signal output available
U3-37 (301B)	Fault 6 MMDD	Shows the month and day when the sixth most recent fault occurred.	No signal output available
U3-38 (301C)	Fault 6 HHMM	Shows the time when the sixth most recent fault occurred.	No signal output available
U3-39 (301D)	Fault 7 YYYY	Shows the year when the seventh most recent fault occurred.	No signal output available
U3-40 (301E)	Fault 7 MMDD	Shows the month and day when the seventh most recent fault occurred.	No signal output available
U3-41 (301F)	Fault 7 HHMM	Shows the time when the seventh most recent fault occurred.	No signal output available
U3-42 (3020)	Fault 8 YYYY	Shows the year when the eighth most recent fault occurred.	No signal output available
U3-43 (3021)	Fault 8 MMDD	Shows the month and day when the eighth most recent fault occurred.	No signal output available
U3-44 (3022)	Fault 8 HHMM	Shows the time when the eighth most recent fault occurred.	No signal output available
U3-45 (3023)	Fault 9 YYYY	Shows the year when the ninth most recent fault occurred.	No signal output available
U3-46 (3024)	Fault 9 MMDD	Shows the month and day when the ninth most recent fault occurred.	No signal output available

No. (Hex.)	Name	Description	MFAO Signal Level
U3-47 (3025)	Fault 9 HHMM	Shows the time when the ninth most recent fault occurred.	No signal output available
U3-48 (3026)	Fault 10 YYYY	Shows the year when the tenth most recent fault occurred.	No signal output available
U3-49 (3027)	Fault 10 MMDD	Shows the month and day when the tenth most recent fault occurred.	No signal output available
U3-50 (3028)	Fault 10 HHMM	Shows the time when the tenth most recent fault occurred.	No signal output available

◆ U4: Maintenance Monitors

No. (Hex.)	Name	Description	MFAO Signal Level
U4-01 (004C)	Cumulative Ope Time	Shows the cumulative operation time of the drive. Use parameter *o4-01 [Elapsed Operating Time Setting]* to reset this monitor. Use parameter *o4-02 [Elapsed Operating Time Selection]* to select the cumulative operation times from: • The time from when the drive is energized until it is de-energized. • The time at which the Run command is turned ON. The maximum value that the monitor will show is *99999*. After this value is more than *99999*, the drive automatically resets it and starts to count from *0* again. Unit: 1 h **Note:** The MEMOBUS/Modbus communication data is shown in 10 h units. Use register 0099H for data in 1 h units.	10 V: 99999 h
U4-02 (0075)	Num of Run Commands	Shows how many times that the drive has received a Run command. Use parameter *o4-13 [RUN Command Counter @ Initialize]* to reset this monitor. The maximum value that the monitor will show is *65535*. After this value is more than *65535*, the drive automatically resets it and starts to count from *0* again. Unit: 1	10 V: 65535 times
U4-03 (0067)	Cooling Fan Ope Time	Shows the cumulative operation time of the cooling fans. Use parameter *o4-03 [Fan Operation Time Setting]* to reset this monitor. The maximum value that the monitor will show is *99999*. After this value is more than *99999*, the drive automatically resets it and starts to count from *0* again. Unit: 1 h **Note:** The MEMOBUS/Modbus communication data is shown in 10 h units. Use register 009BH for data in 1 h units.	10 V: 99999 h
U4-04 (007E)	Cool Fan Maintenance	Shows the cumulative operation time of the cooling fans as a percentage of the replacement life of the cooling fans. Use parameter *o4-03 [Fan Operation Time Setting]* to reset this monitor. Unit: 1% **Note:** Replace the cooling fans when this monitor is 90%.	10 V: 100%
U4-05 (007C)	CapacitorMaintenance	Shows the operation time of the electrolytic capacitors for the main circuit and control circuit as a percentage of the replacement life of the electrolytic capacitors. Use parameter *o4-05 [Capacitor Maintenance Setting]* to reset this monitor. Unit: 1% **Note:** Replace the electrolytic capacitor when this monitor is 90%.	10 V: 100%
U4-06 (07D6)	PreChargeRelayMainte	Shows the operation time of the soft charge bypass relay as a percentage of the replacement life of the soft charge bypass relay. Use parameter *o4-07 [Softcharge Relay Maintenance Set]* to reset this monitor. Unit: 1% **Note:** Replace the drive when this monitor is 90%.	10 V: 100%
U4-07 (07D7)	IGBT Maintenance	Shows the operation time of the IGBTs as a percentage of the replacement life of the IGBTs. Set parameter *o4-09 [IGBT Maintenance Setting]* to reset this monitor. Unit: 1% **Note:** Replace the drive when this monitor is 90%.	10 V: 100%
U4-08 (0068)	Heatsink Temperature	Shows the heatsink temperature of the drive. Unit: 1 °C	10 V: 100 °C

No. (Hex.)	Name	Description	MFAO Signal Level
U4-09 (005E)	LED Check	Turns on the LED Status Ring and all of the keypad LEDs to make sure that the LEDs operate correctly. 1. Set *o2-24 = 0 [LED Light Function Selection = Enable Status Ring & Keypad LED]*. 2. Push ⏎ with *U4-09* shown on the keypad. All LEDs on the keypad and LED Status Ring will turn on. **Note:** When Safety input 2 CH is open (STo), READY will flash.	No signal output available
U4-10 (005C)	kWh, Lower 4 Digits	Shows the lower 4 digits of the watt hour value for the drive. Unit: 1 kWh **Note:** The watt hour is displayed in 9 digits. Monitor *U4-11 [kWh, Upper 5 Digits]* shows the upper 5 digits and *U4-10* shows the lower 4 digits. Example for 12345678.9 kWh: *U4-10*: *678.9 kWh* *U4-11*: *12345 MWh*	No signal output available
U4-11 (005D)	kWh, Upper 5 Digits	Shows the upper 5 digits of the watt hour value for the drive. Unit: 1 MWh **Note:** Monitor *U4-11* shows the upper 5 digits and *U4-10 [kWh, Lower 4 Digits]* shows the lower 4 digits. Example for 12345678.9 kWh: *U4-10*: 678.9 kWh *U4-11*: 12345 MWh	No signal output available
U4-13 (07CF)	Peak Hold Current	Shows the hold value of the peak value (rms) for the drive output current. Use *U4-14 [PeakHold Output Freq]* to show the drive output frequency at the time that the drive holds the output current. The drive will hold the peak hold current at the next start up and restart of the power supply. The drive keeps the held value during baseblock (during stop). The keypad shows the value of *U4-13* in amperes (A). When you use serial communications to show the monitor, the current is "8192 = drive rated current (A)." Use the formula: "Numerals being displayed / 8192 × drive rated current (A)" to use the serial communication current value shown in the monitor. Unit: Determined by the drive model. • 0.01 A: 2011 to 2046, 4005 to 4014 • 0.1 A: 2059 to 2273, 4021 to 4302	No signal output available
U4-14 (07D0)	PeakHold Output Freq	Shows the output frequency at which the peak value (rms) of the drive output current is held. The peak hold current can be monitored by *U4-13 [Peak Hold Current]*. The peak hold output frequency will be cleared at the next startup and restart of the power supply. The drive keeps the value that was under hold during baseblock (during stop). Unit: 0.01 Hz	No signal output available
U4-16 (07D8)	Motor oL1 Level	Shows the integrated value of *oL1 [Motor Overload]* as a percentage of *oL1* detection level. Unit: 0.1%	10 V: 100%
U4-18 (07DA)	Reference Source	Shows the selected frequency reference source. The keypad shows the frequency reference source as "XY-nn" as specified by these rules: X: Frequency reference • 1: *b1-01 [Frequency Reference Selection 1]* Y-nn: Frequency reference source • 0-01: Keypad (*d1-01 [Reference 1]*) • 1-00: Analog input (unassigned) • 1-01: MFAI terminal A1 • 1-02: MFAI terminal A2 • 2-02 to 2-17: Multi-step speed reference (*d1-02 to d1-17 [Reference 2 to 8, Jog Reference]*) • 3-01: Serial communications • 4-01: Communication option card • 7-01: DriveWorksEZ • 9-01: Up/Down command • B-00: Hand Reference 1 (Analog) • B-01: Hand Reference 1 (*S5-05 [HAND Frequency Reference]*)	No signal output available
U4-19 (07DB)	Modbus FreqRef (dec)	Shows the frequency reference sent to the drive from the MEMOBUS/Modbus communications as a decimal. Unit: 0.01%	10 V: Maximum frequency (0 V to +10 V)
U4-20 (07DC)	Option Freq Ref(dec)	Shows the frequency reference sent to the drive from the communication option as a decimal.	10 V: Maximum frequency (0 V to +10 V)

No. (Hex.)	Name	Description	MFAO Signal Level
U4-21 (07DD)	Run Cmd Source	Shows the selected Run command source. The keypad shows the Run command source as "XY-nn" as specified by these rules: X: Run command • 0: OFF • 1: AUTO • 2: HAND • 3: JOG, Emergency Override Y: Run command source • 0: Keypad • 1: Control circuit terminal • 3: Serial communications • 4: Communication option card • 7: DriveWorksEZ nn: Run command limit status data • 00: No limit status. • 01: The Run command stayed ON when the drive stopped in Programming Mode. • 02: The Run command stayed ON when switching from HAND Mode to AUTO Mode. • 03: The Run command is in standby after the drive was energized until the soft charge bypass contactor turns ON. **Note:** The drive will detect *Uv1 [DC Bus Undervoltage]* or *Uv [Undervoltage]* if the soft charge bypass contactor does not turn ON after 10 s. • 04: Will not restart after run stop. • 05: An MFDI terminal cased a Fast stop or you pushed OFF on the keypad to ramp the motor to stop. • 06: *b1-17 = 0 [Run Command at Power Up = Disregard Existing RUN Command]*. • 07: During baseblock while coast to stop with timer. • 08: Frequency reference is less than *E1-09 [Minimum Output Frequency]* during baseblock. • 09: Waiting for the Enter command from PLC.	No signal output available
U4-22 (07DE)	Modbus CmdData (hex)	Shows the operation signal (register 0001H) sent to the drive from MEMOBUS/Modbus communications as a 4-digit hexadecimal number (zero suppress). The keypad shows the operation signal as specified by these rules: bit 0 : Forward run/Stop bit 1 : Reverse run/Stop bit 2 : External fault bit 3 : Fault Reset bit 4 : Multi-function input 1 bit 5 : Multi-function input 2 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 : Not used (normal value of 0). bit C : Not used (normal value of 0). bit D : Not used (normal value of 0). bit E : Not used (normal value of 0). bit F : Not used (normal value of 0).	No signal output available

No. (Hex.)	Name	Description	MFAO Signal Level
U4-23 (07DF)	Option CmdData (hex)	Shows the operation signal (register 0001H) sent to the drive from MEMOBUS/Modbus communications as a 4-digit hexadecimal number. The keypad shows the operation signal as specified by these rules: bit 0 : Forward run/Stop bit 1 : Reverse run/Stop bit 2 : External fault bit 3 : Fault Reset bit 4 : Multi-function input 1 bit 5 : Multi-function input 2 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 : Not used (normal value of 0). bit C : Not used (normal value of 0). bit D : Not used (normal value of 0). bit E : Not used (normal value of 0). bit F : Not used (normal value of 0).	No signal output available
U4-24 (07E6)	Number of Runs (Low)	Shows the lower 4 digits of the drive run count. **Note:** The drive run count is an 8-digit number. Monitor *U4-25 [Number of Runs(High)]* shows the upper 4 digits and *U4-24* shows the lower 4 digits.	No signal output available
U4-25 (07E7)	Number of Runs(High)	Shows the lower 4 digits of the drive run count. **Note:** The drive run count is an 8-digit number. Monitor *U4-25* shows the upper 4 digits and *U4-24 [Number of Runs (Low)]* shows the lower 4 digits.	No signal output available
U4-52 (1592)	Torque Ref from Comm	Shows the torque reference that the drive received from a serial communication option card or from MEMOBUS/Modbus communications as a decimal number. Unit: 0.1%	10 V: 100% (0 V to +10 V)
U4-61 (3096) Expert	Total EMOVR Run Time	Shows the length of time that the drive operated in Emergency Override Mode. Unit: 1 min **Note:** • The maximum value is 60,000 min. • This monitor does not accumulate operation time when *S6-07 = 1 [EMOVR Fault Suppression Mode = Test Mode]*.	No signal output available

◆ U5: PID Monitors

No. (Hex.)	Name	Description	MFAO Signal Level
U5-01 (0057)	PID Feedback	Shows the PID control feedback value. Unit: 0.01% **Note:** Parameters *b5-46 [PID Unit Display Selection]*, *b5-38 [PID User Unit Display Scaling]*, and *b5-39 [PID User Unit Display Digits]* set the unit, range, and resolution.	10 V = Maximum frequency (-10 V to +10 V)
U5-02 (0063)	PID Input	Shows the change between the PID setpoint and PID feedback (the quantity of PID input) as a percentage of the maximum output frequency. Unit: 0.01%	10 V: Maximum frequency (0 V to +10 V)
U5-03 (0064)	PID Output	Shows the PID control output as a percentage of the maximum output frequency. Unit: 0.01%	10 V: Maximum frequency (0 V to +10 V)
U5-04 (0065)	PID Setpoint	Shows the PID setpoint. Unit: 0.01% **Note:** Parameters *b5-46 [PID Unit Display Selection]*, *b5-38 [PID User Unit Display Scaling]*, and *b5-39 [PID User Unit Display Digits]* set the unit, range, and resolution.	10 V = Maximum frequency (-10 V to +10 V)
U5-05 (07D2)	PID DifferentialFdbk	Shows the PID differential feedback value as a percentage of the maximum output frequency. This monitor is available after you set *H3-02 or H3-10 = 16 [Terminal A1/A2 Function Selection = Differential PID Feedback]*. Unit: 0.01%	10 V = Maximum frequency (-10 V to +10 V)

No. (Hex.)	Name	Description	MFAO Signal Level
U5-06 (07D3)	PID Fdbk-Diff PID Fdbk	Shows the difference from calculating "*U5-05 [PID DifferentialFdbk] - U5-01[PID Feedback]*". Unit: 0.01% **Note:** *U5-01 [PID Feedback] = U5-06* when *H3-02 or H3-10 ≠ 16 [Terminal A1/A2 Function Selection ≠ Differential PID Feedback]*.	10 V = Maximum frequency (-10 V to +10 V)
U5-07 (0072)	AUTO Mode Freq Ref	Shows the Frequency reference value at AUTO Mode. Unit: 0.01 Hz **Note:** Parameter *o1-03 [Frequency Display Unit Selection]* sets the display unit.	No signal output available
U5-08 (0073)	HAND Mode Freq Ref	Shows the Frequency reference value at HAND Mode. Unit: 0.01 Hz **Note:** Parameter *o1-03 [Frequency Display Unit Selection]* sets the display unit.	No signal output available
U5-14 (086B)	PID Out2 Upr4 Digits	Shows the custom PI output. Monitor *U5-14* shows the upper four digits and *U5-15 [PID Out2 Lwr4 Digits]* shows the lower four digits. The drive uses *b5-43 [PID Out2 Monitor MAX Upper4 Dig]* and *b5-44 [PID Out2 Monitor MAX Lower4 Dig]* to scale the monitors. Unit: 1 **Note:** Parameter *b5-41 [PID Output 2 Unit]* sets the display unit.	10 V = b5-43 × 10000
U5-15 (086C)	PID Out2 Lwr4 Digits	Shows the custom PI output. Monitor *U5-14* shows the upper four digits and *U5-15 [PID Out2 Lwr4 Digits]* shows the lower four digits. The drive uses *b5-43 [PID Out2 Monitor MAX Upper4 Dig]* and *b5-44 [PID Out2 Monitor MAX Lower4 Dig]* to scale the monitors. Unit: 0.01 **Note:** Parameter *b5-41 [PID Output 2 Unit]* sets the display unit.	b5-43 > 0: 10 V = 10000 b5-43 = 0: 10 V = b5-44
U5-16 (086D)	PI Aux Ctrl Feedback	Shows the PI Auxiliary Control Feedback level from the terminal set for *H3-xx = 27 [PI Auxiliary Control Feedback]*. Unit: PSI **Note:** Parameters *YF-21 [PI Aux Ctrl Level Unit Selection]* and *YF-22 [PI Aux Level Decimal Place Pos]* set the unit and resolution.	No signal output available
U5-17 (086E)	PI2 Control Setpoint	Shows the PI2 Control setpoint. **Note:** Parameters *S3-04 [PI2 Control Unit Selection]* and *S3-03 [PI2 Control Decimal Place Pos]* set the unit and resolution.	10 V = S3-02
U5-18 (086F)	PI2 Control Feedback	Shows the PI2 Control Feedback Level from the terminal set for *H3-xx = 26 [PI2 Control Feedback]*. **Note:** Parameters *S3-04 [PI2 Control Unit Selection]* and *S3-03 [PI2 Control Decimal Place Pos]* set the unit and resolution.	10 V = S3-02
U5-19 (0870)	PI2 Control Input	Shows the PI2 Control input (deviation between PI target and feedback). **Note:** Parameters *S3-04 [PI2 Control Unit Selection]* and *S3-03 [PI2 Control Decimal Place Pos]* set the unit and resolution.	10 V = S3-02
U5-20 (0871)	PI2 Control Output	Shows the PI2 Control output. **Note:** • Parameters *S3-04 [PI2 Control Unit Selection]* and *S3-03 [PI2 Control Decimal Place Pos]* set the unit and resolution. • The drive operation while *H1-xx = A8 or 1A8 [PI2 Control Disable]* changes when the *S3-12 [PI2 Control Disable Mode Sel]* setting changes.	10 V = S3-02
U5-30 (3000)	Time Hr Min HHMM	Shows the current time (Hours and Minutes).	No signal output available
U5-31 (3001)	Date Year	Shows the current year.	No signal output available
U5-32 (3002)	Date Mo Day MMDD	Shows the current date (Month and Date).	No signal output available

No. (Hex.)	Name	Description	MFAO Signal Level
U5-33 (3003)	Date Week	Shows the current date of the week. bit 0 : Sunday bit 1 : Monday bit 2 : Tuesday bit 3 : Wednesday bit 4 : Thursday bit 5 : Friday bit 6 : Saturday bit 7 : Not used (normal value of 0).	No signal output available
U5-79 (3B9A)	PID Feedback Backup	Shows the *PID Feedback Backup [H3-xx = 24]* signal that the drive uses when it loses the *PID Feedback [H3-xx = B]*. Unit: 0.01% **Note:** Display unit and scaling are dependent on System Units.	No signal output available
U5-81 (3B9C)	Diff Level Source	Shows the Differential Feedback signal from the terminal set for *H3-xx = 2D [Differential Level Source]*. Unit: 0.00% **Note:** Unit and display scaling are dependent on System Units.	No signal output available
U5-99 (1599)	Setpoint	Shows the PID setpoint command. Unit: 0.01% **Note:** Parameters *b5-46 [PID Unit Display Selection]*, *b5-38 [PID User Unit Display Scaling]*, and *b5-39 [PID User Unit Display Digits]* set the unit, range, and resolution.	10 V = Maximum frequency (-10 V to +10 V)

◆ U6: Operation Status Monitors

No. (Hex.)	Name	Description	MFAO Signal Level
U6-01 (0051)	Iq Secondary Current	Shows the value calculated for the motor secondary current (q-Axis) as a percentage of the motor rated secondary current. Unit: 0.1%	10 V: Motor secondary rated current (0 V to +10 V)
U6-02 (0052)	Id ExcitationCurrent	Shows the value calculated for the motor excitation current (d-Axis) as a percentage of the motor rated secondary current. Unit: 0.1%	10 V: Motor secondary rated current (0 V to +10 V)
U6-03 (0054)	ASR Input	Shows the ASR input value as a percentage of the maximum frequency. Unit: 0.01%	10 V: Maximum frequency (0 V to +10 V)
U6-04 (0055)	ASR Output	Shows the ASR output value as a percentage of the motor rated secondary current. Unit: 0.01%	10 V: Motor secondary rated current (0 V to +10 V)
U6-05 (0059)	OutputVoltageRef: Vq	Shows the drive internal voltage reference for motor secondary current control (q-Axis). Unit: 0.1 V	208 V class: 10 V = 200 Vrms 480 V class: 10 V = 400 Vrms (-10 V to +10 V)
U6-06 (005A)	OutputVoltageRef: Vd	Shows the drive internal voltage reference for motor excitation current control (d-Axis). Unit: 0.1 V	208 V class: 10 V = 200 Vrms 480 V class: 10 V = 400 Vrms (-10 V to +10 V)
U6-10 (07C1) Expert	ContAxisDeviation Δθ	Shows the deviation between the γδ-Axis that the drive uses for motor control and the dq-Axis. Unit: 0.1 °	5 V: 180 ° (0 V to +10 V)
U6-14 (07CB) Expert	MagPolePosition(Obs)	Shows the value of the flux position estimation. Unit: 0.1 °	10 V: 180 ° (0 V to +10 V)
U6-17 (07D1) Expert	Energy Save Coeff	Shows the total time of direction of motor rotation detections for Speed Estimation Speed Searches. This value adjusts *b3-26 [Direction Determination Level]*. **Note:** Upper limit is +32767 and lower limit is -32767.	No signal output available
U6-21 (07D5)	Offset Frequency	Shows the total value of *d7-01 to d7-03 [Offset Frequency 1 to 3]* selected with *Add Offset Frequency 1 to 3 [H1-xx = 44 to 46]*. Unit: 0.1%	10 V: Maximum Frequency

No. (Hex.)	Name	Description	MFAO Signal Level
U6-31 (007B)	TorqueDetect Monitor	Monitors the torque reference or the output current after applying the filter. Unit: 0.1%	10 V:100%
U6-36 (0720) Expert	Comm Errors-Host	Shows the number of inter-CPU communication errors. When you de-energize the drive, this value resets to 0.	No signal output available
U6-37 (0721) Expert	Comm Errors-Host	Shows the number of inter-CPU communication errors. When you de-energize the drive, this value resets to 0.	No signal output available
U6-57 (07C4)	PolePolarityDeterVal	Shows the change from the integrated current when the drive finds the polarity. Unit: 1 **Note:** If the change from the integrated current is less than 819, increase *n8-84 [Polarity Detection Current]*. *U6-57 = 8192* is equivalent to the motor rated current.	No signal output available
U6-80 (07B0)	Option IP Address 1	Shows the currently available local IP Address (1st octet).	No signal output available
U6-81 (07B1)	Option IP Address 2	Shows the currently available local IP Address (2nd octet).	No signal output available
U6-82 (07B2)	Option IP Address 3	Shows the currently available local IP Address (3rd octet).	No signal output available
U6-83 (07B3)	Option IP Address 4	Shows the currently available local IP Address (4th octet).	No signal output available
U6-84 (07B4)	Online Subnet 1	Shows the currently available subnet mask (1st octet).	No signal output available
U6-85 (07B5)	Online Subnet 2	Shows the currently available subnet mask (2nd octet).	No signal output available
U6-86 (07B6)	Online Subnet 3	Shows the currently available subnet mask (3rd octet).	No signal output available
U6-87 (07B7)	Online Subnet 4	Shows the currently available subnet mask (4th octet).	No signal output available
U6-88 (07B8)	Online Gateway 1	Shows the currently available Gateway address (1st octet).	No signal output available
U6-89 (07B9)	Online Gateway 2	Shows the currently available Gateway address (2nd octet).	No signal output available
U6-90 (07F0)	Online Gateway 3	Shows the currently available Gateway address (3rd octet).	No signal output available
U6-91 (07F1)	Online Gateway 4	Shows the currently available Gateway address (4th octet).	No signal output available
U6-92 (07F2)	Online Speed	Shows the currently available communications speed. 10: 10 Mbps 100: 100 Mbps	No signal output available
U6-93 (07F3)	Online Duplex	Shows the currently available Duplex setting.	No signal output available
U6-98 (07F8)	First Fault	Shows the contents of the most recent communication options fault (Modbus TCP/IP, EtherNet/IP).	No signal output available
U6-99 (07F9)	Current Fault	Shows the contents of current fault from communication options (Modbus TCP/IP, EtherNet/IP).	No signal output available

◆ U8: DriveWorksEZ Monitors

No. (Hex.)	Name	Description	MFAO Signal Level
U8-01 (1950)	DWEZ Monitor 1	Shows DWEZ Monitor 1. (Display range: 0.00% to 999.99%) Unit: 0.01%	10 V = 100%
U8-02 (1951)	DWEZ Monitor 2	Shows DWEZ Monitor 2. (Display range: 0.00% to 999.99%) Unit: 0.01%	10 V = 100%

No. (Hex.)	Name	Description	MFAO Signal Level
U8-03 (1952)	DWEZ Monitor 3	Shows DWEZ Monitor 3. (Display range: 0.00% to 999.99%) Unit: 0.01%	10 V = 100%
U8-04 (1953)	DWEZ Monitor 4	Shows DWEZ Monitor 4. (Display range: 0.00% to 999.99%) Unit: 0.01%	10 V = 100%
U8-05 (1954)	DWEZ Monitor 5	Shows DWEZ Monitor 5. (Display range: 0.00% to 999.99%) Unit: 0.01%	10 V = 100%
U8-06 (1955)	DWEZ Monitor 6	Shows DWEZ Monitor 6. (Display range: 0.00% to 999.99%) Unit: 0.01%	10 V = 100%
U8-07 (1956)	DWEZ Monitor 7	Shows DWEZ Monitor 7. (Display range: -999.9% to +999.99%) Unit: 0.01%	10 V = 100%
U8-08 (1957)	DWEZ Monitor 8	Shows DWEZ Monitor 8. (Display range: -999.9% to +999.99%) Unit: 0.01%	10 V = 100%
U8-09 (1958)	DWEZ Monitor 9	Shows DWEZ Monitor 9. (Display range: -999.9% to +999.99%) Unit: 0.01%	10 V = 100%
U8-10 (1959)	DWEZ Monitor 10	Shows DWEZ Monitor 10.	No signal output available
U8-11 (195A)	DWEZ Version 1	Shows the Upper three digits of the user ID. When you click the setting button on the title bar of the PC tool to open the setting screen, you can confirm the user ID with the primary user ID display.	No signal output available
U8-12 (195B)	DWEZ Version 2	Shows the lower five digits of the user ID. When you click the setting button on the title bar of the PC tool to open the setting screen, you can confirm the user ID with the primary user ID display.	No signal output available
U8-13 (195C)	DWEZ Version 3	Shows the software ID.	No signal output available
U8-18 (1961)	DWEZ Platform Ver	Shows the DriveWorksEZ platform version.	No signal output available
U8-21 (1964)	DWEZ Monitor 21	Shows DWEZ Monitor 21. (Display range: -999.9% to +999.99%) Unit: 0.01%	10 V = 100%
U8-22 (1965)	DWEZ Monitor 22	Shows DWEZ Monitor 22. Unit: The number of decimal points shown is set with Q2-21.	10 V = 100%
U8-23 (1966)	DWEZ Monitor 23	Shows DWEZ Monitor 23. Unit: The number of decimal points shown is set with Q2-22.	10 V = 100%
U8-24 (1967)	DWEZ Monitor 24	Shows DWEZ Monitor 24. Unit: The number of decimal points shown is set with Q2-23.	10 V = 100%
U8-25 (1968)	DWEZ Monitor 25	Shows DWEZ Monitor 25. Unit: The number of decimal points shown is set with Q2-24.	10 V = 100%
U8-31 (196E)	DWEZ Monitor 31	Shows DWEZ Monitor 31. (Display range: 0.00% to 999.99%) Unit: 0.01%	10 V = 100%
U8-32 (196F)	DWEZ Monitor 32	Shows DWEZ Monitor 32. (Display range: 0.00% to 999.99%) Unit: 0.01%	10 V = 100%
U8-33 (1970)	DWEZ Monitor 33	Shows DWEZ Monitor 33. (Display range: 0.00% to 999.99%) Unit: 0.01%	10 V = 100%
U8-34 (1971)	DWEZ Monitor 34	Shows DWEZ Monitor 34. (Display range: 0.00% to 999.99%) Unit: 0.01%	10 V = 100%
U8-35 (1972)	DWEZ Monitor 35	Shows DWEZ Monitor 35. (Display range: 0.00% to 999.99%) Unit: 0.01%	10 V = 100%
U8-36 (1973)	DWEZ Monitor 36	Shows DWEZ Monitor 36. (Display range: 0.00% to 999.99%) Unit: 0.01%	10 V = 100%
U8-37 (1974)	DWEZ Monitor 37	Shows DWEZ Monitor 37. (Display range: -999.9% to +999.99%) Unit: 0.01%	10 V = 100%
U8-38 (1975)	DWEZ Monitor 38	Shows DWEZ Monitor 38. (Display range: -999.9% to +999.99%) Unit: 0.01%	10 V = 100%
U8-39 (1976)	DWEZ Monitor 39	Shows DWEZ Monitor 39. (Display range: -999.9% to +999.99%) Unit: 0.01%	10 V = 100%
U8-40 (1977)	DWEZ Monitor 40	Shows DWEZ Monitor 40.	No signal output available

No. (Hex.)	Name	Description	MFAO Signal Level
U8-51 (1982)	DWEZ Monitor 51	Shows DWEZ Monitor 51. (Display range: -999.9% to +999.99%) Unit: 0.01%	10 V = 100%
U8-52 (1983)	DWEZ Monitor 52	Shows DWEZ Monitor 52. Unit: The number of decimal points shown is set with Q2-41.	10 V = 100%
U8-53 (1984)	DWEZ Monitor 53	Shows DWEZ Monitor 53. Unit: The number of decimal points shown is set with Q2-42.	10 V = 100%
U8-54 (1985)	DWEZ Monitor 54	Shows DWEZ Monitor 54. Unit: The number of decimal points shown is set with Q2-43.	10 V = 100%
U8-55 (1986)	DWEZ Monitor 55	Shows DWEZ Monitor 55. Unit: The number of decimal points shown is set with Q2-44.	10 V = 100%
U8-60 (198B)	RemoteIO Status	Shows the operation status of Remote IO as 1 (ON) and 0 (OFF). If the DriveWorksEZ MEMOBUS master active signal is ON, for example, the monitor shows *U8-60 = 00000001*. bit 0 : Bit 0: DriveWorksEZ MEMOBUS Master Active bit 1 : Not used (normal value of 0) bit 2 : Not used (normal value of 0) bit 3 : Not used (normal value of 0) bit 4 : Not used (normal value of 0) bit 5 : Not used (normal value of 0) bit 6 : Not used (normal value of 0) bit 7 : Not used (normal value of 0)	No signal output available
U8-61 (198C)	RemoteDI Monitor 0-7bit	Shows the operation status of Remote DI1 to DI8 as 1 (ON) and 0 (OFF). If Remote DI1 and DI2 are ON, for example, the monitor shows *U8-61 = 00000011*. bit 0 : Remote DI1 bit 1 : Remote DI2 bit 2 : Remote DI3 bit 3 : Remote DI4 bit 4 : Remote DI5 bit 5 : Remote DI6 bit 6 : Remote DI7 bit 7 : Remote DI8	No signal output available
U8-62 (198D)	RemoteDI Monitor 8-Fbit	Shows the operation status of Remote DI9 to DI16 as 1 (ON) and 0 (OFF). If Remote DI9 and DI10 are ON, for example, the monitor shows *U8-62 = 00000011*. bit 0 : Remote DI9 bit 1 : Remote DI10 bit 2 : Remote DI11 bit 3 : Remote DI12 bit 4 : Remote DI13 bit 5 : Remote DI14 bit 6 : Remote DI15 bit 7 : Remote DI16	No signal output available
U8-63 (198E)	RemoteDO Monitor 0-7bit	Shows the operation status of Remote DO1 to DO8 as 1 (ON) and 0 (OFF). If Remote DO1 and DO2 are ON, for example, the monitor shows *U8-63 = 00000011*. bit 0 : Remote DO1 bit 1 : Remote DO2 bit 2 : Remote DO3 bit 3 : Remote DO4 bit 4 : Remote DO5 bit 5 : Remote DO6 bit 6 : Remote DO7 bit 7 : Remote DO8	No signal output available
U8-64 (198F)	RemoteDO Monitor 8-Fbit	Shows the operation status of Remote DO9 to DO16 as 1 (ON) and 0 (OFF). If Remote DO9 and DO10 are ON, for example, the monitor shows *U8-64 = 00000011*. bit 0 : Remote DO9 bit 1 : Remote DO10 bit 2 : Remote DO11 bit 3 : Remote DO12 bit 4 : Remote DO13 bit 5 : Remote DO14 bit 6 : Remote DO15 bit 7 : Remote DO16	No signal output available

◆ UA: Network Multiplexing

No. (Hex.)	Name	Description	MFAO Signal Level
UA-01 (1EC1)	Network PID Feedback	Shows the Network PID Feedback recognized by the MEMOBUS Network. **Note:** Parameters *b5-46 [PID Unit Display Selection]*, *b5-38 [PID User Unit Display Scaling]*, and *b5-39 [PID User Unit Display Digits]* set the unit, range, and resolution. Unit: 0.01%	No signal output available
UA-02 (1EC2)	Network Activity	Shows network traffic. When this number changes between 0.0% to 100.0%, there is activity. When the number stays near 0.0%, there is no activity. The unit is followed by an identifier that changes as specified by network status: • <->: Drive cannot communicate to other drives • <+>: Drive is a Node on a network • <M>: Drive is the Master on an Network Unit: 0.1%	No signal output available
UA-03 (1EC3)	Time to Alternation	Shows the how much time until the drive requests alternation. This is specified in *Y9-04 [Alternation Mode]*. Unit: 1 min	No signal output available
UA-04 (1EC4)	Running Queue No	Shows the position in the MEMOBUS Multiplex Running Queue.	No signal output available

◆ UC: BACnet Diagnostic Monitors

No. (Hex.)	Name	Description	MFAO Signal Level
UC-01 (3DB0)	BN MSTP Net Health	Shows a number between 0.0% and 100.0% that identifies the health of the MSTP network. This number is dependent on the number of CRC errors, token losses, token retries, and net deadtime perceived. Unit: 0.1%	No signal output available
UC-02 (3DB1)	BACnet Tokens Rx	Shows the number of received MSTP Tokens after you energize the drive. Unit: 1	No signal output available
UC-03 (3DB2)	BACnet Tokens Tx	Shows the number of transmitted MSTP Tokens after you energize the drive. Unit: 1	No signal output available
UC-04 (3DB3)	BACnet Messages Rx	Shows the number of messages with data (non-token, non-polling) received by the drive. Unit: 1	No signal output available
UC-05 (3DB4)	BACnet Messages Tx	Shows the number of messages with data (non-token, non-polling) transmitted by the drive. Unit: 1	No signal output available
UC-06 (3DB5)	MSTP Next Node Addr	Shows the next known node in the MSTP loop. This is the node to which the drive will pass the token.	No signal output available
UC-07 (3DB6)	MSTP Prev Node Addr	Shows the previous known node in the MSTP loop. This is the node from which the drive received the token.	No signal output available
UC-08 (3DB7)	MSTP H MAC Found	Shows the highest MAC address found on the network. This will report the highest value MAC address to which the token was passed by any node on the MSTP loop.	No signal output available
UC-09 (3DB8)	MSTP L MAC Found	Shows the lowest MAC address found on the network. This will report the lowest value MAC address to which the token was passed by any node on the MSTP loop.	No signal output available
UC-10 (3DB9)	MSTP # Nodes Found	Shows the number of unique nodes that transmitted a token on the local MSTP loop. Unit: 1	No signal output available
UC-11 (3DBA)	# of BN COV Sbscrpt	Shows the number of COV subscriptions requested by the nodes on the BACnet network. This is limited to the number of objects that support COV subscriptions. Unit: 1	No Signal output available
UC-12 (3DBB)	MSTP Loop TIme	Shows the number of milliseconds between drive transmitted token and drive token received, showing how long the MSTP loop took to pass the token to all nodes on the MSTP network. Unit: 1 ms	No signal output available
UC-13 (3DBC)	BN MSTP CRC Errors	Shows the number of CRC errors detected after you energize the drive. Unit: 1	No signal output available
UC-14 (3DBD)	BN MSTP Tokens Lost	Shows the number of token losses seen by the unit since power-on. This is sensed by a net deadtime of greater than 500 ms. Unit: 1	No signal output available

No. (Hex.)	Name	Description	MFAO Signal Level
UC-15 (3DBE)	BN MSTP Tokens Retry	Shows the number of token retries seen by the unit since power-on. This is sensed by two subsequent token frames seen from the same node to the same node with the same CRC. Unit: 1	No signal output available
UC-16 (3DBF)	BN MSTP Silence Avg	Shows the average net deadtime (space between active messages), averaged over a 60 packet period. Unit: 1.0 ms	No signal output available

3.19 Y: Application Features

◆ Y1: Application Basics

No. (Hex.)	Name	Description	Default (Range)
Y1-01 (3C00)	Multiplex Mode	Sets the base operation mode of the drive controller. 0 : Drive Only 3 : Memobus Network	0 (0, 3)
Y1-04 (3C03) RUN	Sleep Wake-up Level	Sets the level that feedback must be less than for the time set in *Y1-05 [Sleep Wake-up Level Delay Time]* to start the system. This level also sets the wake up level when the drive is in Sleep Mode. When *Y1-04 < 0*, the feedback level must decrease this amount to less than the setpoint. **Note:** • When PID operates in reverse mode, the feedback value must increase to more than the start level for the time set in *Y1-05* for the system to start. • When *Y2-01 = 5 [Sleep Level Type = Output Frequency (non-PID)]*, the drive will ignore this parameter. • When *Y1-01 = 3 [Multiplex Mode = Memobus Network]*, function is active only on the first drive in the network. Drives that are staging or in alternation will not undergo this process. • Set this parameter to 0.0 to disable the function. • Range is 0.00 to 99.99 with sign-bit "-" or "+" indicating Delta to Setpoint. • Display unit and scaling change when the system units change.	0.0 (-999.9 - +999.9)
Y1-05 (3C04) RUN	Sleep Wake-up Level Delay Time	Sets the drive to start the System again when the feedback decreases to less than *Y1-04 [Sleep Wake-up Level]* for the time set in this parameter.	1 s (0 - 3600 s)
Y1-06 (3C05) RUN	Minimum Speed	Sets the minimum frequency at which the drive will run. The drive applies this setting to HAND and AUTO modes. **Note:** • The unit, decimal place, and setting range change when the *Y1-07 [Minimum Speed Units]* setting changes: – *Y1-07 = 0 [Hz]*: The setting range is 0.0 Hz to *E1-04* Hz. – *Y1-07 = 1 [RPM]*: The setting range is 0 RPM to (*E1-04* × 60) RPM. • When *A1-02 = 8 [Control Method Selection = EZ Vector Control]*, the range is 0.0 Hz to (*E9-02* × 2) Hz.	0.0 Hz Determined by Y1-07
Y1-07 (3C06)	Minimum Speed Units	Sets the units and decimal place for *Y1-06 [Minimum Speed]*. 0 : Hz 1 : RPM **Note:** Changing *Y1-07* will set *Y1-06 [Minimum Speed]* to the default value.	0 (0, 1)
Y1-08 (3C07) RUN	Low Feedback Level	Sets the lower detection level for the PID feedback. **Note:** • Unit and decimal place change when the system units change. • Range is 0.00 to 99.99 with sign-bit "-" indicating Delta to Setpoint.	0.00% (0.00 - 99.99%)
Y1-09 (3C08) RUN	Low Feedback Lvl Fault Dly Time	Sets the delay time for the drive to detect an *LFB [Low Feedback Sensed]* fault after the feedback level decreases to less than the value set in *Y1-08 [Low Feedback Level]*. **Note:** • Set *Y1-10 = 0 [Low Feedback Selection = Fault (and Digital Output)]* to enable this parameter. • When *Y1-01 = 3 [Multiplex Mode = Memobus Network]*, *Y9-18 [Staging Mode]* uses this value to calculate the quick de-stage feedback level.	10 s (0 - 3600 s)
Y1-10 (3C09)	Low Feedback Selection	Sets the drive response when the feedback decreases to less than *Y1-08 [Low Feedback Level]* for longer than the time set in *Y1-09 [Low Feedback Lvl Fault Dly Time]*. 0 : Fault (and Digital Output) 1 : Alarm (and Digital Output) 2 : Digital Output Only	0 (0 - 2)
Y1-11 (3C0A) RUN	High Feedback Level	Sets the upper detection level for the PID feedback. **Note:** • Unit and decimal place change when the system units change. • Range is 0.00 to 99.99 with sign-bit "+" indicating Delta to Setpoint.	0.00% (0.00 - 99.99%)
Y1-12 (3C0B) RUN	High Feedback Lvl Fault Dly Time	Sets the delay time between when the drive detects high feedback until the drive faults on an *HFB [High Feedback Sensed]* fault. **Note:** This parameter is effective only when *Y1-13 = 0 [High Feedback Selection = Fault (and Digital Output)]*.	5 s (0 - 3600 s)

No. (Hex.)	Name	Description	Default (Range)
Y1-13 (3C0C)	High Feedback Selection	Sets the drive response when the feedback increased to more than *Y1-11 [High Feedback Level]* for longer than the time set in *Y1-12 [High Feedback Lvl Fault Dly Time]*. 0 : Fault (and Digital Output) 1 : Alarm (and Digital Output) 2 : Digital Output Only	0 (0 - 2)
Y1-14 (3C0D) RUN	Feedback Hysteresis Level	Sets the hysteresis level for low and high level feedback detection. **Note:** Unit and decimal place change when the system units change.	0.0% (0.0 - 10.00%)
Y1-15 (3C0E) RUN	Maximum Setpoint Difference	Sets a percentage of difference between the setpoint and the feedback. The difference must be more than this value for the time set in *Y1-16 [Not Maintaining Setpoint Time]* to trigger the drive response set in *Y1-17 [Not Maintaining Setpoint Sel]*. **Note:** • Unit and decimal place change when the system units change. • If there is a fault, the drive will coast to a stop. • Set this parameter to 0.0 to disable the function. • This function is only active during run when in Auto Mode. • When *Y1-01 = 3 [Multiplex Mode = Memobus Network]*, the function is active on the lead drive, but will stop all drives running on the network if there is an *NMS [Setpoint Not Met]* fault (system fault).	0.0% (0.0 - 6000.0%)
Y1-16 (3C0F) RUN	Not Maintaining Setpoint Time	Sets the delay time before a Setpoint Not Met condition occurs. The drive must detect the setpoint difference set in *Y1-15 [Maximum Setpoint Difference]* before the timer will start. **Note:** Set *Y1-15 = 0 [Maximum Setpoint Difference = 0]* to disable this function.	60 s (0 - 3600 s)
Y1-17 (3C10)	Not Maintaining Setpoint Sel	Sets the drive response when the feedback increases to more or decreases to less than the setpoint for more than the amount set in *Y1-15 [Maximum Setpoint Difference]*. 0 : Fault (and Digital Output) 1 : Alarm (and Digital Output) 2 : Digital Output Only	0 (0 - 2)
Y1-18 (3C11)	Prime Loss Detection Method	Sets the units and quantity that the drive will use to determine *LOP [Loss of Prime]*. 0 : Current (A) 1 : Power (kW) 2 : Torque (%)	0 (0 - 2)
Y1-19 (3C12) RUN	Prime Loss Level	Sets the level to detect the *LOP [Loss of Prime]* in the pump when in Auto or Sleep Boost Mode. **Note:** • Parameter *Y1-18 [Prime Loss Detection Method]* sets the unit text. • The drive detects *LOP* when the *Y1-18 [Prime Loss Detection Method]* value is less than the level set in this parameter for longer than the time set in *Y1-20 [Prime Loss Time]* and the output frequency is more than the level set in *Y1-21 [Prime Loss Activation Freq]*. • Parameter *Y1-22 [Prime Loss Selection]* sets the drive response to an *LOP* condition.	0.0 (0.0 - 1000.0)
Y1-20 (3C13) RUN	Prime Loss Time	Sets the delay time before the drive detects an *LOP [Loss of Prime]* condition. The timer starts when the drive detects the conditions in *Y1-18 [Prime Loss Detection Method]* and *Y1-19 [Prime Loss Level]*.	20 s (0 - 600 s)
Y1-21 (3C14)	Prime Loss Activation Freq	Sets the frequency level above which the drive enables Loss of Prime detection. **Note:** When this parameter = 0.0 (default), the frequency level is the smaller value between (Fmax - 1 Hz) and (*d2-01 [Frequency Reference Upper Limit]* - 1 Hz).	0.0 Hz (0.0 - 400.0)
Y1-22 (3C15)	Prime Loss Selection	Sets the drive response when the drive is in the Loss of Prime condition. 0 : Fault (and Digital Output) 1 : Alarm (and Digital Output) 2 : Digital Output Only	0 (0 - 2)
Y1-23 (3C16)	Prime Loss Max Restart Time	Sets the time in minutes that the drive will wait before it tries a restart after a restart fails or after it does not do a restart because of a fault. **Note:** During a Loss of Prime Fault restart attempt, this parameter has priority over *L5-04 [Interval Method Restart Time]*.	0.2 min (0.2 - 6000.0 min)
Y1-40 (3C27) RUN	Maximum Speed	Sets the maximum speed. **Note:** • This parameter is not effective when *Y1-40 = 0.0 Hz* or *Y1-40 > E1-04 [Maximum Output Frequency] × d2-01 [Frequency Reference Upper Limit]*. • When *Y1-40 ≠ 0.0 Hz*, this parameter is internally lower-limited to the Minimum Speed (*Y1-06 [Minimum Speed]*, *Y4-12 [Thrust Frequency]*, *d2-02 [Frequency Reference Lower Limit]*).	0.0 Hz (Determined by A1-02)

◆ Y2: PID Sleep and Protection

No. (Hex.)	Name	Description	Default (Range)
Y2-01 (3C64)	Sleep Level Type	Sets the data source that the drive uses to know when to activate the Sleep Function. 0 : Output Frequency 1 : Output Current 2 : Feedback 3 : Output Speed (RPM) 5 : Output Frequency (non-PID) **Note:** • Feedback depends on PID direction operation. • When the Sleep Function is active, the keypad will show the "Sleep" Alarm.	5 (0 - 5)
Y2-02 (3C65) RUN	Sleep Level	Sets the level that the level type set in *Y2-01 [Sleep Level Type]* must be at for the time set in *Y2-03 [Sleep Delay Time]* for the drive to enter Sleep Mode. **Note:** • When you set this parameter to 0.0, this function will not be active. • This function is active only when the drive operates in AUTO Mode. • When *Y2-01 = 5 [Output Frequency (non-PID)]*, the drive will disable the Sleep function when you set this parameter to 0.0. • When *Y2-01 ≠ 5*, the drive will set the sleep level to the largest value from *d2-02 [Frequency Reference Lower Limit]*, *Y1-06 [Minimum Speed]*, and *Y4-12 [Thrust Frequency]* when you set this parameter to 0.0. • When *Y1-01 = 3 [Multiplex Mode = Memobus Network]*, function is active when there is only one drive that operates on the network. • The display unit changes when *Y2-01* changes: – *Y2-01 = 0 [Output Frequency]*: "Hz" – *Y2-01 = 1 [Output Current]*: "A" – *Y2-01 = 2 [Feedback]*: System Units – *Y2-01 = 3 [Output Speed (RPM)]*: "RPM" – *Y2-01 = 5 [Output Frequency (non-PID)]*: "Hz" • When *Y2-01 = 2*, *b5-39 [PID User Unit Display Digits]* sets the decimal places.	0.0 (0.0 - 6000.0)
Y2-03 (3C66) RUN	Sleep Delay Time	Sets the delay time before the drive enters Sleep Mode when the drive is at the sleep level set in *Y2-02 [Sleep Level]*.	5 s (0 - 3600 s)
Y2-04 (3C67) RUN	Sleep Activation Level	Sets the level above which the output frequency must increase to activate the Sleep Function when *Y2-01 = 0, 3, or 5 [Sleep Level Type = Output Frequency, Output Speed (RPM), or Output Frequency (non-PID)]*. **Note:** • When you set this parameter to 0.0, this function will not be active, and the Sleep Function will activate above the minimum speed (largest value from *d2-02 [Frequency Reference Lower Limit]*, *Y1-06 [Minimum Speed]*, and *Y4-12 [Thrust Frequency]*). • The display unit changes when *Y2-01* changes: – *Y2-01 = 0 [Output Frequency]*: "Hz" – *Y2-01 = 1 [Output Current]*: "Hz" – *Y2-01 = 2 [Feedback]*: "Hz" – *Y2-01 = 3 [Output Speed (RPM)]*: "RPM" – *Y2-01 = 5 [Output Frequency (non-PID)]*: "Hz" • When *Y2-01 = 2*, *b5-39 [PID User Unit Display Digits]* sets the decimal places.	0.0 (0.0 - 6000.0)
Y2-05 (3C68) RUN	Sleep Boost Level	Sets the quantity of boost that the drive applies to the setpoint before it goes to sleep. **Note:** • Set this parameter to 0.00 to disable Sleep Boost Function. • The drive will internally limit the value to 25% of system PID scaling. • The display unit and scaling change when the System Units change.	0.00% (0.00 - 600.00%)
Y2-06 (3C69) RUN	Sleep Boost Hold Time	Sets the length of time that the drive will keep the boosted pressure before it goes to sleep.	5.0 s (0.5 - 160.0 s)
Y2-07 (3C6A) RUN	Sleep Boost Max Time	Sets the length of time that the system (feedback) has to reach the boosted setpoint. The system must reach the boosted setpoint in the time set in this parameter, or it will go to sleep.	20.0 s (1.0 - 160.0 s)
Y2-08 (3C6B) RUN	Delta Feedback Drop Level	Sets the level of the PID Error (set-point minus feedback) to deactivate the Sleep Mode operation. **Note:** • Set this parameter to 0.00 to disable the function. • The display unit and scaling change when the System Units change.	0.00% (0.00 - 600.00%)
Y2-09 (3C6C) RUN	Feedback Drop Detection Time	Sets the time during which the software monitors the feedback to detect a flow/no-flow condition. Refer to *Y2-08 [Delta Feedback Drop Level]* for more information.	10.0 s (0.0 - 3600.0 s)

No. (Hex.)	Name	Description	Default (Range)
Y2-23 (3C7A) RUN	Anti-No-Flow Bandwidth	Sets the quantity of PI error bandwidth that the drive uses to detect an Anti- No-Flow condition. **Note:** • Do not set this parameter value too high, because operation can become unstable. • Set this parameter to 0.00 to disable the function.	0.00% (0.00 - 2.00%)
Y2-24 (3C7B) RUN	Anti-No-Flow Detection Time	Sets the time delay before the drive starts the increased deceleration rate after it detects Anti-No-Flow.	10.0 s (1.0 - 60.0 s)
Y2-25 (3C7C) RUN	Anti-No-Flow Release Level	Sets the amount below the setpoint which the feedback must decrease before the drive will disengage Anti-No-Flow and return to normal PI operation. **Note:** The display unit and scaling change when the System Units change.	0.30% (0.00 - 10.00%)

◆ Y4: Application Advanced

No. (Hex.)	Name	Description	Default (Range)
Y4-01 (3CFA) RUN	Pre-Charge Level	Sets the level at which the drive will activate the pre-charge function when the drive is running at the frequency set in *Y4-02 [Pre-Charge Frequency]*. **Note:** • The drive will stop when one of these conditions is true: –The feedback level increases to more than *Y4-01* –The pre-charge time set in *Y4-03 [Pre-Charge Time]* expires • Unit is dependent on System Units.	0.00% (0.00 - 600.00%)
Y4-02 (3CFB) RUN	Pre-Charge Frequency	Sets the frequency at which the pre-charge function will operate. **Note:** • When *A1-02 = 8 [Control Method Selection = EZ Vector Control*, the upper limit is the Hz equivalent of *E9-02 [Maximum Speed]*. • When the MFDI set for *H1-xx = 16 [MFDI Function Selection = Motor 2 Selection]* is activated, the upper limit is the larger of *E1-04 [Maximum Output Frequency]* and *E3-04 [Motor 2 Maximum Output Frequency]*.	0.0 Hz (0.0 - 400.0 Hz)
Y4-03 (3CFC) RUN	Pre-Charge Time	Sets the length of time that the Pre-Charge function will run. **Note:** • Set this parameter to 0.0 to disable the function. • When *Y1-01 = 3 [Multiplex Mode = Memobus Network]*, the function is active only on the first drive to run in the network.	0.0 min (0.0 - 3600.0 min)
Y4-05 (3CFE) RUN	Pre-Charge Loss of Prime Level	Sets the level at which the drive will detect loss of prime in the pump. **Note:** • If these conditions occur at the same time, the drive will detect *LOP [Loss of Prime]*: –*Y1-18 [Prime Loss Detection Method]* ≤ *Y4-05* for longer than *Y1-20 [Prime Loss Time]* –Output frequency ≥ *Y4-02 [Pre-Charge Frequency]* • The drive response to the *LOP* condition changes when the *Y1-22 [Prime Loss Selection]* setting changes. • Parameter *Y1-18 [Prime Loss Detection Method]* sets the units for this parameter.	0.0 A (0.0 - 1000.0 A)
Y4-11 (3D04) RUN	Thrust Acceleration Time	Sets the time at which the drive output frequency will ramp up to the reference frequency set in *Y4-12 [Thrust Frequency]*. **Note:** PID mode is automatically disabled.	1.0 s (0.0 - 600.0 s)
Y4-12 (3D05) RUN	Thrust Frequency	Sets the Thrust Frequency that the drive will use to know which acceleration and deceleration time to use. The drive will accelerate to this frequency in the *Y4-11 [Thrust Acceleration Time]* time and decelerate from this frequency in the *Y4-13 [Thrust Deceleration Time]* time. **Note:** • When *Y4-12* is more than *Y1-06 [Minimum Speed]* and *d2-02 [Frequency Reference Lower Limit]*, *Y4-12* will become the minimum output speed. • When *Y4-12* is the minimum speed and you set a fixed frequency reference (ex. HAND Frequency Reference) to be less than *Y4-12*, the drive will show an *FR<TH [Freq. Reference < Thrust (Y4-12)]* alarm. • When *A1-02 = 8 [Control Method Selection = EZ Vector Control*, the upper limit is the Hz equivalent of *E9-02 [Maximum Speed]*. • When the MFDI set for *H1-xx = 16 [MFDI Function Selection = Motor 2 Selection]* is activated, the upper limit is the larger value between *E1-04 [Maximum Output Frequency]* and *E3-04 [Motor 2 Maximum Output Frequency]*.	0.0 Hz (0.0 - 400.0 Hz)
Y4-13 (3D06) RUN	Thrust Deceleration Time	Sets the length of time necessary for the drive to go from the Thrust Frequency in *Y4-12 [Thrust Frequency]* to stop when Thrust Mode is active. **Note:** When you remove the Run command while the drive is operating in Thrust Mode above the Thrust Frequency, the drive will use the *Y4-13* time when the frequency reference was at or less than the Thrust Frequency.	5.0 s (0.0 - 600.0 s)

No. (Hex.)	Name	Description	Default (Range)
Y4-17 (3D0A) RUN	Utility Start Delay	Sets the length of time that the drive will delay starting at power-up. **Note:** • The specification of Utility Delay is different for different *b1-02 [Run Command Selection 1]* settings: – When *b1-02 = 0 to 3 [Keypad to Option PCB]*, the drive must receive a Run command in 1 s or less at power-up to activate Utility Delay. – When *b1-02 = 7 to 9 [AUTO Command + Term Run to AUTO Command + Option Run]*, the drive must receive a Run command in 1 s or less at power-up OR the drive must be in AUTO Mode in 1 s or less at power-up to activate Utility Delay. • When this function is active, the drive will be unavailable to the MEMOBUS Network (*Y1-01 = 3 [Multiplex Mode = Memobus Network]*) and will force the HOME screen text to show *[Idle: No AUTO Cmd]*. • Set this parameter to 0.0 to disable the function.	0.0 min (0.0 - 1000.0 min)
Y4-18 (3D0B) RUN	Differential Level	Sets the maximum difference that the drive will allow when it subtracts the Differential Feedback from the Primary PID Feedback. **Note:** • The drive will respond as specified by the setting in *Y4-20 [Differential Level Detection Selection]* when the difference increases to more than the value set in this parameter for the time set in *Y4-19 [Differential Level Detection Time]*. • Set this parameter to 0.00 to disable Differential Feedback Detection. • The display unit and decimal place change when the System Units change.	0.00% (-99.99 - +99.99%)
Y4-19 (3D0C) RUN	Differential Lvl Detection Time	Sets the length of time that the difference between PID Feedback and the Differential Feedback must be more than *Y4-18 [Differential Level]* before the drive will respond as specified by *Y4-20 [Differential Level Detection Selection]*.	10 s (0 - 3600 s)
Y4-20 (3D0D) RUN	Differential Level Detection Sel	Sets the drive response during a Differential Level Detected condition. 0 : Fault (and Digital Out) 1 : Alarm (and Digital Out) 2 : Digital Out Only	0 (0 - 2)
Y4-22 (3D0F) RUN	Low City On-Delay Time	Sets the length of time that the drive will wait to stop when the drive detects a Low City Pressure condition.	10 s (1 - 1000 s)
Y4-23 (3D10) RUN	Low City Off-Delay Time	Sets the length of time that the drive will wait to start again after you clear a Low City Pressure condition.	5 s (0 - 1000 s)
Y4-24 (3D11) RUN	Low City Alarm Text	Sets the alarm message to show on the keypad when the drive detects a Low City Pressure condition. 0 : Low City Pressure 1 : Low Suction Pressure 2 : Low Water in Tank	0 (0 - 2)
Y4-36 (3D1D) RUN	Pressure Reached Exit Conditions	Sets how the digital output responds to Feedback changes after it activates. 0 : Hysteresis Above & Below 1 : Hysteresis 1-Way	1 (0, 1)
Y4-37 (3D1E) RUN	Pressure Reached Hysteresis Lvl	Sets the hysteresis level that will cause the drive to exit the Pressure Reached condition. **Note:** The display unit and decimal place change when the System Units change.	0.30% (0.1 - 10.00%)
Y4-38 (3D1F) RUN	Pressure Reached On Delay Time	Sets the length of time that the drive will wait before it activates the Pressure Reached condition.	1.0 s (0.1 - 60.0 s)
Y4-39 (3D20) RUN	Pressure Reached Off Delay Time	Sets the length of time that the drive will wait before it deactivates the Pressure Reached condition.	1.0 s (0.1 - 60.0 s)
Y4-40 (3D21) RUN	Pressure Reached Detection Sel	Sets the drive status that triggers the Pressure Reached Detection digital output. 0 : Always 1 : Drive Running 2 : Run Command	0 (0 - 2)
Y4-41 (3D22) RUN	Diff Lvl Src Fdbk Backup Select	Sets the function to enable or disable *Differential Level Source [H3-xx = 2D]* as the backup transducer if there is a failure with the primary PID Feedback transducer *[H3-xx = B]* and the PID Feedback Backup transducer *[H3-xx = 24]* is not available. 0 : Disabled 1 : Enabled	0 (0, 1)

No. (Hex.)	Name	Description	Default (Range)
Y4-42 (3D23)	Output Disconnect Detection Sel	Sets the drive response when you open the output disconnect then connect it again. 0 : Disabled 1 : Alarm - Speed Search 2 : Alarm - Start at Zero 3 : Fault **Note:** • When the Output Disconnect is active, the drive internally disables Output Phase Loss Detection of more than one phase. • When *A1-02 = 8 [Control Method Selection = EZ Vector Control]*, the drive enables the Output Disconnect for IM motors only (*E9-01 = 0 [Motor Type Selection = Induction (IM)*).	0 (0 - 3)
Y4-43 (3D24)	Output Disconnect Inject Current	Sets the level of DC injection current during output disconnect as a percentage of the drive rated current.	30% (5 - 50%)

◆ Y9: Network Multiplex Options

No. (Hex.)	Name	Description	Default (Range)
Y9-01 (3DF4)	Lead Drive Selection	Sets how to select the new Lead Drive. **Note:** • When *Y9-01 = 1*, MEMOBUS network uses monitor *U4-01 [Cumulative Ope Time]*. The settings of *o4-01 [Elapsed Operating Time Setting]* and *o4-02 [Elapsed Operating Time Selection]* will have a direct effect on this parameter. Yaskawa recommends to keep *o4-02 = 1 [U4-01 Shows Total RUN Time]*. • When *U4-01* > 65535 hours, alternation timer has reached its maximum value. Yaskawa recommends to reset the runtime hours (*o4-01*) on all the drives to keep the function working correctly. 0 : Next Available 1 : Lowest Runtime 2 : Stop History	1 (0 - 2)
Y9-02 (3DF5)	System Feedback Source	Sets the signal to use for PID Feedback when *Y1-01 = 3 [Multiplex Mode = Memobus Network]*. 0 : Analog Only 1 : Ana->Net, No Alarm 2 : Ana->Net, Alarm 3 : Network Only	0 (0 - 3)
Y9-03 (3DF6) RUN	Alternation Time	Sets how much time a drive will request for the alternation, which is set in *Y9-04 [Alternation Mode]*. **Note:** • You can use this parameter only when *Y1-03 = 3 [Multiplex Mode = Memobus Network]*. • Parameter *Y9-19 [Alternation Time Unit]* sets the unit text. • Set this parameter to 0 to disable the alternation function.	24 H (0 - 1000 H)
Y9-04 (3DF7)	Alternation Mode	Sets how the drive does alternation. **Note:** You can use this parameter only when *Y1-03 = 3 [Multiplex Mode = Memobus Network]*. 0 : FIFO Auto 1 : FIFO Forced 2 : LIFO 3 : FIFO @Sleep	0 (0 - 3)
Y9-05 (3DF8)	Lag Drive Mode	Sets the function of the Lag Drives. 0 : Fixed Speed 2 : Turn Off 3 : Follow Lead Speed	0 (0 - 3)
Y9-06 (3DF9) RUN	Lag Fixed Speed	Sets the speed at which the drive will run when the drive set in *Y9-05 = 0 [Lag Drive Mode = Fixed Speed]* changes from a lead to a lag and the time set in *Y9-07 [Lag Fixed Speed Delay]* is expired.	55.0 Hz (0.0 - 400.0 Hz)
Y9-07 (3DFA) RUN	Lag Fixed Speed Delay	Sets how long the drive holds its current speed before the drive operates as specified in *Y9-05 [Lag Drive Mode]* when the drive changes from a Lead to a Lag and *Y9-05 ≠ 1 [Fixed Speed]*.	5 s (0 - 1000 s)
Y9-08 (3DFB)	Staging Mode	Sets the method to determine when it is necessary to stage a new drive to keep the setpoint. 0 : Output Frequency 1 : Feedback 2 : Feedback + Fout	0 (0 - 2)

No. (Hex.)	Name	Description	Default (Range)
Y9-09 (3DFC) RUN	Staging Frequency Level	Sets the level above which the output frequency must increase before the Lead Drive will send a request for a new Lead Drive through the MEMOBUS network. **Note:** • When *A1-02 = 8 [Control Method Selection = EZOLV]*, the range is 0.0 - 120.0 Hz. • Parameter *Y9-08 [Staging Mode]* sets the condition to request for a new Lead Drive. – *Y9-08 = 0 [Output Frequency]*: The output frequency must increase to more than this level for the time set in *Y9-11 [Staging Delay Time]* to request for a new Lead Drive. – *Y9-08 = 2 [Feedback + Fout]*: The delta feedback (setpoint minus feedback) must be more than *Y9-10 [Staging Delta Feedback Level]* level for the time set in *Y9-11 [Staging Delay Time]* and the output frequency must increase to more than this level to request for a new Lead Drive.	59.5 Hz (0.0 - 400.0 Hz)
Y9-10 (3DFD) RUN	Staging Delta Feedback Level	Sets the level above which the difference between the setpoint and feedback must increase before the lead drive will send a request for a new Lead Drive through the MEMOBUS network. **Note:** • When *b5-09 = 0 [PID Output Level Selection = Normal Output (Direct Acting)]*, the drive uses the setpoint minus the feedback to determine the delta feedback level. • When *b5-09 = 1 [Reverse Output (Reverse Acting)]*, the drive uses the feedback minus the setpoint to determine the delta feedback level. • Parameter *Y9-08 [Staging Mode]* sets the condition to request for a new Lead Drive: – *Y9-08 = 1 [Feedback]*: The difference between the setpoint and feedback must increase to more than this level for the time set in *Y9-11 [Staging Delay Time]* to request for a new Lead Drive. – *Y9-08 = 2 [Feedback + Fout]*: The difference between the setpoint and feedback must increase to more than this level and the output frequency must be more than *Y9-09 [Staging Frequency Level]* for the time set in *Y9-11 [Staging Delay Time]* to request for a new Lead Drive. • Parameters *b5-46 [PID Unit Display Selection]*, *b5-38 [PID User Unit Display Scaling]*, and *b5-39 [PID User Unit Display Digits]* set the unit, range, and resolution.	0.40 (0.00 - 600.00)
Y9-11 (3DFE) RUN	Staging Delay Time	Sets the delay time before adding a new Lead Drive to the system.	10 s (0 - 3600 s)
Y9-12 (3DFF)	De-staging Mode	Sets the method to determine when it is necessary to de-stage the previous Lead Drive to keep the setpoint. 0 : Output Frequency 1 : Feedback 2 : Feedback + Fout	0 (0 - 2)
Y9-13 (3E00) RUN	De-staging Frequency Level	Sets the level below which the output frequency must decrease before the Lead Drive will request to be removed from the system through the MEMOBUS network. **Note:** • When *A1-02 = 8 [Control Method Selection = EZOLV]*, the range is 0.0 - 120.0 Hz. • Parameter *Y9-12 [De-staging Mode]* sets the condition to request for the removal: – *Y9-12 = 0 [Output Frequency]*: The output frequency must decrease to less than this level for the time set in *Y9-15 [De-staging Delay Time]* to request for the removal. – *Y9-12 = 2 [Feedback + Fout]*: The output frequency must decrease to less than this level and the difference between the feedback and setpoint must be more than *Y9-14 [De-staging Delta Feedback Level]* for the time set in *Y9-15 [De-staging Delay Time]* to request for the removal.	40.0 Hz (0.0 - 400.0 Hz)
Y9-14 (3E01) RUN	De-staging Delta Feedback Level	Sets the level above which the difference between the feedback and setpoint must increase before the lead drive will request to be removed from the system through the MEMOBUS network. **Note:** • When *b5-09 = 0 [PID Output Level Selection = Normal Output (Direct Acting)]*, the drive uses the feedback minus the setpoint to determine the delta feedback level. • When *b5-09 = 1 [Reverse Output (Reverse Acting)]*, the drive uses the setpoint minus the feedback to determine the delta feedback level. • Parameter *Y9-12 [De-staging Mode]* sets the condition to request for the removal: – *Y9-12 = 1 [Feedback]*: The difference between the feedback and setpoint must increase to more than this level for the time set in *Y9-15 [De-staging Delay Time]* to request for the removal. – *Y9-12 = 2 [Feedback + Fout]*: The difference between the feedback and setpoint must increase to more than this level and the output frequency must be less than *Y9-13 [De-staging Frequency Level]* level for the time set in *Y9-15 [De-staging Delay Time]* to request for the removal. • Parameters *b5-46 [PID Unit Display Selection]*, *b5-38 [PID User Unit Display Scaling]*, and *b5-39 [PID User Unit Display Digits]* set the unit, range, and resolution.	0.00 (0.00 - 600.00)
Y9-15 (3E02) RUN	De-staging Delay Time	Sets the delay time before removing the Lead Drive from the system.	10 s (0 - 3600 s)
Y9-16 (3E03) RUN	Stabilization Time	Sets the time used to keep the system stable when you stage or de-stage a drive. **Note:** Lead-lag control and pump protection is stopped during the stabilization time.	3 s (0 - 3600 s)

No. (Hex.)	Name	Description	Default (Range)
Y9-17 (3E04) RUN	Setpoint Modifier	Sets the value by which the system setpoint is incremented as specified by the number of drives that are running. **Note:** Parameters *b5-46 [PID Unit Display Selection]*, *b5-38 [PID User Unit Display Scaling]*, and *b5-39 [PID User Unit Display Digits]* set the unit, range, and resolution.	0.00 (-99.99 - +99.99)
Y9-18 (3E05) RUN	High Feedback De-stage Level	Sets the feedback level to trigger a quick de-stage as a percentage of *Y1-11 [High Feedback Level]*. **Note:** • The quick de-stage ignores parameters *Y9-12 [De-staging Mode]* to *Y9-15 [De-staging Delay Time]* and only uses an internal 2 s delay. • Set this parameter to 0.0 to disable the function.	97.0% (0.0 - 100.0%)
Y9-19 (3E06) RUN	Alternation Time Unit	Sets the units for *Y9-03 [Alternation Time]*. You can set this parameter to *1 [Minutes (min)]* during commission to test the alternation function. **Note:** You can use this parameter only when *Y1-03 = 3 [Multiplex Mode = Memobus Network]*. 0 : Hours (H) 1 : Minutes (min)	0 (0, 1)
Y9-20 (3E07)	Allow Network Run	Sets when the drive will respond to a network Run command. 0 : Always 1 : First/Alternation 2 : First Only 3 : Alternation Only	0 (0 - 3)
Y9-21 (3E08) RUN	Run Priority	Sets the Lead Drive selection priority to override the *Y9-01 [Lead Drive Selection]* selection. **Note:** • The drive with the lowest *Y9-21* value has the highest priority and will become the Lead Drive first. If more than one drive has the lowest *Y9-21* value, then *Y9-01 [Lead Drive Selection]* selects which drive becomes the lead. • When you set *Y9-21* to the same value for all drives on the MEMOBUS network, it will disable this function. If more than one drive has the same *Y9-21* value, then *Y9-01* will select the next Lead Drive. • To give First Drive (and Lead Drive) control back to the drive with highest priority level set in *Y9-21*, set *Y9-24 [Lead Swap at Sleep Delay Time]* on the other drives with a lower priority level.	8 (1 - 16)
Y9-22 (3E09) RUN	System Fault Retry Attempts	Sets the number of times that the MEMOBUS Network will allow automatic restarts of system faults. The drive uses *L5-04 [Interval Method Restart Time]* to select the time to try a system fault restart. **Note:** Set this parameter to the same value for all drives on the network for correct operation.	5 (0 - 10)
Y9-23 (3E0A)	Max Drives Allowed to Run	Sets the maximum number of drives that can run on the system.	4 (1 - 4)
Y9-24 (3E0B) RUN	Lead Swap at Sleep Delay Time	Sets the length of time that the Lead Drive will be in Sleep Mode before the drive will request for a swap when there is another drive available with a lower *Y9-21 [Run Priority]* setting. **Note:** Set this parameter to 0 to disable the function.	0 s (0 - 7200 s)
Y9-25 (3E0C)	Highest Node Address	Sets the highest possible node address in the MEMOBUS network. **Note:** For optimal network performance, set the serial communication address *H5-01 [Drive Node Address]* beginning with 01H consecutively up to the last drive and then set this parameter to the final *H5-01* address.	4 (2 - 4)
Y9-26 (3E0D)	Master Time-out	Sets the minimum length of time that the slave drives will wait for a message from the master before they do the action set in *Y9-27 [Network Recovery]*.	4.0 s (1.0 - 10.0 s)
Y9-27 (3E0E)	Network Recovery	Sets the slave drive response when it does not receive a message from the master for the time set in *Y9-26 [Master Time-out]*. 0 : Automatic 1 : Slave/Resume 2 : Slave/Stop 3 : Fault MSL	0 (0 - 3)
Y9-28 (3E0F)	NETSCAN Alarm Time	Sets the length of time that the slave drives will wait for a message from the master before they will show an *NETSC [NETSCAN Waiting for Master]* alarm. **Note:** If the network response is late or many node drives are offline, increase the value of this parameter. The master identifies an offline drive as node 1 to *Y9-25 [Highest Node Address]* that does not have a power supply, has connection problems, or is not connected to the network.	2.0 s (1.0 - 10.0 s)
Y9-29 (3E10) RUN	Network AUTO Start Delay	Sets the length of time that the network will wait before it selects and starts the Lead Drive after the First Drive on the network is in AUTO Mode.	2.0 s (0.0 - 60.0 s)

No. (Hex.)	Name	Description	Default (Range)
Y9-30 (3E11) RUN	Lag Speed Follower Gain	Sets the gain applied to the speed of the current Lead Drive when *Y9-05 = 3 [Lag Drive Mode = Follow Lead Speed]*. Set the bias to apply in *Y9-31 [Lag Speed Follower Bias]*.	100.0% (0.0 - 300.0%)
Y9-31 (3E12) RUN	Lag Speed Follower Bias	Sets the bias applied to the speed of the current Lead Drive when *Y9-05 = 3 [Lag Drive Mode = Follow Lead Speed]*. Set the gain to apply in *Y9-30 [Lag Speed Follower Gain]*.	0.00 Hz (-60.00 - +60.00 Hz)
Y9-32 (3E13) RUN	Lag Follower Deceleration Rate	Sets the deceleration time when the *Y9-33 [Lag Follower Decel Activ Time]* timer is running and the drive is running as Lag Drive Speed Follower (*Y9-05 = 3 [Lag Drive Mode = Follow Lead Speed]*).	60.0 s (0.0 - 1000.0 s)
Y9-33 (3E14) RUN	Lag Follower Decel Activ Time	Sets the time during which the deceleration time set in *Y9-32 [Lag Follower Deceleration Rate]* is effective. The drive will use the standard deceleration rate when it is expired. **Note:** Set this parameter to 0.0 to disable the function.	0.0 s (0.0 - 3600.0 s)
Y9-34 (3E15) RUN	Low Feedback De-stage	Sets the low feedback level that will trigger a quick de-stage. **Note:** • Parameters *b5-46 [PID Unit Display Selection]*, *b5-38 [PID User Unit Display Scaling]*, and *b5-39 [PID User Unit Display Digits]* set the unit, range, and resolution. • The quick de-stage ignores *Y9-12 [De-staging Mode]* and *Y9-15 [De-staging Delay Time]* and only uses an internal 2 s delay. • Set this parameter to 0.00 to disable the function.	0.00 (0.00 - 600.00)
Y9-35 (3E16) RUN	Alternation Stabilize Time	Sets the maximum length of time the drive will stay running after it is called to alternate-out. The drive will be in Alternation Stabilization Mode during this time. **Note:** • You can use this parameter only when *Y1-03 = 3 [Multiplex Mode = Memobus Network]*. • Set this parameter to 0 to disable the function.	0 s (0 - 1000 s)
Y9-36 (3E17) RUN	Alternation Stabilize Bias	Sets the minimum quantity of PID error applied to the drive during Alternation Stabilization Mode. A lower value can cause it to stay running longer, while a higher value will make the change faster, but it will have a larger pressure change. **Note:** • You can use this parameter only when *Y1-03 = 3 [Multiplex Mode = Memobus Network]*. • Set as a percentage of *b5-38 [PID Unit Scaling]*.	0.50% (0.00 - 10.00%)
Y9-50 (3E25)	PI Auxiliary Control Source	Sets the signal to use for *PI Auxiliary Control [YF-xx]* when *Y1-01 = 3 [Multiplex Mode = Memobus Network]*. 0 : Analog Only 1 : Ana->Net, No Alrm 2 : Ana->Net, Alarm 3 : Network Only **Note:** • Drives that have *YF-19 = 0 [PI Aux Ctrl Feedback WireBreak = Disabled]* and *Y9-50 ≠ 3* will have wire-break detection and will continuously send valid or invalid PI Aux Feedback signals to the Network. • When *YF-19 = 2 [Fault (no retry, coast to stop)]* and *Y9-50 ≠ 3*, the PI Auxiliary Feedback detection will cause an alarm(not a fault) when one of these conditions is true: –The drive is in HAND Mode –There is no Lead Drive on the network –The drive is not in AUTO Mode	0 (0 - 3)
Y9-51 (3E26)	PI Aux Control Turn-Off Method	Sets the MEMOBUS Multiplex response to the PI Aux Control. 0 : Disabled 1 : Enabled	0 (0, 1)
Y9-98 (3E55)	Network Parameter Push	Sets how the system sends System-wide parameters into the MEMOBUS Multiplex network. 0 : Disabled 1 : Enabled/Prompt	1 (0, 1)

◆ YA: Preset Setpoint

No. (Hex.)	Name	Description	Default (Range)
YA-01 (3E58) RUN	Setpoint 1	Sets the PID Setpoint when *b1-01 = 0 [Frequency Reference Selection 1 = Keypad or Multi-Speed Selection]*. **Note:** Parameters *b5-46 [PID Unit Display Selection]*, *b5-38 [PID User Unit Display Scaling]*, and *b5-39 [PID User Unit Display Digits]* set the unit, range, and resolution.	0.00 (0.00 - 600.00)
YA-02 (3E59) RUN	Setpoint 2	Sets the PID Setpoint as specified by the Multi-Setpoint digital inputs. **Note:** Parameters *b5-46 [PID Unit Display Selection]*, *b5-38 [PID User Unit Display Scaling]*, and *b5-39 [PID User Unit Display Digits]* set the unit, range, and resolution.	0.00 (0.00 - 600.00)
YA-03 (3E5A) RUN	Setpoint 3	Sets the PID Setpoint as specified by the Multi-Setpoint digital inputs. **Note:** Parameters *b5-46 [PID Unit Display Selection]*, *b5-38 [PID User Unit Display Scaling]*, and *b5-39 [PID User Unit Display Digits]* set the unit, range, and resolution.	0.00 (0.00 - 600.00)
YA-04 (3E5B) RUN	Setpoint 4	Sets the PID Setpoint as specified by the Multi-Setpoint digital inputs. **Note:** Parameters *b5-46 [PID Unit Display Selection]*, *b5-38 [PID User Unit Display Scaling]*, and *b5-39 [PID User Unit Display Digits]* set the unit, range, and resolution.	0.00 (0.00 - 600.00)

◆ YC: Foldback Features

No. (Hex.)	Name	Description	Default (Range)
YC-01 (3EBC)	Output Current Limit Select	Sets the function to enable or disable the output current regulator. 0 : Disabled 1 : Enabled	0 (0, 1)
YC-02 (3EBD) RUN	Current Limit	Sets the current limit. **Note:** Value is internally limited to 300% of the drive rated current set in *n9-01 [Inverter Rated Current]*.	0.0 A (0.0 - 1000.0 A)

◆ YF: PI Auxiliary Control

No. (Hex.)	Name	Description	Default (Range)
YF-01 (3F50)	PI Aux Control Selection	Sets the PI Auxiliary Control function. 0 : Disabled 1 : Enabled	0 (0, 1)
YF-02 (3F51) RUN	PI Aux Control Transducer Scale	Sets the full scale (10 V or 20 mA) output of the pressure transducer connected to the analog input terminal programmed for *H3-xx = 27 [PI Aux Control Feedback Level]*. **Note:** Parameters *YF-21 [PI Aux Ctrl Level Unit Selection]* and *YF-22 [PI Aux Level Decimal Place Pos]* set the unit and resolution.	145.0 (1.0 - 6000.0)
YF-03 (3F52) RUN	PI Aux Control Setpoint	Sets the level to which the drive will try to regulate. **Note:** • The PI Auxiliary Control Setpoint values programmed to the MFAI Setpoint *[H3-xx = 25]* and MEMOBUS Setpoint 000DH (while 000FH, bit 4 = 1) have higher priority than the setpoint programmed to *YF-03*. • Parameters *YF-21 [PI Aux Ctrl Level Unit Selection]* and *YF-22 [PI Aux Level Decimal Place Pos]* set the unit and resolution.	20.0 PSI (0.0 - 6000.0)
YF-04 (3F53) RUN	PI Aux Control Minimum Level	Sets the level below which the drive must be for longer than *YF-05 [PI Aux Control Sleep Delay Time]* before the drive goes to sleep and turns off all lag pumps. **Note:** • Set this parameter to 0.0 to disable the function. • Parameters *YF-21 [PI Aux Ctrl Level Unit Selection]* and *YF-22 [PI Aux Level Decimal Place Pos]* set the unit and resolution.	10.0 PSI (0.0 - 6000.0)
YF-05 (3F54) RUN	PI Aux Control Sleep Delay Time	Sets the length of time that the drive will delay before it goes to sleep after the level is less than *YF-04 [PI Aux Control Minimum Level]* (when *YF-23 = 1 [PI Aux Ctrl Output Level Select = Inverse Acting]*) or more than *YF-24 [PI Auxiliary Ctrl Maximum Level]* (when *YF-23 = 0 [Direct Acting]*).	5 s (0 - 3600 s)

No. (Hex.)	Name	Description	Default (Range)
YF-06 (3F55) RUN	PI Aux Control Wake-up Level	Sets the level to wake up the drive when the drive after *YF-04 [PI Aux Control Minimum Level]* or *YF-24 [PI Auxiliary Ctrl Maximum Level]* put the drive to sleep. **Note:** • Parameter *YF-23 [PI Aux Ctrl Output Level Select]* sets the condition to wake up the drive. – *YF-23 = 0 [Direct Acting]*: The PI Aux Feedback must be less than the level set in this parameter for longer than the time set in *YF-07* to wake up. – *YF-23 = 1 [Inverse Acting]:* The PI Aux Feedback must be more than the level set in this parameter for longer than the time set in *YF-07 [PI Aux Control Wake-up Time]* to wake up. • Parameters *YF-21 [PI Aux Ctrl Level Unit Selection]* and *YF-22 [PI Aux Level Decimal Place Pos]* set the unit and resolution.	30.0 PSI (-999.9 - +999.9 PSI)
YF-07 (3F56)	PI Aux Control Wake-up Time	Sets the time to wake up the drive when the drive after *YF-04 [PI Aux Control Minimum Level]* or *YF-24 [PI Auxiliary Ctrl Maximum Level]* put the drive to sleep. **Note:** Parameter *YF-23 [PI Aux Ctrl Output Level Select]* sets the condition to wake up the drive. • *YF-23 = 0 [Direct Acting]*: The PI Aux Feedback must be less than the level set in *YF-06* for longer than the time set in *YF-07* to wake up. • *YF-23 = 1 [Inverse Acting]*: The PI Aux Feedback must be more than the level set in *YF-06 [PI Aux Control Wake-up Level]* for longer than the time set in *YF-07* to wake up.	1 s (0 - 3600 s)
YF-08 (3F57) RUN	PI Aux Control Minimum Speed	Sets the minimum speed at which the drive can run when the PI Auxiliary Control has an effect on the output speed. **Note:** The drive will use *Y1-06 [Minimum Speed]* and *Y4-12 [Thrust Frequency]* as the minimum speed when PI Aux Control does not have an effect on the output speed or when you set *YF-08 < Y1-06 and Y4-12*.	0.00 Hz (0.00 - 400.00 Hz)
YF-09 (3F58) RUN	PI Aux Control Low Level Detect	Sets the level below which the drive must be for longer than *YF-10 [PI Aux Control Low Lvl Det Time]* to respond as specified by *YF-11 [PI Aux Control Low Level Det Sel]*. **Note:** • Set this parameter to 0.0 to disable the function. • Parameter *YF-10* only applies to when *YF-11 = 2 and 3 [Fault and Auto-Restart (time set by YF-15)]*. • Parameters *YF-21 [PI Aux Ctrl Level Unit Selection]* and *YF-22 [PI Aux Level Decimal Place Pos]* set the unit and resolution.	0.0 PSI (-999.9 - +999.9 PSI)
YF-10 (3F59) RUN	PI Aux Low Level Detection Time	Sets the length of time that the PI Aux Feedback must be less than *YF-09 [PI Aux Control Low Lvl Detection]* to trigger a drive response when *YF-11 = 2 and 3 [PI Aux Control Low Level Det Sel = Fault and Auto-Restart (time set by YF-15)]*.	0.1 s (0.0 - 300.0 s)
YF-11 (3F5A)	PI Aux Control Low Level Det Sel	Sets drive response when the PI Aux Feedback decreases to less than *YF-09 [PI Aux Control Low Lvl Detection]* for longer than *YF-10 [PI Aux Control Low Lvl Det Time]*. 0 : No Display 1 : Alarm Only 2 : Fault 3 : Auto-Restart (time set by YF-15) **Note:** • Set *YF-01 = 1 [PI Aux Control Selection = Enabled]* and *YF-09 [PI Aux Control Low Level Detect]* > 0 to enable PI Aux Low Level Detection. • Parameter *YF-10* only applies when *YF-11 = 2 or 3*.	1 (0 - 3)
YF-12 (3F5B) RUN	PI Aux Control High Level Detect	Sets the value above which the level must be for longer than *YF-13 [PI Aux High Level Detection Time]* to respond as specified by *YF-14 [PI Aux Hi Level Detection Select]*. **Note:** • Set this parameter to 0.0 to disable the function. • Parameter *YF-13* only applies to when *YF-14 = 2 and 3 [Fault and Auto-Restart (time set by YF-15)]*. • Parameters *YF-21 [PI Aux Ctrl Level Unit Selection]* and *YF-22 [PI Aux Level Decimal Place Pos]* set the unit and resolution.	0.0 PSI (-999.9 - +999.9 PSI)
YF-13 (3F5C) RUN	PI Aux High Level Detection Time	Sets the length of time that the level must be more than *YF-12 [PI Aux Control High Level Detect]* before the drive will respond when *YF-14 = 2, 3 [PI Aux Hi Level Detection Select]*.	0.1 s (0.0 - 300.0 s)
YF-14 (3F5D)	PI Aux Control Hi Level Det Sel	Sets the drive response when the PI Aux Feedback increases to more than the *YF-12 [PI Aux Control High Level Detect]* level for longer than the time set in *YF-13 [PI Aux High Level Detection Time]*. 0 : NoDisplay (Digital Output Only) 1 : Alarm Only 2 : Fault 3 : Auto-Restart (time set by YF-15) **Note:** • Set *YF-01 = 1 [PI Aux Control Selection = Enabled]* and *YF-12 [PI Aux Control High Level Detect]* > 0 to enable PI Aux High Level Detection. • Parameter *YF-13* only applies when *YF-14 = 2 or 3*	1 (0 - 3)
YF-15 (3F5E)	PI Aux Level Detect Restart Time	Sets the length of time the drive will wait before it tries an Auto-Restart of *LOAUX [Low PI Aux Feedback Level]* or *HIAUX [High PI Aux Feedback Level]* fault.	5.0 min (0.1 - 6000.0 min)

No. (Hex.)	Name	Description	Default (Range)
YF-16 (3F5F) RUN	PI Auxiliary Control P Gain	Sets the proportional gain for the suction pressure control.	2.00 (0.00 - 25.00)
YF-17 (3F60) RUN	PI Auxiliary Control I Time	Sets the integral time for the suction pressure control. **Note:** Set this parameter to 0.0 to disable the integrator.	5.0 s (0.0 - 360.0 s)
YF-18 (3F61)	PI Aux Control Detect Time Unit	Sets the time unit for *YF-10 [PI Aux Control Low Lvl Det Time]* and *YF-13 [PI Aux High Level Detection Time]*. 0 : Minutes (min) 1 : Seconds (sec)	1 (0, 1)
YF-19 (3F62)	PI Aux Ctrl Feedback WireBreak	Sets how the analog input selected for PI Aux Feedback will respond when it is programmed to receive a 4 mA to 20 mA signal and the signal is lost. 0 : Disabled 1 : Alarm Only 2 : Fault (no retry, coast to stop)	2 (0 - 2)
YF-20 (3F63)	PI Aux Main PI Speed Control	Sets if the PI Auxiliary Controller has an effect on output speed. 0 : Disabled 1 : Enabled	1 (0, 1)
YF-21 (3F64)	PI Aux Ctrl Level Unit Selection	Set the units shown for the PI Aux Level parameters and monitors. 0 : "WC: inches of water column 1 : PSI: pounds per suqare inch 2 : GPM: gallons/min 3 : °F: Fahrenheit 4 : ft^3/min: cubic feet/min 5 : m^3/h: cubic meters/hour 6 : L/h: liters/hour 7 : L/s: liters/sec 8 : bar: bar 9 : Pa: Pascal 10 : °C: Celsius 11 : m: meters 12 : ft: feet 13 : L/min: liters/min 14 : m^3/min: cubic meters/min 15 : "Hg: Inch Mercury 16 : kPa: kilopascal 48 : %: Percent 49 : Custom (YF-32 ~ 34) 50 : None	1 (0 - 50)
YF-22 (3F65)	PI Aux Level Decimal Place Pos	Sets the number of decimal places for the PI Aux Level parameters and monitors. 0 : No Decimal Places (XXXXX) 1 : One Decimal Places (XXXX.X) 2 : Two Decimal Places (XXX.XX) 3 : Three Decimal Places (XX.XXX)	1 (0 - 3)
YF-23 (3F66)	PI Aux Ctrl Output Level Select	Sets the PI Auxiliary Controller to be Direct-acting or Inverse-acting. 0 : Direct Acting 1 : Inverse Acting	1 (0, 1)
YF-24 (3F67) RUN	PI Auxiliary Ctrl Maximum Level	Sets the maximum level for PI Auxiliary Control. When the level is more than this setting for longer than *YF-05 [PI Aux Control Sleep Delay Time]*, the drive will go to sleep and turn off all lag drives. **Note:** • Set this parameter to 0.0 to disable the function. • Parameters *YF-21 [PI Aux Ctrl Level Unit Selection]* and *YF-22 [PI Aux Level Decimal Place Pos]* set the unit and resolution.	0.0 PSI (0.0 - 6000.0 PSI)

No. (Hex.)	Name	Description	Default (Range)
YF-25 (3F68) RUN	PI Aux Control Activation Level	Sets the level to activate the PI Auxiliary Control. **Note:** • The drive response changes when the *YF-23 [PI Aux Ctrl Output Level Select]* setting changes. – *YF-23 = 0 [Direct Acting]*: When the PI Aux Feedback level is more than this setting for longer than *YF-26 [PI Aux Control Activation Delay]*, the drive will activate the PI Auxiliary Control to control the output frequency. – *YF-23 = 1 [Inverse Acting]*: When the PI Aux Feedback level is less than this setting for longer than *YF-26*, the drive will activate PI Auxiliary Control to control the output frequency. • When you set this parameter to 0.0 PSI, PI Auxiliary Control is always enabled. • Parameters *YF-21 [PI Aux Ctrl Level Unit Selection]* and *YF-22 [PI Aux Level Decimal Place Pos]* set the unit and resolution.	0.0 PSI (0.0 - 6000.0 PSI)
YF-26 (3F69) RUN	PI Aux Control Activation Delay	Sets the delay time to activate the PI Auxiliary Control. **Note:** • The drive response changes when the *YF-23 [PI Aux Ctrl Output Level Select]* setting changes. – *YF-23 = 0 [Direct Acting]*: When the PI Aux Feedback level is more than *YF-25 [PI Aux Control Activation Level]* for longer than this time, the drive will activate the PI Auxiliary Control to control the output frequency. – *YF-23 = 1 [Inverse Acting]*: When the PI Aux Feedback level is less than *YF-25* for longer than this time, the drive will activate PI Auxiliary Control to control the output frequency. • When you set this parameter to 0.0 PSI, PI Auxiliary Control is always enabled.	2 s (0 - 3600 s)
YF-32 (3F6F)	PI Aux Custom Unit Character 1	Sets the first character of the PI Aux custom unit display when *YF-21 = 49 [PI Aux Ctrl Level Unit Selection = Custom (YF-32 ~ 34)]*.	41 (20 - 7A)
YF-33 (3F70)	PI Aux Custom Unit Character 2	Sets the second character of the PI Aux custom unit display when *YF-21 = 49 [PI Aux Ctrl Level Unit Selection = Custom (YF-32 ~ 34)]*.	41 (20 - 7A)
YF-34 (3F71)	PI Aux Custom Unit Character 3	Sets the third character of the PI Aux custom unit display when *YF-21 = 49 [PI Aux Ctrl Level Unit Selection = Custom (YF-32 ~ 34)]*.	41 (20 - 7A)
YF-35 (3F72)	PI Aux Minimum Transducer Scale	Sets the minimum scale output of the pressure transducer that is connected to the terminal set for *H3-xx = 27 [MFAI Function Selection = PI Auxiliary Control Feedback]*. **Note:** • To enable this parameter, set it to less than *YF-02 [PI Aux Control Transducer Scale]*. If you set it to more than *YF-02*, it will disable the PI Auxiliary Feedback (set to 0). • Parameters *YF-21 [PI Aux Ctrl Level Unit Selection]* and *YF-22 [PI Aux Level Decimal Place Pos]* set the unit and resolution.	0.0 PSI (-999.9 - +999.9 PSI)

3.20 Parameters that Change from the Default Settings with A1-02 [Control Method Selection]

The values for parameter *A1-02* changes the default settings for the parameters in these tables:

◆ A1-02 = 0 [V/f]

No.	Name	Range	Unit	Control Method (A1-02 Setting)
				V/f (0)
b2-13	Short Circuit Brake Time @ Stop	0.00 - 25.50	0.01 s	-
b3-02	SpeedSearch Deactivation Current	0 - 200	1%	120
b3-08	Speed Estimation ACR P Gain	0.00 - 6.00	0.01	0.50 *1
b3-09	Speed Estimation ACR I Time	0.0 - 1000.0	0.1 ms	2.0
b3-14	Bi-directional Speed Search	0 - 1	1	0 *2
b3-24	Speed Search Method Selection	1 - 2	1	2
b8-19	E-Save Search Injection Freq	10 - 300	1 Hz	-
C2-01	S-Curve Time @ Start of Accel	0.00 - 10.00	0.01 s	0.20
C3-02	Slip Compensation Delay Time	0 - 10000	1 ms	2000
C3-22	Motor 2 Slip Comp Delay Time	0 - 10000	1 ms	2000
C4-01	Torque Compensation Gain	0.00 - 2.50	0.01	1.00
C4-02	Torque Compensation Delay Time	0 - 60000	1 ms	200
C5-01	ASR Proportional Gain 1	0.00 - 300.00	0.01	-
C5-02	ASR Integral Time 1	0.000 - 60.000	0.001 s	-
C5-03	ASR Proportional Gain 2	0.00 - 300.00	0.01	-
C5-04	ASR Integral Time 2	0.000 - 60.000	0.001 s	-
C5-06	ASR Delay Time	0.000 - 0.500	0.001 s	-
C6-02	Carrier Frequency Selection	1 - F	1	1 *1
E1-04	Maximum Output Frequency	40.0 - 400.0 *3	0.1 Hz	60.0 *4
E1-05	Maximum Output Voltage	0.0 - 255.0 *5	0.1 V	230.0 *4
E1-06	Base Frequency	0.0 - 400.0 *3	0.1 Hz	60.0 *4
E1-07	Mid Point A Frequency	0.0 - 400.0 *3	0.1 Hz	30.0 *4
E1-08	Mid Point A Voltage	0.0 - 255.0 *5	0.1 V	57.5 *4
E1-09	Minimum Output Frequency	0.0 - 400.0 *3	0.1 Hz	1.5 *4
E1-10	Minimum Output Voltage	0.0 - 255.0 *5	0.1 V	10.2 *4 *6
E1-11	Mid Point B Frequency	0.0 - 400.0	0.1 Hz	0.0
E1-12	Mid Point B Voltage	0.0 - 255.0 *5	0.1 V	0.0
E1-13	Base Voltage	0.0 - 255.0 *5	0.1 V	0.0
L1-01	Motor Overload (oL1) Protection	0 - 4	1	1
L2-31	KEB Start Voltage Offset Level	0 - 100 *5	1 V	0
L3-05	Stall Prevention during RUN	0 - 3	1	2
L3-20	DC Bus Voltage Adjustment Gain	0.00 - 5.00	0.01	1.00
L8-38	Carrier Frequency Reduction	0 - 3	1	2
n8-51	Pull-in Current @ Acceleration	0 - 200	1%	-

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.
*2 When *b3-24 = 1*, the default value is 1.

*3 The setting range varies depending on the setting of *E5-01 [PM Motor Code Selection]* when *A1-02 = 5 [Control Method Selection = PM Open Loop Vector]*.
*4 The default setting changes when the drive model and *E1-03 [V/f Pattern Selection]* change.
*5 This is the value for 208 V class drives. Double the value for 480 V class drives.
*6 The default value changes when the drive model changes.

◆ A1-02 = 5 and 8 [OLV/PM and EZOLV]

No.	Name	Range	Unit	Control Method (A1-02 Setting)	
				OLV/PM (5)	EZOLV (8)
b2-13	Short Circuit Brake Time @ Stop	0.00 - 25.50	0.01 s	0.50	0.00 *1
b3-02	SpeedSearch Deactivation Current	0 - 200	1%	-	-
b3-08	Speed Estimation ACR P Gain	0.00 - 6.00	0.01	0.30	0.60 *2
b3-09	Speed Estimation ACR I Time	0.0 - 1000.0	0.1 ms	2.0	10.0
b3-14	Bi-directional Speed Search	0 - 1	1	-	0
b3-24	Speed Search Method Selection	1 - 2	1	-	1 *3
b8-19	E-Save Search Injection Freq	10 - 300	1 Hz	-	20
C2-01	S-Curve Time @ Start of Accel	0.00 - 10.00	0.01 s	1.00	1.00
C3-02	Slip Compensation Delay Time	0 - 10000	1 ms	-	200
C3-22	Motor 2 Slip Comp Delay Time	0 - 10000	1 ms	-	-
C4-01	Torque Compensation Gain	0.00 - 2.50	0.01	0.00	0.00
C4-02	Torque Compensation Delay Time	0 - 60000	1 ms	100	200
C5-01	ASR Proportional Gain 1	0.00 - 300.00	0.01	-	10.00
C5-02	ASR Integral Time 1	0.000 - 60.000	0.001 s	-	0.500
C5-03	ASR Proportional Gain 2	0.00 - 300.00	0.01	-	10.00
C5-04	ASR Integral Time 2	0.000 - 60.000	0.001 s	-	0.500
C5-06	ASR Delay Time	0.000 - 0.500	0.001 s	-	0.004
C6-02	Carrier Frequency Selection	1 - F	1	2 *2	2 *2
E1-04	Maximum Output Frequency	40.0 - 400.0	0.1 Hz	Determined by E5-01	-
E1-05	Maximum Output Voltage	0.0 - 255.0 *5	0.1 V	Determined by E5-01	-
E1-06	Base Frequency	0.0 - 400.0	0.1 Hz	Determined by E5-01	-
E1-07	Mid Point A Frequency	0.0 - 400.0	0.1 Hz	-	-
E1-08	Mid Point A Voltage	0.0 - 255.0 *5	0.1 V	-	-
E1-09	Minimum Output Frequency	0.0 - 400.0	0.1 Hz	Determined by E5-01	-
E1-10	Minimum Output Voltage	0.0 - 255.0 *5	0.1 V	-	-
E1-11	Mid Point B Frequency	0.0 - 400.0	0.1 Hz	-	-
E1-12	Mid Point B Voltage	0.0 - 255.0 *5	0.1 V	-	-
E1-13	Base Voltage	0.0 - 255.0 *5	0.1 V	-	-
L1-01	Motor Overload (oL1) Protection	0 - 4	1	4	1 *6
L2-31	KEB Start Voltage Offset Level	0 - 100 *5	1 V	50	50
L3-05	Stall Prevention during RUN	0 - 3	1	2	3
L3-20	DC Bus Voltage Adjustment Gain	0.00 - 5.00	0.01	0.65	0.65
L8-38	Carrier Frequency Reduction	0 - 3	1	-	-
n8-51	Pull-in Current @ Acceleration	0 - 200	1%	50	80
o1-03	Frequency Display Unit Selection	0 - 3	1	2	0 *7

*1 Enabled only when *E9-01=1 [Motor Type Selection = Permanent Magnet (PM)]*

*2 The default setting is different for different models.
- 2011 - 2114, 4005 - 4052: 0.6
- 2143 - 2273, 4065 - 4302: 0.3

*3 The default settings are different for different motor types.
- E9-01 = 0 [Motor Type Selection = Induction (IM)]: 2
- E9-01 = 1, 2 [Permanent Magnet (PM), Synchronous Reluctance (SynRM)]: 1

*4 The unit of measure changes when *o2-04* changes.
*5 This is the value for 208 V class drives. Double the value for 480 V class drives.
*6 The default settings are different for different motor types.
- E9-01 = 0 [Motor Type Selection = Induction (IM)]: 1
- E9-01 = 1, 2 [Permanent Magnet (PM), Synchronous Reluctance (SynRM)]: 4

*7 The default settings are different for different motor types.
- E9-01 = 0 [Motor Type Selection = Induction (IM)]: 0
- E9-01 = 1, 2 [Permanent Magnet (PM), Synchronous Reluctance (SynRM)]: 1

3.21 Parameters Changed by E1-03 [V/f Pattern Selection]

The values for parameters *A1-02 [Control Method Selection]* and *E1-03 [V/f Pattern Selection]* change the default settings for the parameters in these tables:

Table 3.1 Parameters Changed by E1-03: 2011, 2017, 4005, and 4011

No.	Unit	Setting Value																Control Method (A1-02 Setting)
E1-03		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	OLV/PM (5)
E1-04	Hz	50.0	60.0	60.0	72.0	50.0	50.0	60.0	60.0	50.0	50.0	60.0	60.0	90.0	120.0	180.0	60.0 *1	*2
E1-05 *3	V	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0 *1	*2
E1-06	Hz	50.0	60.0	50.0	60.0	50.0	50.0	60.0	60.0	50.0	50.0	60.0	60.0	60.0	60.0	60.0	60.0 *1	*2
E1-07	Hz	2.5	3.0	3.0	3.0	25.0	25.0	30.0	30.0	2.5	2.5	3.0	3.0	3.0	3.0	3.0	30.0 *1	-
E1-08 *3	V	17.3	17.3	17.3	17.3	40.3	57.5	40.3	57.5	21.9	27.6	21.9	27.6	17.3	17.3	17.3	57.5 *1	-
E1-09	Hz	1.3	1.5	1.5	1.5	1.3	1.3	1.5	1.5	1.3	1.3	1.5	1.5	1.5	1.5	1.5	1.5 *1	*2
E1-10 *3	V	10.4	10.4	10.4	10.4	9.2	10.4	9.2	10.4	12.7	15.0	12.7	17.3	10.4	10.4	10.4	10.2 *1	-

*1 These values are the default settings for *E1-04 to E1-10* and *E3-04 to E3-10 [V/f Pattern for Motor 2]*. These settings are the same as those for the V/f pattern when *E1-03 = 1 [Const Trq, 60Hz base, 60Hz max]*.
*2 The default setting varies depending on the setting of *E5-01 [PM Motor Code Selection]*.
*3 This is the value for 208 V class drives. Double the value for 480 V class drives.

Table 3.2 Parameters Changed by E1-03: 2024 to 2169 and 4014 to 4065

No.	Unit	Setting Value																Control Method (A1-02 Setting)
E1-03		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	OLV/PM (5)
E1-04	Hz	50.0	60.0	60.0	72.0	50.0	50.0	60.0	60.0	50.0	50.0	60.0	60.0	90.0	120.0	180.0	60.0 *1	*2
E1-05 *3	V	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0 *1	*2
E1-06	Hz	50.0	60.0	50.0	60.0	50.0	50.0	60.0	60.0	50.0	50.0	60.0	60.0	60.0	60.0	60.0	60.0 *1	*2
E1-07	Hz	2.5	3.0	3.0	3.0	25.0	25.0	30.0	30.0	2.5	2.5	3.0	3.0	3.0	3.0	3.0	30.0 *1	-
E1-08 *3	V	16.1	16.1	16.1	16.1	40.3	57.5	40.3	57.5	20.7	26.5	20.7	26.5	16.1	16.1	16.1	57.5 *1	-
E1-09	Hz	1.3	1.5	1.5	1.5	1.3	1.3	1.5	1.5	1.3	1.3	1.5	1.5	1.5	1.5	1.5	1.5 *1	*2
E1-10 *3	V	8.1	8.1	8.1	8.1	6.9	8.1	6.9	8.1	10.4	12.7	10.4	15.0	8.1	8.1	8.1	8.1 *1	-

*1 These values are the default settings for *E1-04 to E1-10* and *E3-04 to E3-10 [V/f Pattern for Motor 2]*. These settings are the same as those for the V/f pattern when *E1-03 = 1 [Const Trq, 60Hz base, 60Hz max]*.
*2 The default setting varies depending on the setting of *E5-01 [PM Motor Code Selection]*.
*3 This is the value for 208 V class drives. Double the value for 480 V class drives.

Table 3.3 Parameters Changed by E1-03: 2211 to 2273 and 4077 to 4302

No.	Unit	Setting Value																Control Method (A1-02 Setting)
E1-03		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	OLV/PM (5)
E1-04	Hz	50.0	60.0	60.0	72.0	50.0	50.0	60.0	60.0	50.0	50.0	60.0	60.0	90.0	120.0	180.0	60.0 *1*	*2*
E1-05 *3*	V	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0	230.0 *1*	*2*
E1-06	Hz	50.0	60.0	50.0	60.0	50.0	50.0	60.0	60.0	50.0	50.0	60.0	60.0	60.0	60.0	60.0	60.0 *1*	*2*
E1-07	Hz	2.5	3.0	3.0	3.0	25.0	25.0	30.0	30.0	2.5	2.5	3.0	3.0	3.0	3.0	3.0	30.0 *1*	-
E1-08 *3*	V	13.8	13.8	13.8	13.8	40.3	57.5	40.3	57.5	17.3	23.0	17.3	23.0	13.8	13.8	13.8	57.5 *1*	-
E1-09	Hz	1.3	1.5	1.5	1.5	1.3	1.3	1.5	1.5	1.3	1.3	1.5	1.5	1.5	1.5	1.5	1.5 *1*	*2*
E1-10 *3*	V	6.9	6.9	6.9	6.9	5.8	6.9	5.8	6.9	8.1	10.4	8.1	12.7	6.9	6.9	6.9	6.9 *1*	-

*1 These values are the default settings for *E1-04 to E1-10* and *E3-04 to E3-10 [V/f Pattern for Motor 2]*. These settings are the same as those for the V/f pattern when *E1-03 = 1 [Const Trq, 60Hz base, 60Hz max]*.
*2 The default setting varies depending on the setting of *E5-01 [PM Motor Code Selection]*.
*3 This is the value for 208 V class drives. Double the value for 480 V class drives.

3.22 Defaults by o2-04 [Drive Model (kVA) Selection]

The values for parameter *o2-04* changes the default settings for the parameters in these tables:

◆ 208 V class

No. *1	Name	Unit	Default							
-	Drive Model	-	2011	2017	2024	2031	2046	2059	2075	2088
o2-04	Drive Model (KVA) Selection	Hex.	65	67	68	6A	6B	6D	6E	6F
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	3 (2.2)	5 (3.7)	7.5 (5.5)	10 (7.5)	15 (11)	20 (15)	25 (18.5)	30 (22)
b3-04	V/f Gain during Speed Search	%	100	100	100	100	100	100	100	100
b3-06	Speed Estimation Current Level 1	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
b3-08	Speed Estimation ACR P Gain	-	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
b3-11	Spd Est Method Switch-over Level	%	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
b3-12	Speed Search Current Deadband	-	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
b3-26	Direction Determination Level	-	1000	1000	1000	1000	1000	1000	1000	1000
b8-04	Energy Saving Coefficient Value	-	156.8	122.9	94.75	72.69	70.44	63.13	57.87	51.79
C6-02	Carrier Frequency Selection	-	2	2	2	2	2	2	2	2
E2-01 (E4-01)	Motor Rated Current (FLA)	A	10.6	16.7	24.2	30.8	46.2	59.4	74.8	88
E2-02 (E4-02)	Motor Rated Slip	Hz	2.90	2.73	1.50	1.30	1.70	1.60	1.67	1.70
E2-03 (E4-03)	Motor No-Load Current	A	3.00	4.50	5.10	8.00	11.2	15.2	15.7	18.5
E2-05 (E4-05)	Motor Line-to-Line Resistance	Ω	1.601	0.771	0.399	0.288	0.230	0.138	0.101	0.079
E2-06 (E4-06)	Motor Leakage Inductance	%	18.4	19.6	18.2	15.5	19.5	17.2	20.1	19.5
E2-10 (E4-10)	Motor Iron Loss	W	77	112	172	262	245	272	505	538
E5-01	PM Motor Code Selection	-	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
L2-02	Power Loss Ride Through Time	s	0.7	0.9	1.5	1.8	2.0	2.0	2.0	2.0
L2-03	Minimum Baseblock Time	s	0.5	0.6	0.7	0.8	0.9	1	1	1
L2-04	Powerloss V/f Recovery Ramp Time	s	0.3	0.3	0.3	0.3	0.3	0.6	0.6	0.6

No. *1	Name	Unit	Default							
-	Drive Model	-	2011	2017	2024	2031	2046	2059	2075	2088
o2-04	Drive Model (KVA) Selection	Hex.	65	67	68	6A	6B	6D	6E	6F
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	3 (2.2)	5 (3.7)	7.5 (5.5)	10 (7.5)	15 (11)	20 (15)	25 (18.5)	30 (22)
L2-05	Undervoltage Detection Lvl (Uv1)	-	190	190	190	190	190	190	190	190
L3-24	Motor Accel Time for Inertia Cal	s	0.145	0.154	0.168	0.175	0.265	0.244	0.317	0.355
L8-02	Overheat Alarm Level	°C	95	95	125	125	125	125	115	115
L8-09	Output Ground Fault Detection	-	0	0	0	0	0	1	1	1
L8-35	Installation Method Selection	-	2 *3	2 *3	2 *3	2 *3	2 *3	2 *3	2 *3	2 *3
L8-38 *2	Carrier Frequency Reduction	-	2	2	2	2	2	2	2	2
n1-01	Hunting Prevention Selection	-	1	1	1	1	1	1	1	1
n1-03	Hunting Prevention Time Constant	ms	10	10	10	10	10	10	10	10

*1 Parameters within parentheses are for motor 2.
*2 You can use this parameter only when *A1-02 = 0 [Control Method Selection = V/f]*.
*3 When you use an IP55/UL Type 12 drive, the factory default setting is *3 [IP55/UL Type 12]*.

No. *1	Name	Unit	Default				
-	Drive Model	-	2114	2143	2169	2211	2273
o2-04	Drive Model (KVA) Selection	Hex.	70	72	73	74	75
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	40 (30)	50 (37)	60 (45)	75 (55)	100 (75)
b3-04	V/f Gain during Speed Search	%	80	80	80	80	80
b3-06	Speed Estimation Current Level 1	-	0.5	0.5	0.5	0.5	0.7
b3-08	Speed Estimation ACR P Gain	-	0.50	0.50	0.50	0.50	0.50
b3-11	Spd Est Method Switch-over Level	%	5.0	5.0	5.0	5.0	5.0
b3-12	Speed Search Current Deadband	-	2.5	2.5	2.5	2.5	2.5
b3-26	Direction Determination Level	-	1000	1000	1000	1000	1000
b8-04	Energy Saving Coefficient Value	-	46.27	38.16	35.78	31.35	23.10
C6-02	Carrier Frequency Selection	-	2	2	2	2	2
E2-01 (E4-01)	Motor Rated Current (FLA)	A	114	143	169	211	273
E2-02 (E4-02)	Motor Rated Slip	Hz	1.80	1.33	1.60	1.43	1.39
E2-03 (E4-03)	Motor No-Load Current	A	21.9	38.2	44.0	45.6	72.0

No. *1	Name	Unit	Default				
-	Drive Model	-	2114	2143	2169	2211	2273
o2-04	Drive Model (KVA) Selection	Hex.	70	72	73	74	75
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	40 (30)	50 (37)	60 (45)	75 (55)	100 (75)
E2-05 (E4-05)	Motor Line-to-Line Resistance	Ω	0.064	0.039	0.030	0.022	0.023
E2-06 (E4-06)	Motor Leakage Inductance	%	20.8	18.8	20.2	20.5	20.0
E2-10 (E4-10)	Motor Iron Loss	W	699	823	852	960	1200
E5-01	PM Motor Code Selection	-	FFFF	FFFF	FFFF	FFFF	FFFF
L2-02	Power Loss Ride Through Time	s	2.0	2.0	2.0	2.0	2.0
L2-03	Minimum Baseblock Time	s	1.1	1.1	1.2	1.3	1.5
L2-04	Powerloss V/f Recovery Ramp Time	s	0.6	0.6	1	1	1
L2-05	Undervoltage Detection Lvl (Uv1)	-	190	190	190	190	190
L3-24	Motor Accel Time for Inertia Cal	s	0.323	0.32	0.387	0.317	0.533
L8-02	Overheat Alarm Level	°C	115	110	110	110	110
L8-09	Output Ground Fault Detection	-	1	1	1	1	1
L8-35	Installation Method Selection	-	2 *3	2 *3	2 *3	0	0
L8-38 *2	Carrier Frequency Reduction	-	2	2	2	2	2
n1-01	Hunting Prevention Selection	-	1	1	1	1	1
n1-03	Hunting Prevention Time Constant	ms	10	10	10	10	10

*1 Parameters within parentheses are for motor 2.
*2 You can use this parameter only when *A1-02 = 0 [Control Method Selection = V/f]*.
*3 When you use an IP55/UL Type 12 drive, the factory default setting is *3 [IP55/UL Type 12]*.

◆ 480 V Class

No. *1	Name	Unit	Default							
-	Drive Model	-	4005	4008	4011	4014	4021	4027	4034	4040
o2-04	Drive Model (KVA) Selection	Hex.	95	97	99	9A	9B	9D	9E	9F
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	2 (1.5)	4 (3.0)	5 (4.0)	7.5 (5.5)	10 (7.5)	15 (11)	20 (15)	25 (18.5)
b3-04	V/f Gain during Speed Search	%	100	100	100	100	100	100	100	100
b3-06	Speed Estimation Current Level 1	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
b3-08	Speed Estimation ACR P Gain	-	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50

No. *1	Name	Unit	Default							
-	Drive Model	-	4005	4008	4011	4014	4021	4027	4034	4040
o2-04	Drive Model (KVA) Selection	Hex.	95	97	99	9A	9B	9D	9E	9F
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	2 (1.5)	4 (3.0)	5 (4.0)	7.5 (5.5)	10 (7.5)	15 (11)	20 (15)	25 (18.5)
b3-11	Spd Est Method Switch-over Level	%	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
b3-12	Speed Search Current Deadband	-	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
b3-26	Direction Determination Level	-	1000	1000	1000	1000	1000	1000	1000	1000
b8-04	Energy Saving Coefficient Value	-	338.8	265.7	245.8	189.5	145.38	140.88	126.26	115.74
C6-02	Carrier Frequency Selection	-	2	2	2	2	2	2	2	2
E2-01 (E4-01)	Motor Rated Current (FLA)	A	4.80	7.60	11.00	14.00	21.0	27.0	34.0	40.0
E2-02 (E4-02)	Motor Rated Slip	Hz	2.50	2.70	2.70	1.50	1.30	1.70	1.60	1.67
E2-03 (E4-03)	Motor No-Load Current	A	1.4	1.9	2.3	2.6	4	5.6	7.6	7.8
E2-05 (E4-05)	Motor Line-to-Line Resistance	Ω	10.1	4.360	3.333	1.595	1.152	0.922	0.550	0.403
E2-06 (E4-06)	Motor Leakage Inductance	%	18.3	19	19.3	18.2	15.5	19.6	17.2	20.1
E2-10 (E4-10)	Motor Iron Loss	W	53	105	130	193	263	385	440	508
E5-01	PM Motor Code Selection	-	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
L2-02	Power Loss Ride Through Time	s	0.7	0.9	1.3	1.3	1.7	2.0	2.0	2.0
L2-03	Minimum Baseblock Time	s	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.0
L2-04	Powerloss V/f Recovery Ramp Time	s	0.3	0.3	0.3	0.3	0.3	0.3	0.6	0.6
L2-05	Undervoltage Detection Lvl (Uv1)	-	380	380	380	380	380	380	380	380
L3-24	Motor Accel Time for Inertia Cal	s	0.166	0.145	0.154	0.168	0.175	0.265	0.244	0.317
L8-02	Overheat Alarm Level	°C	115	115	95	95	127	127	127	123
L8-09	Output Ground Fault Detection	-	0	0	0	0	0	0	0	1
L8-35	Installation Method Selection	-	2 *3	2 *3	2 *3	2 *3	2 *3	2 *3	2 *3	2 *3
L8-38 *2	Carrier Frequency Reduction	-	2	2	2	2	2	2	2	2

No. *1	Name	Unit	Default							
-	Drive Model	-	4005	4008	4011	4014	4021	4027	4034	4040
o2-04	Drive Model (KVA) Selection	Hex.	95	97	99	9A	9B	9D	9E	9F
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	2 (1.5)	4 (3.0)	5 (4.0)	7.5 (5.5)	10 (7.5)	15 (11)	20 (15)	25 (18.5)
n1-01	Hunting Prevention Selection	-	1	1	1	1	1	1	1	1
n1-03	Hunting Prevention Time Constant	ms	10	10	10	10	10	10	10	10

*1 Parameters within parentheses are for motor 2.
*2 You can use this parameter only when *A1-02 = 0 [Control Method Selection = V/f]*.
*3 When you use an IP55/UL Type 12 drive, the factory default setting is *3 [IP55/UL Type 12]*.

No. *1	Name	Unit	Default								
-	Drive Model	-	4052	4065	4077	4096	4124	4156	4180	4240	4302
o2-04	Drive Model (KVA) Selection	Hex.	A0	A2	A3	A4	A5	A6	A7	A8	A9
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	30 (22)	40 (30)	50 (37)	60 (45)	75 (55)	100 (75)	125 (90)	150 (110)	200 (160)
b3-04	V/f Gain during Speed Search	%	100	100	100	100	80	60	60	60	60
b3-06	Speed Estimation Current Level 1	-	0.5	0.5	0.5	0.5	0.5	0.7	0.7	0.7	0.7
b3-08	Speed Estimation ACR P Gain	-	0.50	0.50	0.50	0.50	0.50	0.80	0.80	0.80	0.80
b3-11	Spd Est Method Switch-over Level	%	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
b3-12	Speed Search Current Deadband	-	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
b3-26	Direction Determination Level	-	1000	1000	1000	1000	1000	1000	1000	1000	1000
b8-04	Energy Saving Coefficient Value	-	103.58	92.54	76.32	71.56	67.2	46.2	38.91	36.23	30.13
C6-02	Carrier Frequency Selection	-	2	2	2	2	2	2	2	2	1
E2-01 (E4-01)	Motor Rated Current (FLA)	A	52.0	65.0	77.0	96.0	124.0	156.0	180.0	240.0	302.0
E2-02 (E4-02)	Motor Rated Slip	Hz	1.70	1.80	1.33	1.60	1.46	1.39	1.40	1.40	1.35
E2-03 (E4-03)	Motor No-Load Current	A	9.2	10.9	19.1	22	24	36	40	49.00	70
E2-05 (E4-05)	Motor Line-to-Line Resistance	Ω	0.316	0.269	0.155	0.122	0.088	0.092	0.056	0.05	0.029
E2-06 (E4-06)	Motor Leakage Inductance	%	23.5	20.7	18.8	19.9	20.0	20.0	20.0	20.00	20.0

No. *1	Name	Unit	Default								
-	Drive Model	-	4052	4065	4077	4096	4124	4156	4180	4240	4302
o2-04	Drive Model (KVA) Selection	Hex.	A0	A2	A3	A4	A5	A6	A7	A8	A9
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	30 (22)	40 (30)	50 (37)	60 (45)	75 (55)	100 (75)	125 (90)	150 (110)	200 (160)
E2-10 (E4-10)	Motor Iron Loss	W	586	750	925	1125	1260	1600	1760	2150	2850
E5-01	PM Motor Code Selection	-	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
L2-02	Power Loss Ride Through Time	s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
L2-03	Minimum Baseblock Time	s	1.0	1.1	1.1	1.2	1.2	1.3	1.5	1.7	1.8
L2-04	Powerloss V/f Recovery Ramp Time	s	0.6	0.6	0.6	0.6	1.0	1.0	1.0	1.0	1.0
L2-05	Undervoltage Detection Lvl (Uv1)	-	380	380	380	380	380	380	380	380	380
L3-24	Motor Accel Time for Inertia Cal	s	0.355	0.323	0.320	0.387	0.317	0.533	0.592	0.646	0.777
L8-02	Overheat Alarm Level	°C	123	123	120	124	124	110	120	120	125
L8-09	Output Ground Fault Detection	-	1	1	1	1	1	1	1	1	1
L8-35	Installation Method Selection	-	2 *3	2 *3	2 *3	2 *3	2 *3	2 *3	0	0	0
L8-38 *2	Carrier Frequency Reduction	-	2	2	2	2	2	2	2	2	2
n1-01	Hunting Prevention Selection	-	1	1	1	1	1	1	1	1	1
n1-03	Hunting Prevention Time Constant	ms	10	10	10	10	30	30	30	30	30

*1 Parameters within parentheses are for motor 2.
*2 You can use this parameter only when *A1-02 = 0 [Control Method Selection = V/f]*.
*3 When you use an IP55/UL Type 12 drive, the factory default setting is *3 [IP55/UL Type 12]*.

◆ 480 V Class

No. *1	Name	Unit	Default							
-	Drive Model	-	4005	4008	4011	4014	4021	4027	4034	4040
o2-04	Drive Model (KVA) Selection	Hex.	95	97	99	9A	9B	9D	9E	9F
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	3 (2.2)	5 (3.7)	7.5 (5.5)	10 (7.5)	15 (11)	20 (15)	25 (18.5)	30 (22)
b3-04	V/f Gain during Speed Search	%	100	100	100	100	100	100	100	100
b3-06	Speed Estimation Current Level 1	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
b3-08	Speed Estimation ACR P Gain	-	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
b3-11	Spd Est Method Switch-over Level	%	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
b3-12	Speed Search Current Deadband	-	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
b3-26	Direction Determination Level	-	1000	1000	1000	1000	1000	1000	1000	1000
b8-04	Energy Saving Coefficient Value	-	313.6	245.8	189.5	145.38	140.88	126.26	115.74	103.58
C6-02	Carrier Frequency Selection	-	2	2	2	2	2	2	2	2
E2-01 (E4-01)	Motor Rated Current (FLA)	A	4.80	7.60	11.00	14.00	21.0	27.0	34.0	40.0
E2-02 (E4-02)	Motor Rated Slip	Hz	3.00	2.70	1.50	1.30	1.70	1.60	1.67	1.70
E2-03 (E4-03)	Motor No-Load Current	A	1.5	2.3	2.6	4	5.6	7.6	7.8	9.2
E2-05 (E4-05)	Motor Line-to-Line Resistance	Ω	6.495	3.333	1.595	1.152	0.922	0.550	0.403	0.316
E2-06 (E4-06)	Motor Leakage Inductance	%	18.7	19.3	18.2	15.5	19.6	17.2	20.1	23.5
E2-10 (E4-10)	Motor Iron Loss	W	77	130	193	263	385	440	508	586
E5-01	PM Motor Code Selection	-	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
L2-02	Power Loss Ride Through Time	s	0.7	0.9	1.3	1.3	1.7	2.0	2.0	2.0
L2-03	Minimum Baseblock Time	s	0.5	0.6	0.7	0.8	0.9	1.0	1.0	1.0
L2-04	Powerloss V/f Recovery Ramp Time	s	0.3	0.3	0.3	0.3	0.3	0.6	0.6	0.6
L2-05	Undervoltage Detection Lvl (Uv1)	-	380	380	380	380	380	380	380	380
L3-24	Motor Accel Time for Inertia Cal	s	0.145	0.154	0.168	0.175	0.265	0.244	0.317	0.355

No. *1	Name	Unit	Default							
-	Drive Model	-	4005	4008	4011	4014	4021	4027	4034	4040
o2-04	Drive Model (KVA) Selection	Hex.	95	97	99	9A	9B	9D	9E	9F
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	3 (2.2)	5 (3.7)	7.5 (5.5)	10 (7.5)	15 (11)	20 (15)	25 (18.5)	30 (22)
L8-02	Overheat Alarm Level	°C	115	115	95	95	127	127	127	123
L8-09	Output Ground Fault Detection	-	0	0	0	0	0	0	0	1
L8-35	Installation Method Selection	-	2 *3	2 *3	2 *3	2 *3	2 *3	2 *3	2 *3	2 *3
L8-38 *2	Carrier Frequency Reduction	-	2	2	2	2	2	2	2	2
n1-01	Hunting Prevention Selection	-	1	1	1	1	1	1	1	1
n1-03	Hunting Prevention Time Constant	ms	10	10	10	10	10	10	10	10

*1 Parameters within parentheses are for motor 2.
*2 You can use this parameter only when *A1-02 = 0 [Control Method Selection = V/f]*.
*3 When you use an IP55/UL Type 12 drive, the factory default setting is *3 [IP55/UL Type 12]*.

No. *1	Name	Unit	Default								
-	Drive Model	-	4052	4065	4077	4096	4124	4156	4180	4240	4302
o2-04	Drive Model (KVA) Selection	Hex.	A0	A2	A3	A4	A5	A6	A7	A8	A9
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	40 (30)	50 (37)	60 (45)	75 (55)	100 (75)	125 (90)	150 (110)	200 (150)	250 (185)
b3-04	V/f Gain during Speed Search	%	100	100	100	80	60	60	60	60	60
b3-06	Speed Estimation Current Level 1	-	0.5	0.5	0.5	0.5	0.7	0.7	0.7	0.7	0.7
b3-08	Speed Estimation ACR P Gain	-	0.50	0.50	0.50	0.50	0.80	0.80	0.80	0.80	0.80
b3-11	Spd Est Method Switch-over Level	%	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
b3-12	Speed Search Current Deadband	-	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
b3-26	Direction Determination Level	-	1000	1000	1000	1000	1000	1000	1000	1000	1000
b8-04	Energy Saving Coefficient Value	-	92.54	76.32	71.56	67.2	46.2	38.91	36.23	32.79	30.57
C6-02	Carrier Frequency Selection	-	2	2	2	2	2	2	2	2	1
E2-01 (E4-01)	Motor Rated Current (FLA)	A	52.0	65.0	77.0	96.0	124.0	156.0	180.0	240.0	302.0

No. *1	Name	Unit	Default								
-	Drive Model	-	4052	4065	4077	4096	4124	4156	4180	4240	4302
o2-04	Drive Model (KVA) Selection	Hex.	A0	A2	A3	A4	A5	A6	A7	A8	A9
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	40 (30)	50 (37)	60 (45)	75 (55)	100 (75)	125 (90)	150 (110)	200 (150)	250 (185)
E2-02 (E4-02)	Motor Rated Slip	Hz	1.80	1.33	1.60	1.46	1.39	1.40	1.40	1.38	1.30
E2-03 (E4-03)	Motor No-Load Current	A	10.9	19.1	22	24	36	40	49	58	81
E2-05 (E4-05)	Motor Line-to-Line Resistance	Ω	0.269	0.155	0.122	0.088	0.092	0.056	0.046	0.035	0.025
E2-06 (E4-06)	Motor Leakage Inductance	%	20.7	18.8	19.9	20.0	20.0	20.0	20.0	20.0	20.0
E2-10 (E4-10)	Motor Iron Loss	W	750	925	1125	1260	1600	1760	2150	2350	3200
E5-01	PM Motor Code Selection	-	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
L2-02	Power Loss Ride Through Time	s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
L2-03	Minimum Baseblock Time	s	1.1	1.1	1.2	1.2	1.3	1.5	1.7	1.7	1.9
L2-04	Powerloss V/f Recovery Ramp Time	s	0.6	0.6	0.6	1.0	1.0	1.0	1.0	1.0	1.8
L2-05	Undervoltage Detection Lvl (Uv1)	-	380	380	380	380	380	380	380	380	380
L3-24	Motor Accel Time for Inertia Cal	s	0.323	0.320	0.387	0.317	0.533	0.592	0.646	0.673	0.864
L8-02	Overheat Alarm Level	°C	123	123	120	124	124	110	120	120	125
L8-09	Output Ground Fault Detection	-	1	1	1	1	1	1	1	1	1
L8-35	Installation Method Selection	-	2 *3	2 *3	2 *3	2 *3	2 *3	2 *3	0	0	0
L8-38 *2	Carrier Frequency Reduction	-	2	2	2	2	2	2	2	2	2
n1-01	Hunting Prevention Selection	-	1	1	1	1	1	1	1	1	1
n1-03	Hunting Prevention Time Constant	ms	10	10	10	10	30	30	30	30	30

*1 Parameters within parentheses are for motor 2.
*2 You can use this parameter only when *A1-02 = 0 [Control Method Selection = V/f]*.
*3 When you use an IP55/UL Type 12 drive, the factory default setting is *3 [IP55/UL Type 12]*.

4

Mechanical & Electrical Installation

This chapter explains how to properly mount and install the drive, and to wire the control circuit terminals, motor, and power supply.

4.1 Section Safety

⚠DANGER

Electrical Shock Hazard

Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, remove the covers before measuring for dangerous voltages to make sure that the drive is safe.

If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.

⚠WARNING

Electrical Shock Hazard

Do not operate the drive when covers are missing. Replace covers and shields before you operate the drive. Use the drive only as specified by the instructions.

Some figures in this section include drives without covers or safety shields to more clearly show the inside of the drive. If covers or safety shields are missing from the drive, it can cause serious injury or death.

Make sure that the protective ground wire complies with technical standards and local safety regulations. The IEC/EN 61800-5-1:2007 standard specifies that you must wire the power supply to automatically de-energize when the protective ground wire disconnects. You can also connect a protective ground wire that has a minimum cross-sectional area of 10mm^2 (copper wire) or 16 mm^2 (aluminum wire). The leakage current of the drive will be more than 3.5 mA in drive models;

- **2xxxB**
- **2xxxC**
- **4002B to 4371B**
- **4002C to 4371C (with built-in EMC filter turned ON)**
- **4414 to 4720**
- **T414 to T720**

If you do not obey the standards and regulations, it can cause serious injury or death.

When there is a DC component in the protective earthing conductor, the drive can cause a residual current. When a residual current operated protective or monitoring device prevents direct or indirect contact, always use a type B Ground Fault Circuit Interrupter (GFCI) as specified by IEC/EN 60755.

If you do not use the correct GFCI, it can cause serious injury or death.

Do not wear loose clothing or jewelry when you do work on the drive. Tighten loose clothing and remove all metal objects, for example watches or rings.

Loose clothing can catch on the drive and jewelry can conduct electricity and cause serious injury or death.

Do not remove covers or touch circuit boards while the drive is energized.

If you touch the internal components of an energized drive, it can cause serious injury or death.

Only let approved personnel install, wire, maintain, examine, replace parts, and repair the drive.

If personnel are not approved, it can cause serious injury or death.

Do not modify the drive body or drive circuitry.

Modifications to drive body and circuitry can cause serious injury or death, will cause damage to the drive, and will void the warranty. Yaskawa is not responsible for modifications of the product made by the user.

Fire Hazard

Tighten all terminal screws to the correct tightening torque.

Connections that are too loose or too tight can cause incorrect operation and damage to the drive. Incorrect connections can also cause death or serious injury from fire.

⚠WARNING

Tighten screws at an angle in the specified range shown in this manual.

If you tighten the screws at an angle not in the specified range, you can have loose connections that can cause damage to the terminal block or start a fire and cause serious injury or death.

Damage to Equipment

Do not apply incorrect voltage to the main circuit of the drive. Operate the drive in the specified range of the input voltage on the drive nameplate.

Voltages that are higher than the permitted nameplate tolerance can cause damage to the drive.

Fire Hazard

When you install a dynamic braking option, wire the components as specified by the wiring diagrams.

Incorrect wiring can cause damage to braking components or serious injury or death.

NOTICE

Do not let unwanted objects, for example metal shavings or wire clippings, fall into the drive during drive installation. Put a temporary cover over the drive during installation. Remove the temporary cover before start-up.

Unwanted objects inside of the drive can cause damage to the drive.

Damage to Equipment

When you touch the drive and circuit boards, make sure that you observe correct electrostatic discharge (ESD) procedures.

If you do not follow procedures, it can cause ESD damage to the drive circuitry.

Select a motor that is compatible with the load torque and speed range. When 100% continuous torque is necessary at low speed, use an inverter-duty motor or vector-duty motor. When you use a standard fan-cooled motor, decrease the motor torque in the low-speed range.

If you operate a standard fan-cooled motor at low speed and high torque, it will decrease the cooling effects and can cause heat damage.

Obey the speed range specification of the motor as specified by the manufacturer. When you must operate the motor outside of its specifications, contact the motor manufacturer.

If you continuously operate oil-lubricated motors outside of the manufacturer specifications, it can cause damage to the motor bearings.

When the input voltage is 440 V or higher or the wiring distance is longer than 100 m (328 ft), make sure that the motor insulation voltage is sufficient or use an inverter-duty motor or vector-duty motor with reinforced insulation.

Motor winding and insulation failure can occur.

Before you connect a dynamic braking option to the drive, make sure that qualified personnel read and obey the Braking Unit and Braking Resistor Unit Installation Manual (TOBPC72060001).

If you do not read and obey the manual or if personnel are not qualified, it can cause damage to the drive and braking circuit.

Make sure that all connections are correct after you install the drive and connect peripheral devices.

Incorrect connections can cause damage to the drive.

Note:

- 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.
- The current rating of submersible motors is usually higher than the current rating of standard motors for a given motor power. Make sure that the rated output current of the drive is equal to or more than the current rating of the motor. If the motor wire length is longer than 100 m (328 ft), select the correct wire gauge to adjust for a loss in voltage and prevent a loss of motor torque.
- Do not use unshielded wire for control wiring. Use shielded, twisted-pair wires and ground the shield to the ground terminal of the drive. Unshielded wire can cause electrical interference and unsatisfactory system performance.

4.2 Removing/Reattaching Covers

This section gives information about how to remove and reattach the front cover and terminal cover for wiring and inspection.

Different drive models have different procedures to remove and reattach the covers. Refer toTable 4.1 for more information.

Table 4.1 Procedures to Remove Covers by Drive Model

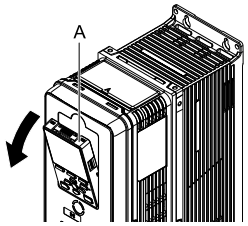
Model	IP20/UL Type 1 or IP20/UL Open Type		IP55/UL Type 12	
	Procedure	Reference	Procedure	Reference
2011 - 2114 4005 - 4124	Procedure A	249	Procedure C	253
2143, 2169 4156	Procedure B	250	Procedure D	Missing reference ID
2211 - 2273 4180 - 4302			-	

◆ Removing/Reattaching the Cover Using Procedure A

DANGER! *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, remove the covers before measuring for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

■ Remove the Front Cover

1. Remove the keypad from the drive.



A - Keypad

Figure 4.1 Remove the Keypad

2. Loosen the front cover screw.

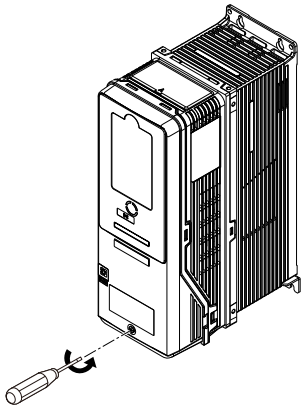


Figure 4.2 Loosen the Front Cover Screw

3. Push on the tabs in the sides of the front cover then pull the front cover forward to remove it from the drive.

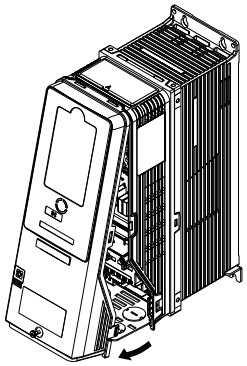


Figure 4.3 Remove the Front Cover

■ Reattach the Front Cover

1. Wire the drive and other peripheral devices.
2. Reverse the steps to reattach the cover.

Note:
- Make sure that you did not pinch wires or signal lines between the front cover and the drive before you reattach the cover.
- Make sure that the tabs on the sides of the front cover correctly click into the hook.
- Tighten the screws to a tightening torque of 0.98 N·m to 1.33 N·m (8.67 in·lb to 11.77 in·lb).

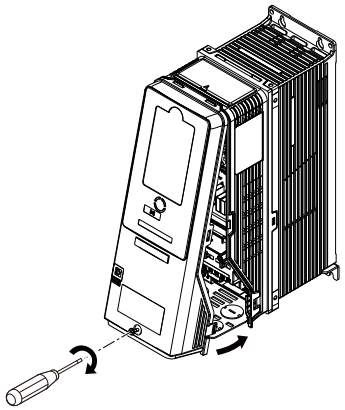


Figure 4.4 Reattach the Front Cover

3. Reattach the keypad to its initial position.

◆ Removing/Reattaching the Cover Using Procedure B

DANGER! *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, remove the covers before measuring for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

■ Remove the Terminal Cover

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

   CAUTION! *Crush Hazard. Loosen the cover screws. Do not fully remove them. If you fully remove the cover screws, the terminal cover can fall and cause moderate injury.*

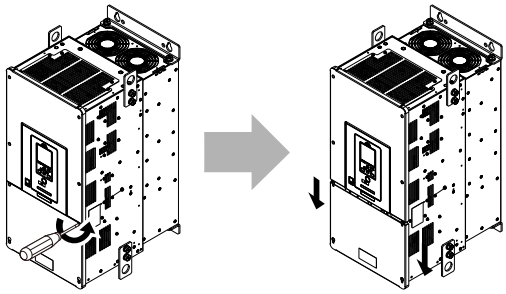


Figure 4.5 Loosen the Terminal Cover Mounting Screws

2. Pull the terminal cover away from the drive.

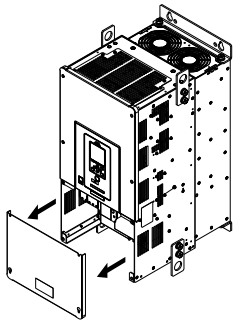
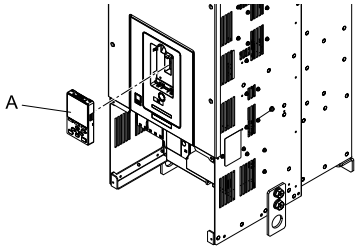


Figure 4.6 Remove the Terminal Cover

■ Remove the Front Cover

1. Remove the keypad from the drive.



A - Keypad

Figure 4.7 Remove the Keypad

2. Loosen the front cover screws.

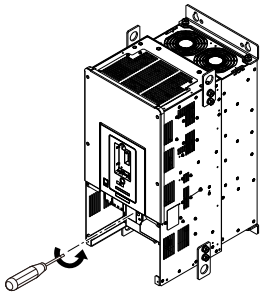
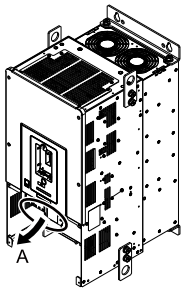


Figure 4.8 Loosen the Front Cover Screws

3. Pull part A of the front cover forward to remove the cover from the drive.



A - Pull forward to remove the front cover.

Figure 4.9 Pull Forward to Remove the Front Cover

4. Remove the front cover from the drive.

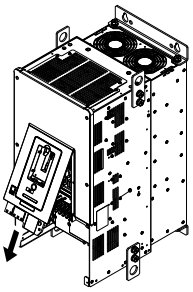
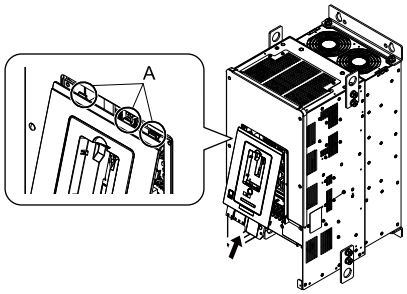


Figure 4.10 Remove the Front Cover

■ Reattach the Front Cover

Wire the drive and other peripheral devices then reattach the front cover.

1. Move the front cover to connect the hooks at the top of the front cover to the drive.



A - Hooks

Figure 4.11 Reattach the Front Cover

2. Move the front cover while pushing on the hooks on the left and right sides of the front cover until it clicks into position.

Note:

Make sure that you did not pinch wires or signal lines between the front cover and the drive before you reattach the cover.

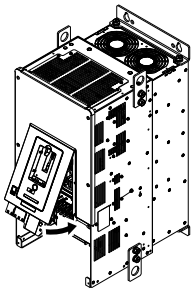


Figure 4.12 Reattach the Front Cover

3. Reattach the keypad to its initial position.

■ Reattach the Terminal Cover

Wire the drive and other peripheral devices then reattach the terminal cover.

Note:
- Make sure that you do not pinch wires or signal lines between the wiring cover and the drive before you reattach the cover.
- Tighten the screws to a tightening torque of 0.98 N·m to 1.33 N·m (8.67 in·lb to 11.77 in·lb).

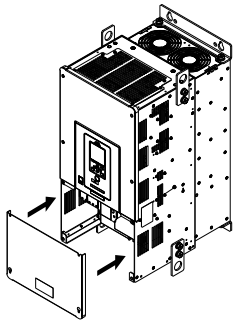


Figure 4.13 Reattach the Terminal Cover

◆ Removing/Reattaching the Cover Using Procedure C

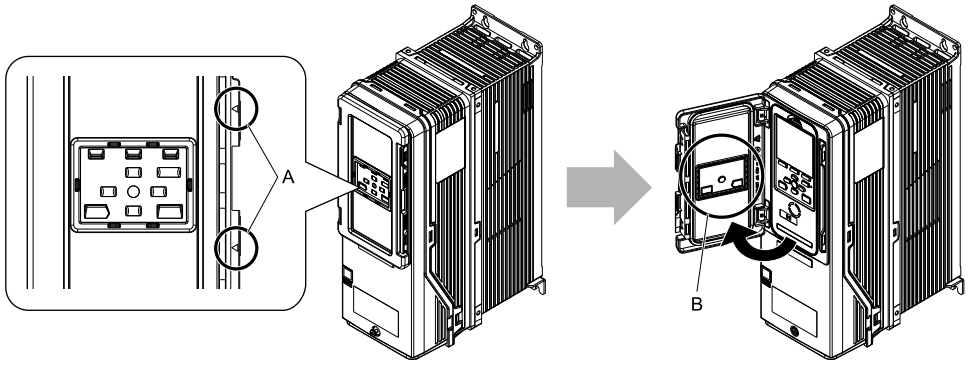
DANGER! *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, remove the covers before measuring for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

■ Remove the Front Cover

1. Push in the two tabs on the right side of the IP55/UL Type 12 keypad cover door and pull the door to the left to open.

   NOTICE: *Damage to Equipment. Do not open the IP55/UL Type 12 keypad cover door too far. If you open the door too far, it will fall off.*

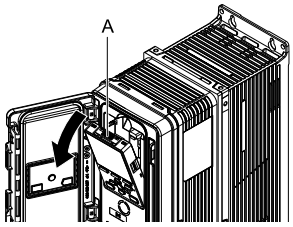
   NOTICE: *Damage to Equipment. When the IP55/UL Type 12 keypad cover door is open, do not push the keypad key cover. If you push the keypad key cover, it will fall off.*



A - Tabs **B - Keypad key cover**

Figure 4.14 Open the IP55/UL Type 12 Keypad Cover Door

2. Remove the keypad from the drive.



A - Keypad

Figure 4.15 Remove the Keypad

3. Loosen the front cover screw.

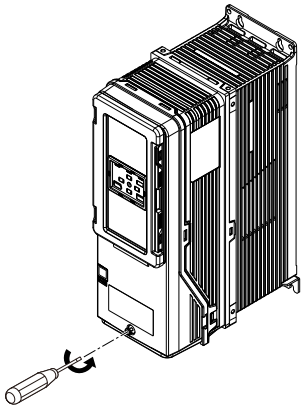


Figure 4.16 Loosen the Front Cover Screw

4. Push in the tabs on the sides of the front cover and pull the front cover forward to remove it from the drive.

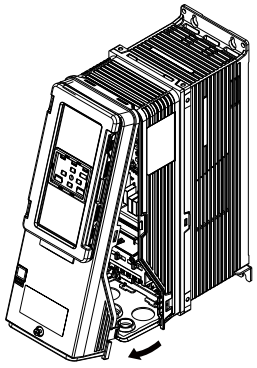


Figure 4.17 Remove the Front Cover

■ Reattach the Front Cover

1. Wire the drive and other peripheral devices.
2. Reverse the steps to reattach the cover. Reattach the cover carefully and make sure that the gasket on the conduit bracket does not twist.

Note:
- Make sure that you did not pinch wires or signal lines between the front cover and the drive before you reattach the cover.
- Make sure that the tabs on the sides of the front cover correctly click into the hook.
- Tighten the screws to a tightening torque of 0.98 N·m to 1.33 N·m (8.67 in·lb to 11.77 in·lb).

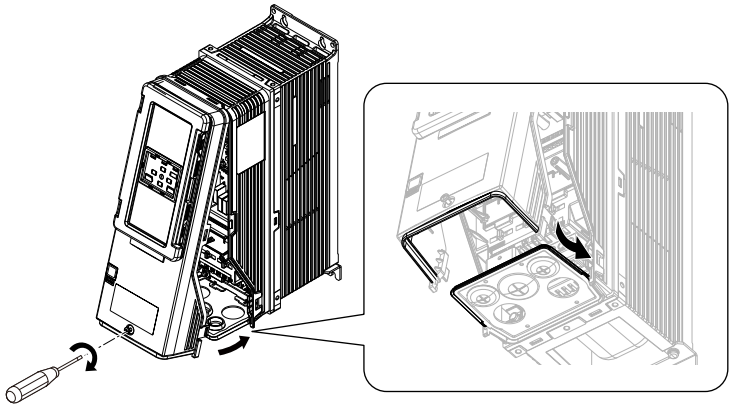


Figure 4.18 Reattach the Front Cover

3. Open the IP55/UL Type 12 keypad cover door and reattach the keypad to its initial position, then close the door until the two tabs click into position.

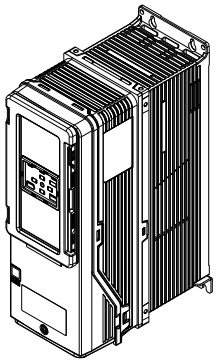


Figure 4.19 Reattach the Keypad and Close the Keypad Cover Door

4.3 Electrical Installation

DANGER! *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, remove the covers before measuring for dangerous voltages to make sure that the drive is safe. If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.*

WARNING! *Electrical Shock Hazard. De-energize the drive and wait 5 minutes minimum until the Charge LED turns off. Remove the front cover and terminal cover to do work on wiring, circuit boards, and other parts. Use terminals for their correct function only. Incorrect wiring, incorrect ground connections, and incorrect repair of protective covers can cause death or serious injury.*

WARNING! *Electrical Shock Hazard. Correctly ground the drive before you turn on the EMC filter switch. If you touch electrical equipment that is not grounded, it can cause serious injury or death.*

WARNING! *Electrical Shock Hazard. Use the terminals for the drive only for their intended purpose. Refer to the technical manual for more information about the I/O terminals. Wiring and grounding incorrectly or modifying the cover may damage the equipment or cause injury.*

◆ Standard Connection Diagram

Wire the drive as specified by Figure 4.20.

WARNING! *Sudden Movement Hazard. Set the MFDI parameters before you close control circuit switches. Incorrect Run/Stop circuit sequence settings can cause serious injury or death from moving equipment.*

WARNING! *Sudden Movement Hazard. Correctly wire the start/stop and safety circuits before you energize the drive. If you momentarily close a digital input terminal, it can start a drive that is programmed for 3-Wire control and cause serious injury or death from moving equipment.*

WARNING! *Sudden Movement Hazard. When you use a 3-Wire sequence, set A1-03 = 3330 [Initialize Parameters = 3-Wire Initialization] and make sure that b1-17 = 0 [Run Command at Power Up = Disregard Existing RUN Command]. If you do not correctly set the drive parameters for 3-Wire operation before you energize the drive, the motor can suddenly rotate in reverse when you energize the drive.*

WARNING! *Sudden Movement Hazard. Check the I/O signals and the external sequences for the drive before you set the Application Preset function. When you set the Application Preset function (A1-06 ≠ 0), it changes the I/O terminal functions for the drive and it can cause equipment to operate unusually. This can cause serious injury or death.*

WARNING! *Fire Hazard. Install sufficient branch circuit short circuit protection as specified by applicable codes and this manual. The drive is suitable for circuits that supply not more than 100,000 RMS symmetrical amperes, 240 Vac maximum (208 V Class), 480 Vac maximum (480 V Class). Incorrect branch circuit short circuit protection can cause serious injury or death.*

NOTICE: *When the input voltage is 440 V or higher or the wiring distance is longer than 100 m (328 ft), make sure that the motor insulation voltage is sufficient or use an inverter-duty motor or vector-duty motor with reinforced insulation. Motor winding and insulation failure can occur.*

Note:

Do not connect the AC control circuit ground to the drive enclosure. Incorrect ground wiring can cause the control circuit to operate incorrectly.

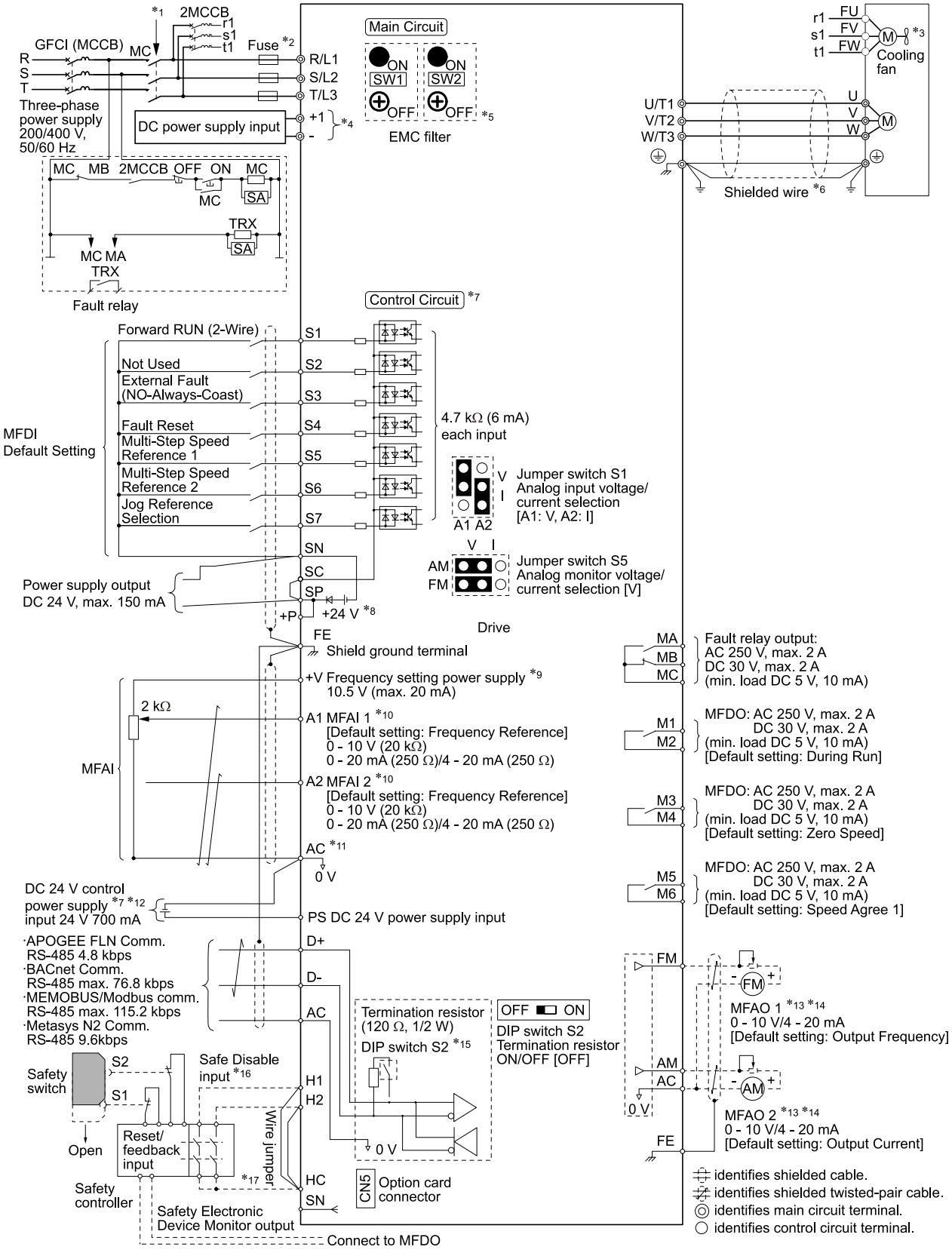


Figure 4.20 Standard Drive Connection Diagram

*1 Set the wiring sequence to de-energize the drive with the fault relay output. If the drive outputs a fault during fault restart when you use the fault restart function, set *L5-02 = 1 [Fault Contact at Restart Select = Always Active]* to de-energize the drive. Be careful when you use a cut-off sequence. The default setting for *L5-02* is *0 [Active Only when Not Restarting]*.

*2 Use branch circuit protection devices as recommended in this manual.

*3 Cooling fan wiring is not necessary for self-cooling motors.
*4 Connect DC power supply input to terminals - and +1.

WARNING! *Fire Hazard. Only connect factory-recommended devices or circuits to drive terminals - and +1. Do not connect AC power to these terminals. Incorrect wiring can cause damage to the drive and serious injury or death from fire.*

*5 **NOTICE:** *When you use the drive with a non-grounding, high-resistance grounding, or asymmetric-grounding network, put the EMC Filter screw or screws in the OFF position to disable the built-in EMC filter. Failure to obey the instructions can damage the drive.*
*6 Use braided shield cable for the drive and motor wiring, or run the wiring through a metal conduit.
*7 Connect a 24 V power supply to terminals PS-AC to operate the control circuit while the main circuit power supply is OFF.
*8 To set the MFDI power supply (Sinking/Sourcing Mode or internal/external power supply), install or remove a jumper between terminals SC-SP or SC-SN depending on the application.

NOTICE: *Damage to Equipment. Do not close the circuit between terminals SP-SN. If you close the circuits between terminals SC-SP and terminals SC-SN at the same time, it will cause damage to the drive.*

- Sinking Mode, Internal power supply: Install the jumper to close the circuit between terminals SC-SP.

  NOTICE: *Damage to Equipment. Do not close the circuit between terminals SC-SN. If you close the circuits between terminals SC-SP and terminals SC-SN at the same time, it will cause damage to the drive.*

- Sourcing Mode, Internal power supply: Install the jumper to close the circuit between terminals SC-SN.

  NOTICE: *Damage to Equipment. Do not close the circuit between terminals SC-SP. If you close the circuits between terminals SC-SP and terminals SC-SN at the same time, it will cause damage to the drive.*

- External power supply: Remove the jumper from the MFDI terminals. It is not necessary to close the circuit between terminals SC-SP and terminals SC-SN.

*9 The maximum output current capacity for terminal +V on the control circuit is 20 mA.

NOTICE: *Damage to Equipment. Do not install a jumper between terminals +V and AC. A closed circuit between these terminals will cause damage to the drive.*

*10 Jumper switch S1 sets terminals A1 and A2 for voltage or current input signal. The default setting for S1 is voltage input (“V” side) for A1 and current input (“I” side) for A2.
*11 **NOTICE:** *Do not ground the AC control circuit terminals and only connect the AC terminals according to the product instructions. If you connect the AC terminals incorrectly, it can cause damage to the drive.*
*12 Connect the positive lead from an external 24 Vdc power supply to terminal PS and the negative lead to terminal AC.

NOTICE: *Connect terminals PS and AC correctly for the 24 V power supply. If you connect the wires to the incorrect terminals, it will cause damage to the drive.*

*13 Use multi-function analog monitor outputs with analog frequency meters, ammeters, voltmeters, and wattmeters. Do not use monitor outputs with feedback-type signal devices.
*14 Jumper switch S5 sets terminal FM and AM for voltage or current output. The default setting for S5 is voltage output (“V” side).
*15 Set DIP switch S2 to “ON” to enable the termination resistor in the last drive in a MEMOBUS/Modbus network.
*16 Use only Sourcing Mode for Safe Disable input.
*17 Disconnect the jumpers between H1 and HC and H2 and HC to use the Safe Disable input.

4.4 Main Circuit Wiring

This section gives information about the functions, specifications, and procedures necessary to safely and correctly wire the main circuit in the drive.

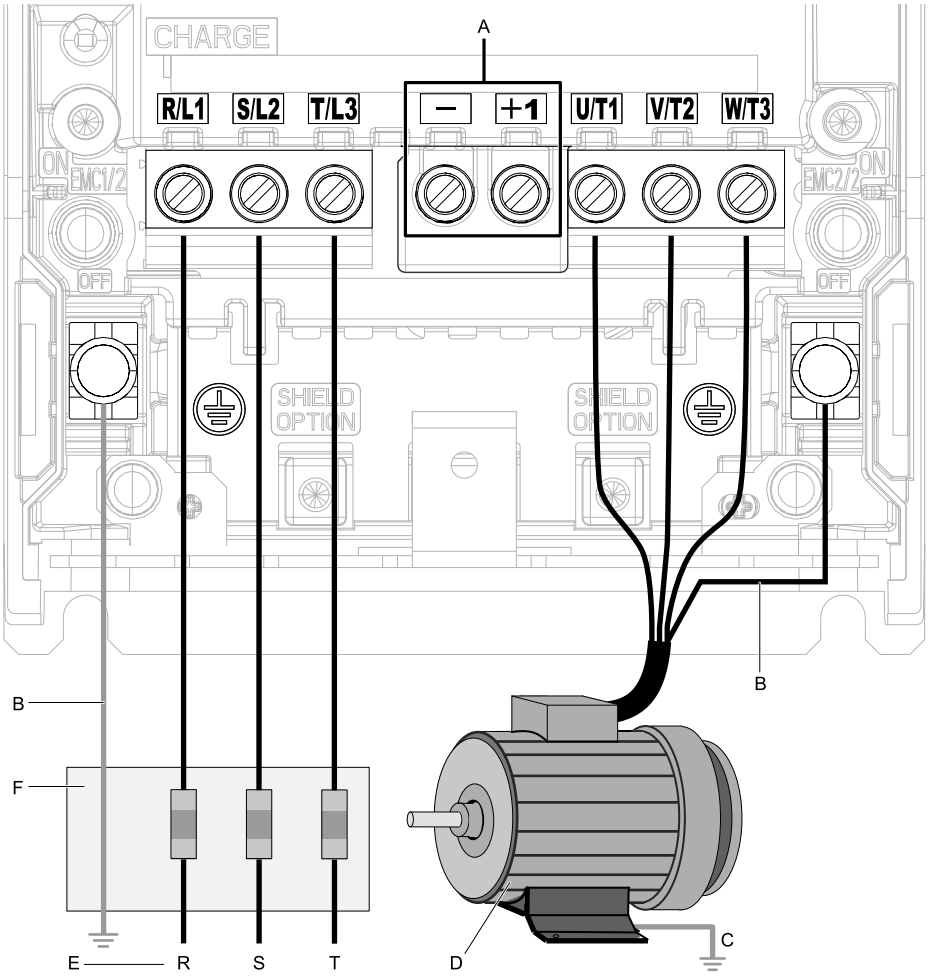
NOTICE: *Damage to Equipment. Do not energize and de-energize the drive more frequently than one time each 30 minutes. If you frequently energize and de-energize the drive, it can cause drive failure.*

Note:

Soldered wire connections can become loose over time and cause unsatisfactory drive performance.

◆ Motor and Main Circuit Connections

WARNING! *Electrical Shock Hazard. Do not connect terminals R/L1, S/L2, T/L3, U/T1, V/T2, W/T3, -, or +1 to the ground terminal. If you connect these terminals to earth ground, it can cause damage to the drive or serious injury or death.*



Note:

The location of terminals are different for different drive models.

A - DC bus terminal
B - Connect to the drive ground terminal.
C - Ground the motor case.
D - Three-Phase Motor
E - Use R, S, T for input power supply.
F - Input Protection (Fuses or Circuit Breakers)

Figure 4.21 Wiring the Main Circuit and Motor

◆ Main Circuit Terminal Functions

Refer to Table 4.2 for the functions of drive main circuit terminals.

Table 4.2 Main Circuit Terminal Functions

Terminal	Function
R/L1	Line side
S/L2	
T/L3	
U/T1	Load side
V/T2	
W/T3	
-	DC input terminal
+1	
⏚	Ground terminal

4.5 Control Circuit Wiring

This section gives information about how to correctly wire the control circuit.

◆ Control Circuit Connection Diagram

Wire the drive control circuit as shown in Figure 4.22.

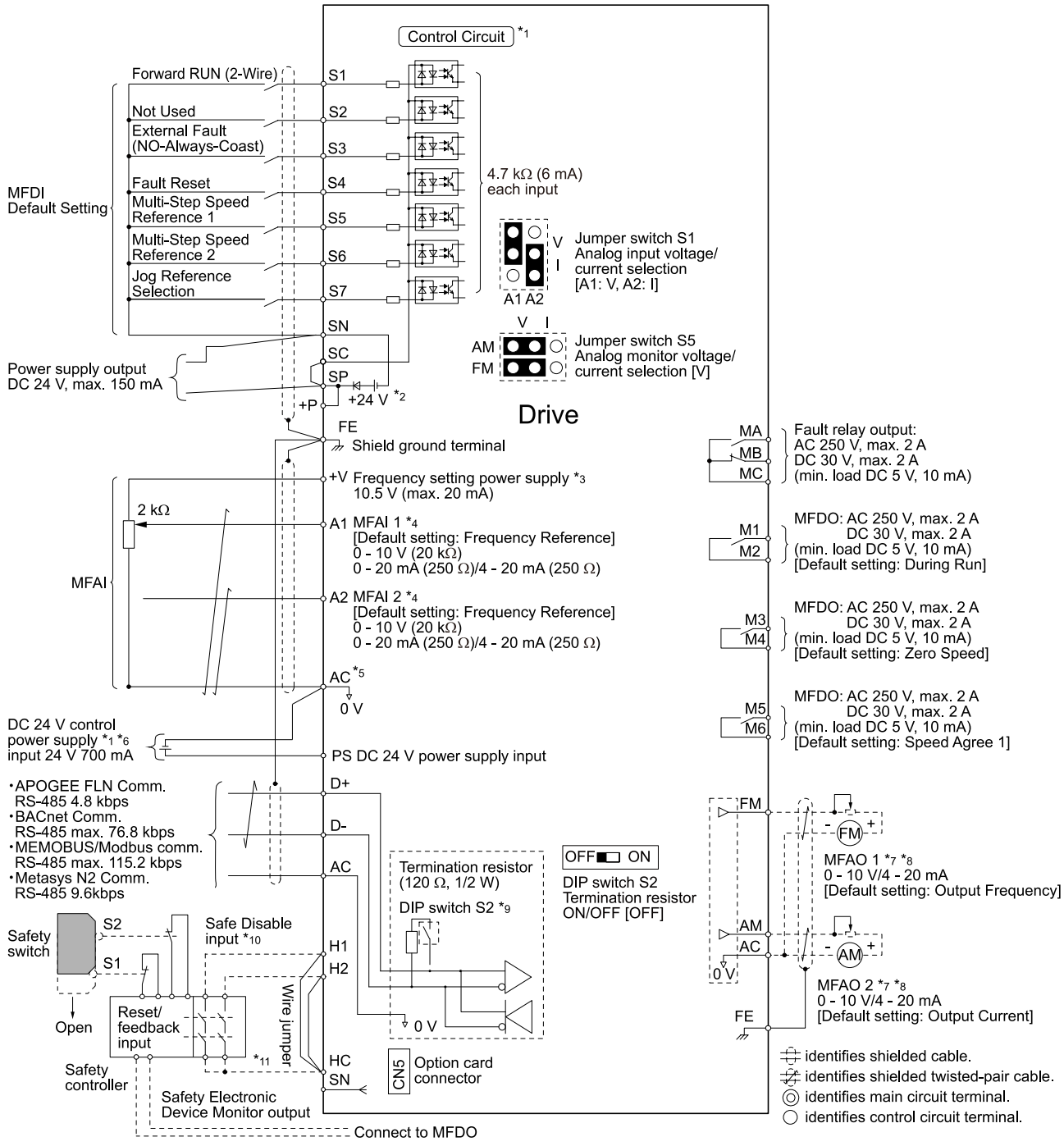


Figure 4.22 Control Circuit Connection Diagram

*1 Connect a 24 V power supply to terminals PS-AC to operate the control circuit while the main circuit power supply is OFF.

*2 To set the MFDI power supply (Sinking/Sourcing Mode or internal/external power supply), install or remove a jumper between terminals SC-SP or SC-SN depending on the application.

NOTICE: *Damage to Equipment. Do not close the circuit between terminals SP-SN. If you close the circuits between terminals SC-SP and terminals SC-SN at the same time, it will cause damage to the drive.*

- Sinking Mode, Internal power supply: Install the jumper to close the circuit between terminals SC-SP.

  NOTICE: *Damage to Equipment. Do not close the circuit between terminals SC-SN. If you close the circuits between terminals SC-SP and terminals SC-SN at the same time, it will cause damage to the drive.*

- Sourcing Mode, Internal power supply: Install the jumper to close the circuit between terminals SC-SN.

  NOTICE: *Damage to Equipment. Do not close the circuit between terminals SC-SP. If you close the circuits between terminals SC-SP and terminals SC-SN at the same time, it will cause damage to the drive.*

- External power supply: Remove the jumper from the MFDI terminals. It is not necessary to close the circuit between terminals SC-SP and terminals SC-SN.

*3 The maximum output current capacity for terminal +V on the control circuit is 20 mA.

NOTICE: *Damage to Equipment. Do not install a jumper between terminals +V and AC. A closed circuit between these terminals will cause damage to the drive.*

*4 Jumper S1 sets terminals A1 and A2 for voltage or current input signal. The default setting for S1 is voltage input (“V” side) for A1 and current input (“I” side) for A2.

*5 **NOTICE:** *Do not ground the AC control circuit terminals and only connect the AC terminals according to the product instructions. If you connect the AC terminals incorrectly, it can cause damage to the drive.*

*6 Connect the positive lead from an external 24 Vdc power supply to terminal PS and the negative lead to terminal AC.

NOTICE: *Connect terminals PS and AC correctly for the 24 V power supply. If you connect the wires to the incorrect terminals, it will cause damage to the drive.*

*7 Use multi-function analog monitor outputs with analog frequency meters, ammeters, voltmeters, and wattmeters. Do not use monitor outputs with feedback-type signal devices.

*8 Jumper switch S5 sets terminal FM and AM for voltage or current output. The default setting for S5 is voltage output (“V” side).

*9 Set DIP switch S2 to “ON” to enable the termination resistor in the last drive in a MEMOBUS/Modbus network.

*10 Use only Sourcing Mode for Safe Disable input.

*11 Disconnect the jumpers between H1 and HC and H2 and HC to use the Safe Disable input.

◆ Control Circuit Terminal Block Functions

Hx-xx parameters set functions for the multi-function input and output terminals.

WARNING! *Sudden Movement Hazard. Correctly wire and test all control circuits to make sure that the control circuits operate correctly. If you use a drive that has incorrect control circuit wiring or operation, it can cause death or serious injury.*

WARNING! *Sudden Movement Hazard. Check the I/O signals and the external sequences for the drive before you set the Application Preset function. When you set the Application Preset function (A1-06 ≠ 0), it changes the I/O terminal functions for the drive and it can cause equipment to operate unusually. This can cause serious injury or death.*

NOTICE: *Damage to Equipment. Do not energize and de-energize the drive more frequently than one time each 30 minutes. If you frequently energize and de-energize the drive, it can cause drive failure.*

■ Input Terminals

Refer to Table 4.3 for a list of input terminals and functions.

Table 4.3 Multi-function Input Terminals

Type	Terminal	Name (Default)	Function (Signal Level)
MFDI	S1	MFDI selection 1 (ON: Forward RUN (2-Wire) OFF: Stop)	Multi-Function Digital Input • Photocoupler • 24 V, 6 mA **Note:** Install the wire jumpers between terminals SC-SP and SC-SN to set the MFDI power supply (sinking/sourcing mode or internal/external power supply). • Sinking Mode: Install a jumper between terminals SC and SP. **NOTICE:** *Damage to Equipment. Do not close the circuit between terminals SC-SN. If you close the circuits between terminals SC-SP and terminals SC-SN at the same time, it will cause damage to the drive.* • Sourcing Mode: Install a jumper between terminals SC and SN. **NOTICE:** *Damage to Equipment. Do not close the circuit between terminals SC-SP. If you close the circuits between terminals SC-SP and terminals SC-SN at the same time, it will cause damage to the drive.* • External power supply: No jumper necessary between terminals SC-SN and terminals SC-SP.
	S2	MFDI selection 2 (Not Used)	
	S3	MFDI selection 3 (External Fault (NO-Always-Coast))	
	S4	MFDI selection 4 (Fault Reset)	
	S5	MFDI selection 5 (Multi-Step Speed Reference 1)	
	S6	MFDI selection 6 (Multi-Step Speed Reference 2)	
	S7	MFDI selection 7 (Jog Reference Selection)	
	SN	MFDI power supply 0 V	MFDI power supply, 24 V (maximum 150 mA) **NOTICE:** *Damage to Equipment. Do not close the circuit between terminals SP-SN. If you close the circuits between terminals SC-SP and terminals SC-SN at the same time, it will cause damage to the drive.*
	SC	MFDI selection common	
	SP	MFDI power supply +24 Vdc	
Safe Disable Input	H1	Safe Disable input 1	Safe Disable Input Remove the jumper between terminals H1-HC and H2-HC to use the Safe Disable input. • 24 V, 6 mA • ON: Normal operation • OFF: Coasting motor • Internal impedance 4.7 kΩ • OFF Minimum OFF time of 2 ms.
	H2	Safe Disable input 2	
	HC	Safe Disable function common	Safe Disable function common **NOTICE:** *Do not close the circuit between terminals HC and SN. A closed circuit between these terminals will cause damage to the drive.*
Master Frequency Reference	+V	Power supply for frequency setting	Power Supply for Multi-Function Analog Input • 10.5 V (allowable current 20 mA maximum)
	A1	MFAI1 (Frequency Reference)	Voltage input or current input Select terminal A1 with Jumper switch S1 and *H3-01 [Terminal A1 Signal Level Select]*. • 0 V to 10 V/100% (input impedance: 20 kΩ) • 4 mA to 20 mA/100%, 0 mA to 20 mA/100% (input impedance: 250 Ω)
	A2	MFAI2 (Combined to terminal A1)	Voltage input or current input Select terminal A2 with Jumper switch S1 and *H3-09 [Terminal A2 Signal Level Select]* • 0 V to 10 V/100% (input impedance: 20 kΩ) • 4 mA to 20 mA/100%, 0 mA to 20 mA/100% (input impedance: 250 Ω)
	AC	Frequency reference common	Signal Ground for Multi-Function Analog Input • 0 V
	FE	Connecting shielded cable	Frame Earth

■ Output Terminals

Refer to Table 4.4 and Table 4.5 for a list of output terminals and functions.

Table 4.4 Control Circuit Output Terminals

Type	Terminal	Name (Default)	Function (Signal Level)
Fault Relay Output	MA	N.O. output (Fault)	Drive Fault Signal Output • Relay output • 30 Vdc, 10 mA to 2 A • 250 Vac, 10 mA to 2 A • Minimum load: 5 V, 10 mA (Reference value)
	MB	N.C. output (Fault)	
	MC	Digital output common	
MFDO	M1	MFDO (During Run)	Multi Function Digital Output • Relay output • 30 Vdc, 10 mA to 2 A • 250 Vac, 10 mA to 2 A • Minimum load: 5 V, 10 mA (Reference value) **Note:** Do not set functions that frequently switch ON/OFF to MFDO (M1 to M6) because this will decrease the performance life of the relay contacts. Yaskawa estimates switching life at 200,000 times (assumes 1 A, resistive load).
	M2		
	M3	MFDO (Zero Speed)	
	M4		
	M5	MFDO (Speed Agree 1)	
	M6		

Table 4.5 Control Circuit Monitor Output Terminals

Type	Terminal	Name (Default)	Function (Signal Level)
Monitor Output	FM	MFAO 1 (Output frequency)	Multi Function Analog Output Select voltage or current output. • 0 V to 10 V/0% to 100% • 4 mA to 20 mA (receiver recommended impedance: 250 Ω) **Note:** Select with jumper switch S5 and *H4-07 [Terminal FM Signal Level Select]* or *H4-08 [Terminal AM Signal Level Select]*.
	AM	MFAO 2 (Output current)	
	AC	Monitor common	0 V
External Power Supply Output	+P	External power supply	Power supply for external devices. • 24 V (150 mA maximum)

■ External Power Supply Input Terminals

Refer to Table 4.6 for a list of the functions of the external power supply input terminals.

Table 4.6 External Power Supply Input Terminals

Type	Terminal	Name (Default)	Function
External Power Supply Input Terminals	PS	External 24 V power supply input	Supplies backup power to the drive control circuit, keypad, and option board. 21.6 VDC to 26.4 VDC, 700 mA
	AC	External 24 V power supply ground	0 V

Alarm Display When You Use External 24 V Power Supply

When you use an external 24 V power supply, the drive detects an alarm as shown in Table 4.7 if you set *o2-23 [External 24V Powerloss Detection]* and *o2-26 [Alarm Display at Ext. 24V Power]* for the main circuit power supply. Set the alarm display as necessary.

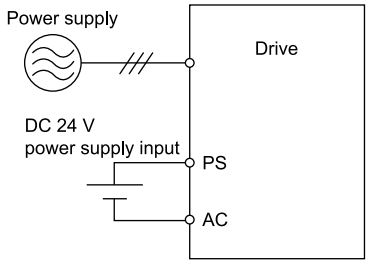


Table 4.7 Power Supply and Alarm Display

Main Circuit Power Supply	External 24 V Power Supply	o2-23 [External 24V Powerloss Detection]	o2-26 [Alarm Display at Ext. 24V Power]	Alarm Display
ON	ON	-	-	-
ON	OFF	0 [Disabled]	-	-
		1 [Enabled]	-	*L24v [Loss of External Power 24 Supply]*
OFF	ON	-	0 [Disabled]	"Ready" LED light flashes quickly
		-	1 [Enabled]	*EP24v [External Power 24V Supply]*

■ Serial Communication Terminals

Refer to Table 4.8 for a list of serial communication terminals and functions.

Table 4.8 Serial Communication Terminals

Type	Terminal	Terminal Name	Function (Signal Level)	
Serial Communication	D+	Communication input/output (+)	• APOGEE FLN communications • BACnet communications • MEMOBUS/ Modbus communications • Metasys N2 communications Use an RS-485 cable to connect the drive. **Note:** Set DIP switch S2 to ON to enable the termination resistor in the last drive in an APOGEE FLN, BACnet, MEMOBUS/ Modbus, or Metasys N2 network.	• RS-485 • APOGEE FLN communications: 4.8 kbps • BACnet communications: Maximum 76.8 kbps • MEMOBUS/Modbus communications: Maximum 115.2 kbps • Metasys N2 communications: 9.6 kbps
	D-	Communication output (-)		
	AC	Signal ground	0 V	
	FE	Option card ground	-	

◆ Control Circuit Terminal Configuration

The control circuit terminals are in the positions shown in Figure 4.23.

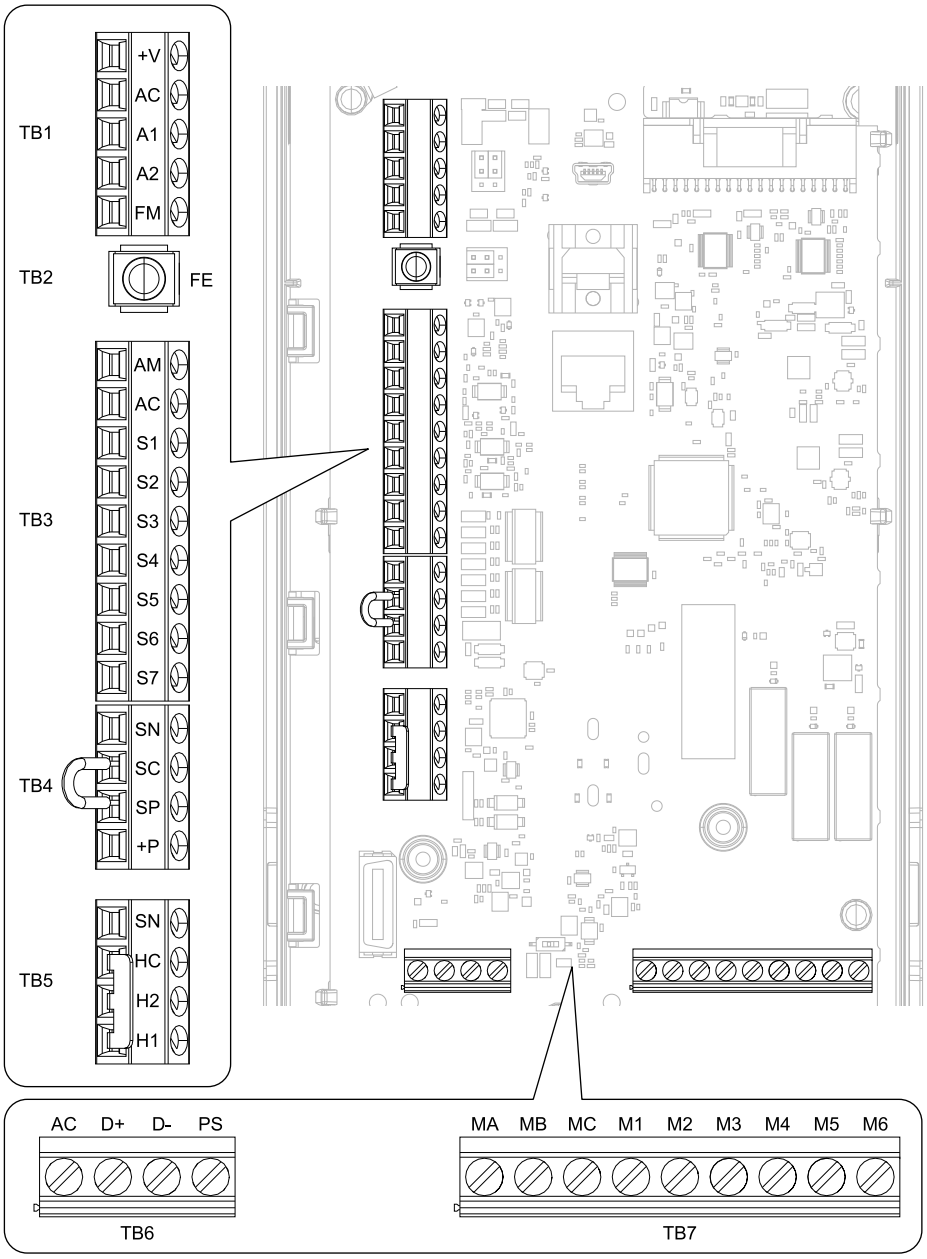


Figure 4.23 Control Circuit Terminal Arrangement

The tightening torque for the terminal screws is shown on the reverse side or the lower front side of the front cover.

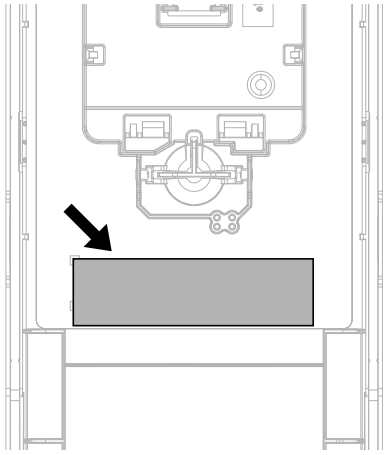


Figure 4.24 Tightening Torque Display Location (Reverse Side of Front Cover)

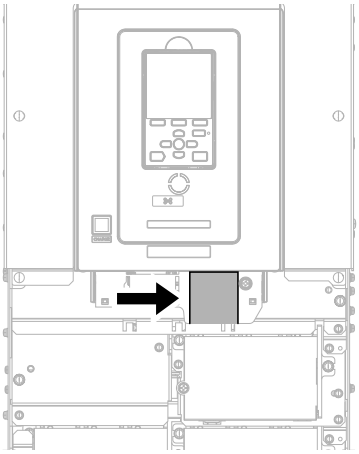


Figure 4.25 Tightening Torque Display Location (Lower Front Side of Front Cover)

■ Control Circuit Wire Gauges and Tightening Torques

Use the tables in this section to select the correct wires. Use shielded wire to wire the control circuit terminal block. Use crimp ferrules on the wire ends to make the wiring procedure easier and more reliable.

Table 4.9 Control Circuit Wire Gauges and Tightening Torques

Terminal Block	Terminal	Screw Size	Tightening Torque N·m (in·lb)	Bare Wire		Crimp Ferrule	
				Recommended Gauge mm² (AWG)	Applicable Gauge mm² (AWG)	Recommended Gauge mm² (AWG)	Applicable Gauge mm² (AWG)
TB1	+V, AC, A1, A2, FM	M3	0.5 - 0.6 (4.4 - 5.3)	0.75 (18)	Stranded wire: 0.25 - 1.5 (24 - 16) Solid wire: 0.25 - 1.5 (24 - 16)	0.75 (18)	0.25 - 1.5 (24 - 16)
TB3	AM, AC, S1 - S7						
TB4	SN, SC, SP, +P						
TB5	SN, HC, H1, H2						
TB6	AC, D+, D-, PS						
TB7	MA, MB, MC, M1 - M6						
TB2	FE		1.0 - 1.2 (8.85 - 10.62)	0.75 (18)	Stranded wire: 0.12 - 0.75 (26 - 18) Solid wire: 0.2 - 1.5 (26 - 16)	0.75 (18)	0.25 - 1.5 (24 - 16)

Crimp Ferrules

Attach an insulated sleeve when you use crimp ferrules. Refer to Table 4.10 for the recommended external dimensions and model numbers of the crimp ferrules.

Use the CRIMPFOX 6, a crimping tool made by PHOENIX CONTACT.

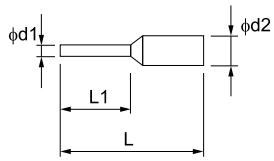


Figure 4.26 External Dimensions of Crimp Ferrules

Table 4.10 Crimp Ferrule Models and Sizes

Wire Gauge mm² (AWG)	Model	L (mm)	L1 (mm)	φd1 (mm)	φd2 (mm)
0.25 (24)	AI 0.25-8YE	12.5	8	0.8	2.0
0.34 (22)	AI 0.34-8TQ	12.5	8	0.8	2.0
0.5 (20)	AI 0.5-8WH AI 0.5-8OG	14	8	1.1	2.5
0.75 (18)	AI 0.75-8 GY	14	8	1.3	2.8

◆ Wiring the Control Circuit Terminal

WARNING! *Electrical Shock Hazard. Do not remove covers or touch circuit boards while the drive is energized. If you touch the internal components of an energized drive, it can cause serious injury or death.*

NOTICE: *Do not let wire shields touch other signal lines or equipment. Insulate the wire shields with electrical tape or shrink tubing. If you do not insulate the wire shields, it can cause a short circuit and damage the drive.*

Note:

- Isolate control circuit wiring from main circuit wiring (terminals R/L1, S/L2, T/L3, U/T1, V/T2, W/T3, -, +1) and other high-power wiring. If the control circuit wires are adjacent to the main circuit wires, electrical interference can cause the drive or the devices around the drive to malfunction.
- Isolate contact output terminals MA, MB, MC and M1-M6 from other control circuit wiring. If the output terminal wires are adjacent to other control circuit wires, electrical interference can cause the drive or devices around the drive to malfunction.
- Use a UL Listed Class 2 Power Supply to connect external power to the control terminals. If the power supply for peripheral devices is incorrect, it can cause a decrease in drive performance.
- Connect the shield of shielded cable to the applicable ground terminal. If the grounding is not correct, electrical interference can cause the drive or devices around the drive to malfunction.

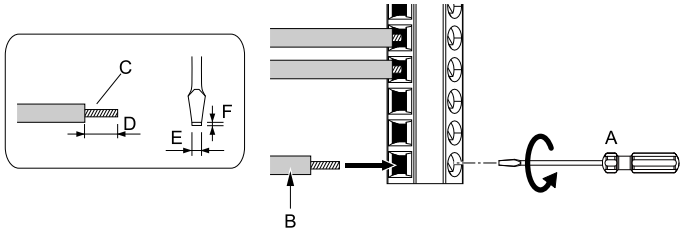
Correctly ground the drive terminals and complete main circuit wiring before you wire the control circuit. Remove the keypad and front cover.

1. Refer to Figure 4.27 and wire the control circuit.

   WARNING! *Fire Hazard. Tighten all terminal screws to the correct tightening torque. Connections that are too loose or too tight can cause incorrect operation and damage to the drive. Incorrect connections can also cause death or serious injury from fire.*

Note:

- Use shielded wires and shielded twisted-pair wires for the control circuit terminal wiring. If the grounding is not correct, electrical interference can cause the drive or devices around it to malfunction.
- Do not use control circuit wiring that is longer than 50 m (164 ft) to supply the frequency reference with an analog signal from a remote source. Wiring that is too long can cause unsatisfactory system performance.



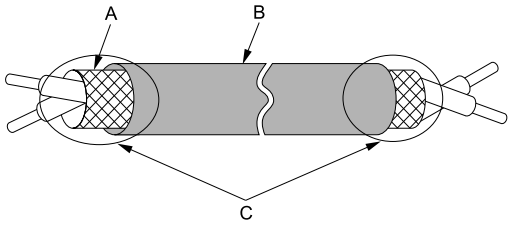
A - Loosen the screws and put the wire into the opening on the terminal block.
B - Wire with a crimp ferrule attached, or use wire that is not soldered with the core wires lightly twisted.
C - Pull back the shielding and lightly twist the end with your fingers to keep the ends from fraying.
D - If you do not use crimp ferrules, remove approximately 5.5 mm (0.21 in) of the covering at the end of the wire.
E - Blade width of 2.5 mm (0.1 in) or less
F - Blade depth of 0.4 mm (0.01 in) or less

Figure 4.27 Wiring Procedure for the Control Circuit

WARNING! *Fire Hazard. Tighten all terminal screws to the correct tightening torque. Connections that are too loose or too tight can cause incorrect operation and damage to the drive. Incorrect connections can also cause death or serious injury from fire.*

NOTICE: *Do not solder the core wire. Soldered wire connections can become loose over time and cause unsatisfactory drive performance.*

Note:
- Refer to Figure 4.28 for information to prepare terminal ends of the shielded wire.
- Prepare the wire ends of shielded twisted-pair wires as shown in Figure 4.28 to use an analog reference from an external frequency setting potentiometer to set the frequency. Connect the shield to terminal FE of the drive.



A - Connect the shield to terminal FE of the drive.
B - Sheath
C - Insulate with electrical tape or shrink tubing.

Figure 4.28 Prepare the Ends of Shielded Wire

2. Put the cables through the clearance of the drive and knock-out holes.

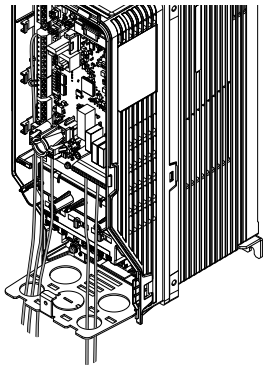


Figure 4.29 Control Circuit Wiring

3. Install the front cover and the keypad to their initial positions.

◆ Switches and Jumpers on the Terminal Board

The terminal board has switches to adapt the drive I/Os to the external control signals as shown in Figure 4.30. Set the switches to select the functions for each terminal.

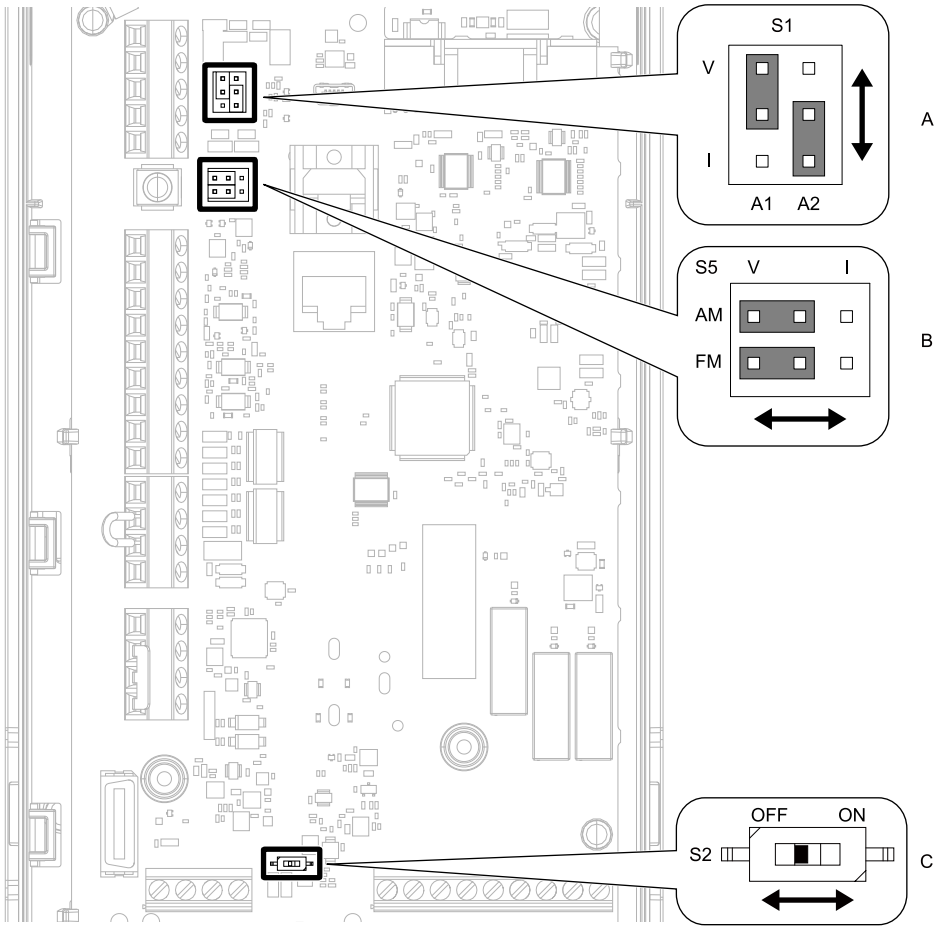


Figure 4.30 Locations of Switches

Table 4.11 I/O Terminals and Switches Functions

Position	Switch	Terminal	Function	Default Setting
A	Jumper switch S1	A1, A2	Sets terminals A1 and A2 to voltage or current output.	A1: V (voltage input) A2: I (current input)
B	Jumper switch S5	FM, AM	Sets terminals FM and AM to voltage or current output.	FM: V (voltage output) AM: V (voltage output)
C	DIP switch S2	-	Enables and disables the termination resistor of these communications: • APOGEE FLN • BACnet • MEMOBUS/Modbus • Metasys N2	OFF

4.6 Control I/O Connections

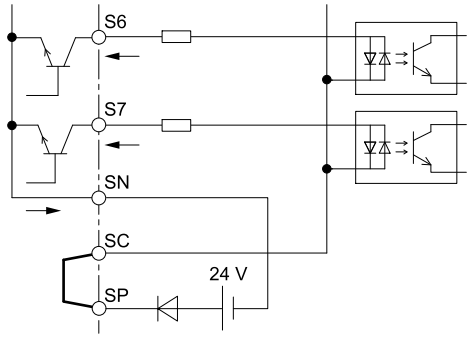
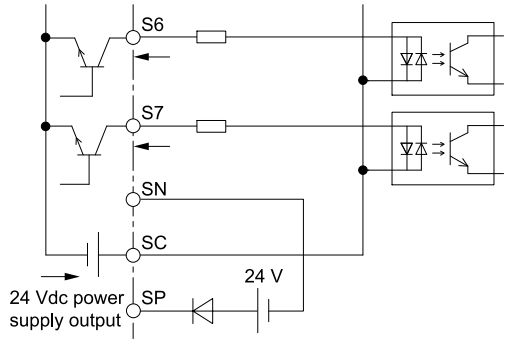
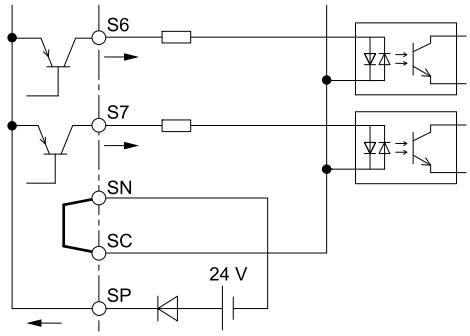
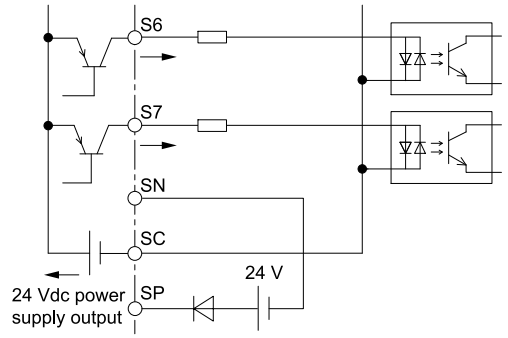
This section gives information about the settings for the listed control circuit I/O signals.

- MFDI (terminals S1 to S7)
- MFDO (terminals M1 to M6)
- MFAI (terminals A1, A2)
- MFAO (terminals FM, AM)
- RS-485 communications (terminals D+, D-, AC)

◆ Set Sinking Mode/Sourcing Mode

Close the circuit between terminals SC-SP and SC-SN to set the sinking mode/sourcing mode and the internal/external power supply for the MFDI terminals. The default setting for the drive is internal power supply sinking mode.

NOTICE: *Damage to Equipment. Do not close the circuit between terminals SP-SN. If you close the circuits between terminals SC-SP and terminals SC-SN at the same time, it will cause damage to the drive.*

Mode	Internal Power Supply (Terminal SN-SP)	External 24 V Power Supply
Sinking Mode (NPN)		
Sourcing Mode (PNP)		

◆ Set Input Signals for MFAI Terminals A1 and A2

Use terminals A1 and A2 to input a voltage or a current signal. Set the signal type as shown in Table 4.12.

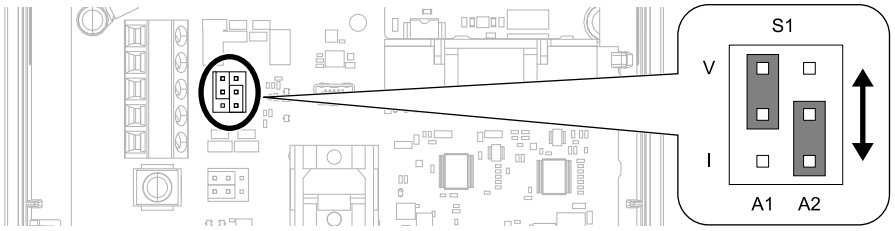
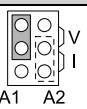
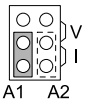
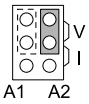
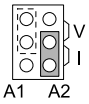


Figure 4.31 Location of Jumper Switch S1

Table 4.12 MFAI Terminals A1 and A2 Signal Settings

Terminal	Types of Input Signals	Jumper Switch S1	Parameter	
			No.	Signal Level
A1	Voltage input (Default)		H3-01	0: 0 V to 10 V/0% to 100% (input impedance: 20 kΩ)
	Current input			2: 4 mA to 20 mA/0% to 100% (input impedance: 250 Ω) 3: 0 mA to 20 mA/0% to 100% (input impedance: 250 Ω)
A2	Voltage input		H3-09	0: 0 V to 10 V/0% to 100% (input impedance: 20 kΩ)
	Current input (Default)			2: 4 mA to 20 mA/0% to 100% (input impedance: 250 Ω) 3: 0 mA to 20 mA/0% to 100% (input impedance: 250 Ω)

Note:
Set *H3-02, H3-10 = 0 [Terminal A1 Function Selection, Terminal A2 Function Selection = Frequency Reference]* to set A1 and A2 to frequency reference. The drive will add the analog input values together to make the frequency reference.

◆ Set Output Signals for MFAO Terminals FM, AM

Set the signal type for terminals AM and FM to voltage or current output. Use jumper switch S5 and *H4-07, H4-08 [Terminal FM Signal Level Select, Terminal AM Signal Level Select]* to set the signal type.

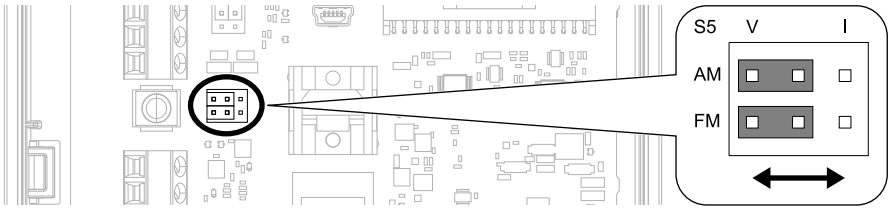
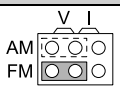
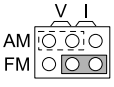
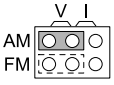
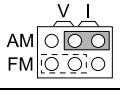


Figure 4.32 Location of Jumper Switch S5

Terminal	Types of Output Signals	Jumper Switch S5	Parameter	
			No.	Signal Level
FM	Voltage output (Default)		H4-07	0: 0 V to 10 V
	Current output			2: 4 mA to 20 mA
AM	Voltage output (Default)		H4-08	0: 0 V to 10 V
	Current output			2: 4 mA to 20 mA

◆ Switch ON Termination Resistor for RS-485 Communications

When the drive is the last slave in these communications, set DIP switch S2 to the ON position:

- APOGEE FLN
- BACnet
- MEMOBUS/Modbus
- Metasys N2

This drive has a built-in termination resistor for the RS-485 interface.

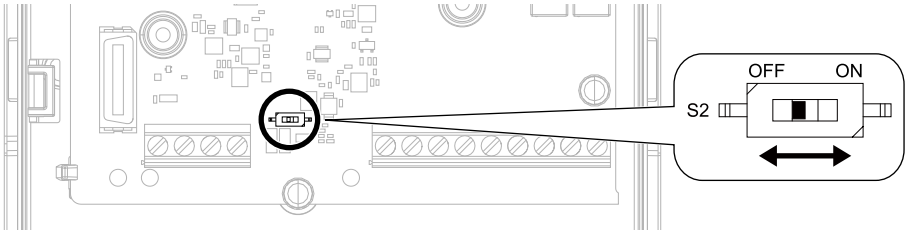


Figure 4.33 Location of DIP Switch S2

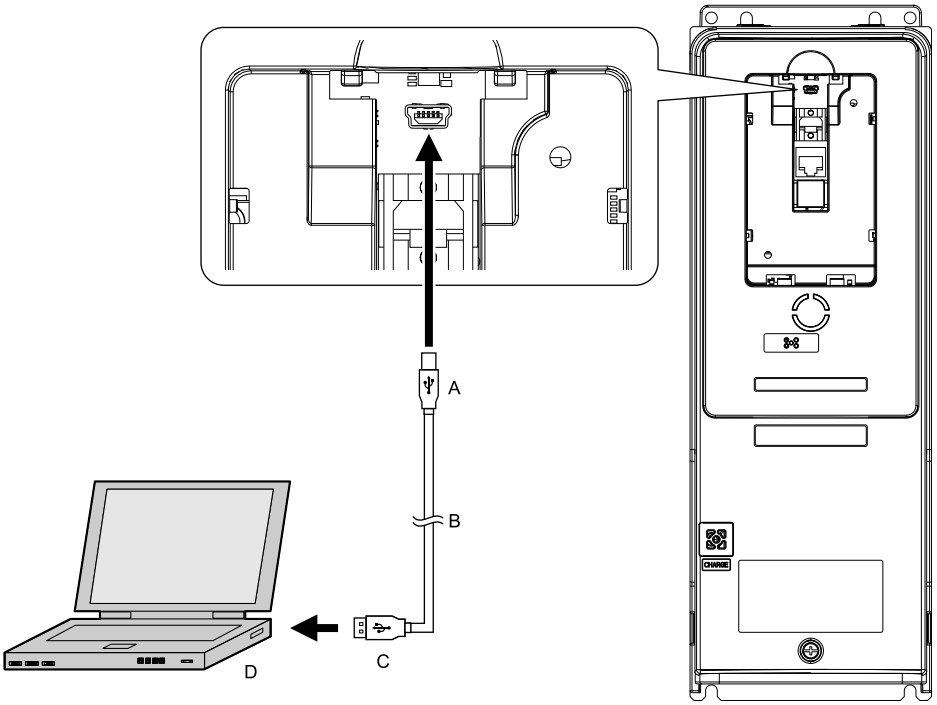
Table 4.13 RS-485 Communications Termination Resistor Setting

DIP Switch S2	Description
ON	The built-in termination resistor is ON.
OFF (Default)	The built-in termination resistor is OFF.

4.7 Connect the Drive to a PC

The drive has a mini-B type USB port.

You can use a USB cable (USB 2.0, type: A - mini-B) to connect the drive to a type-A USB port on a PC. Remove the keypad to connect the USB cable to the port on the drive. After you connect the drive to the PC, you can use Yaskawa DriveWizard HVAC software to monitor drive performance and manage parameter settings.



A - Mini-B type connector
B - USB 2.0, type A - mini-B cable
C - Type-A connector
D - PC

Figure 4.34 Connect to a PC (USB)

Yaskawa recommends that you use a USB cable with connectors connected with shielded wires.

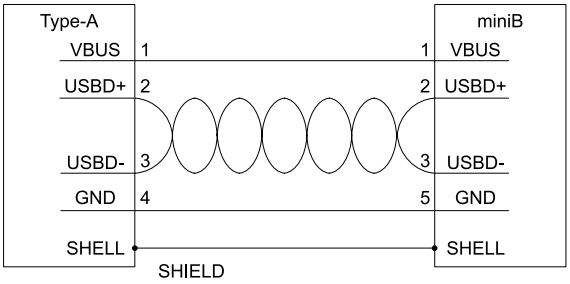


Figure 4.35 Recommended USB Cable

4.8 External Interlock

For applications that will have unwanted effects on the system if the drive stops, make an interlock between fault relay output (MA, MB, MC) and the MFDO *DriveReady* signal.

◆ Drive Ready

When the drive is operating or is prepared to accept a Run command, the MFDO terminal to which *Drive Ready [H2-xx = 6]* is set will enter the ON status.

In these conditions, Drive Ready is OFF and the drive ignores Run commands:

- The drive is de-energized
- During a fault
- There is problem with the control power supply
- There is a parameter setting error that will not let the drive run, although a Run command is entered
- An overvoltage or undervoltage fault occurs when the Run command is entered
- The drive is in Programming Mode.

◆ Interlock Circuit Example

Refer to Figure 4.36 for an example of how two drives that run one application use the Drive Ready and Fault output signals to interlock with the controller.

Terminal	Output Signal	Parameter Settings for Output Signal
MA, MB, MC	Fault	-
M1-M2	Drive Ready	H2-01 = 6

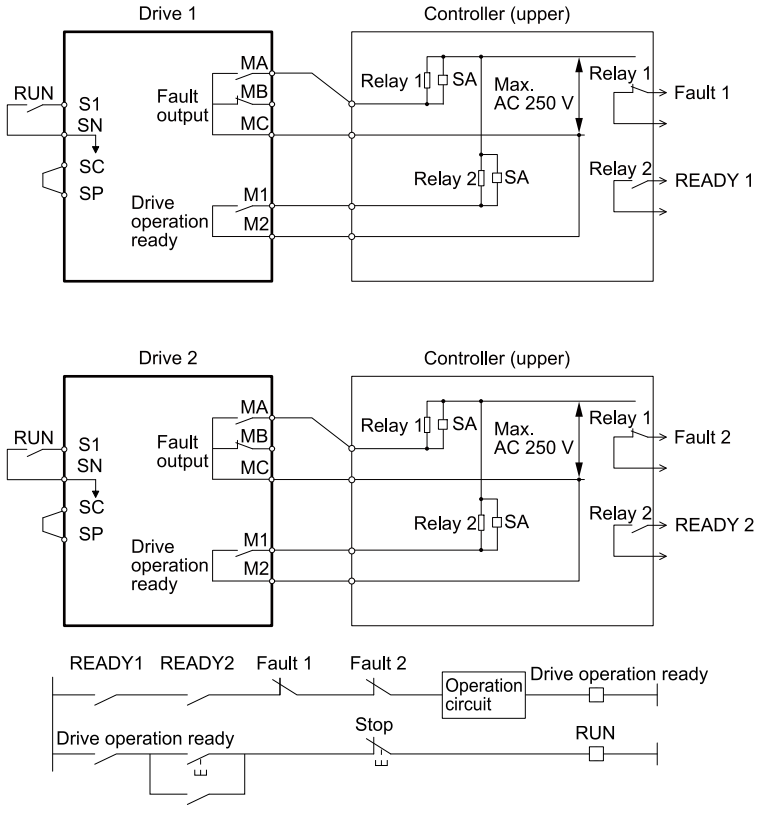


Figure 4.36 Interlock Circuit Example

5

Startup Procedure and Test Run

5.1 Section Safety

⚠DANGER

Electrical Shock Hazard

Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge indicator LED extinguishes when the DC bus voltage decreases below 50 Vdc. When all indicators are OFF, remove the covers before measuring for dangerous voltages to make sure that the drive is safe.

If you do work on the drive when it is energized, it will cause serious injury or death from electrical shock.

⚠WARNING

Electrical Shock Hazard

Do not operate the drive when covers are missing. Replace covers and shields before you operate the drive. Use the drive only as specified by the instructions.

Some figures in this section include drives without covers or safety shields to more clearly show the inside of the drive. If covers or safety shields are missing from the drive, it can cause serious injury or death.

Do not remove covers or touch circuit boards while the drive is energized.

If you touch the internal components of an energized drive, it can cause serious injury or death.

NOTICE

Sudden Movement Hazard

Deactivate the Run command before you switch from Programming Mode to Drive Mode.

If you switch from Programming Mode to Drive Mode and there is an active Run command, the motor will rotate and the equipment can suddenly start.

5.2 Keypad: Names and Functions

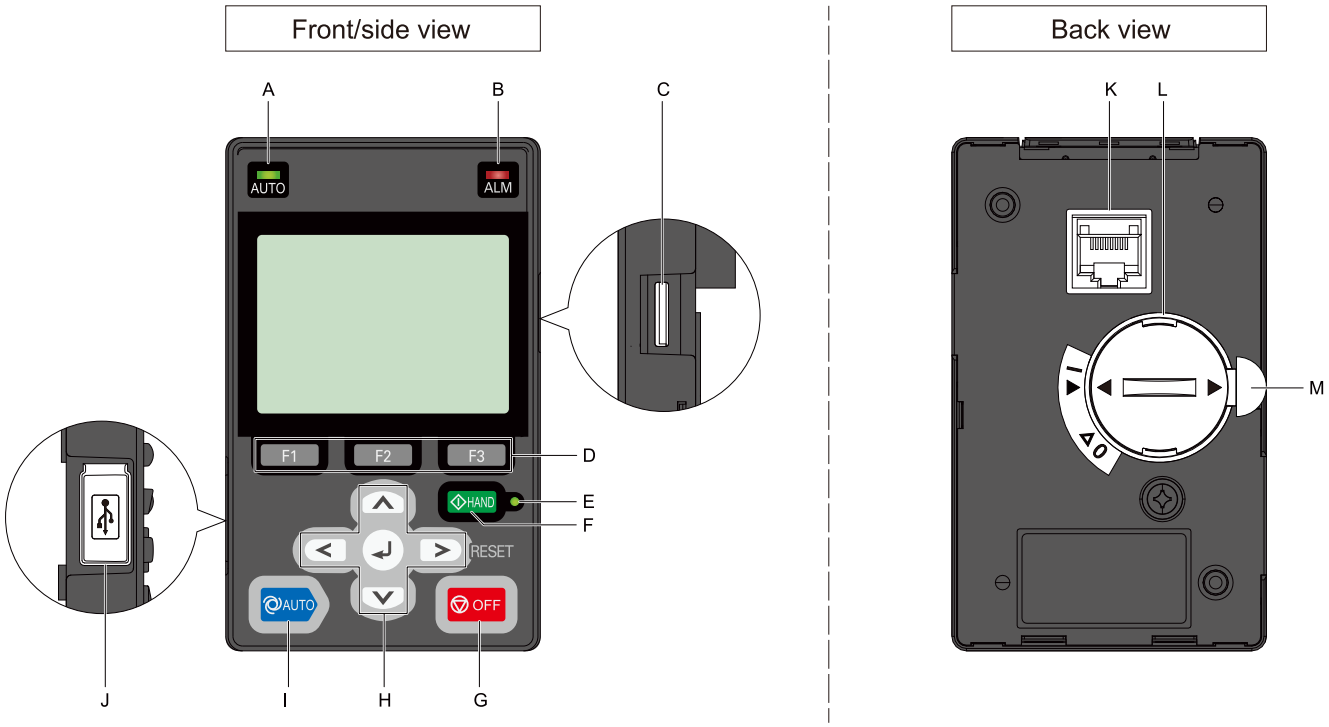


Figure 5.1 Keypad

Table 5.1 Keypad: Names and Functions

No.	Name	Function
A	AUTO LED *1* 	Illuminates to show that the drive is in AUTO Mode.
B	ALM LED 	Illuminates when the drive detects a fault. Flashes when the drive detects: • An alarm • An oPE parameter setting error • A fault or alarm during Auto-Tuning The LED turns off when there are no drive faults or alarms.
C	microSD Card Insertion Slot	The insertion point for a microSD card.
D	Function Keys (F1, F2, F3) 	The menu shown on the keypad sets the functions for function keys. The name of each function is in the lower half of the display window.
E	HAND LED *1* 	Illuminates to show that the drive is in HAND Mode.
F	HAND Key 	Sets drive operation to HAND Mode. The drive uses the *S5-01 [HAND Frequency Reference Selection]* setting.
G	OFF Key 	Stops drive operation. **Note:** The OFF key has highest priority. Push  to stop the motor even when a Run command is active at an external Run command source. Set *o2-02 = 0 [STOP Key Function Selection = Disabled]* to disable  priority.

No.	Name	Function
H	Left Arrow Key	Moves the cursor to the left.
	Up Arrow Key/Down Arrow Key	• Scrolls up or down to display the next item or the previous item. • Selects parameter numbers, and increments or decrements setting values.
	Right Arrow Key (RESET)	• Moves the cursor to the right. • Continues to the next screen. • Clears drive faults.
	ENTER Key	• Enters parameter values and settings. • Selects menu items to move the user between keypad displays. • Selects each mode, parameter, and set value.
I	AUTO Key	Sets drive operation to AUTO Mode. The drive uses the *b1-01 [Frequency Reference Selection 1]* and *b1-02 [Run Command Selection 1]* settings. **Note:** Push HAND on the keypad to set the drive to HAND Mode before you use the keypad to operate the motor.
J	USB Terminal	Insertion point for a mini USB cable. Uses a USB cable (USB standard 2.0, type A - mini-B) to connect the keypad to a PC.
K	RJ-45 Connector	Uses an RJ-45 8-pin straight through UTP CAT5e extension cable or keypad connector to connect to the drive.
L	Clock Battery Cover	Cover for the clock battery. **Note:** • The battery included with the keypad is for operation check. It may be exhausted earlier than the expected battery life described in the manual. • Refer to "Maintenance & Troubleshooting Manual (TOEPYAIHV6001)" for more information about replacement procedure. To replace the battery, use a Hitachi Maxell "CR2016 Lithium Manganese Dioxide Lithium Battery" or an equivalent battery with these properties: • Nominal voltage: 3 V • Operating temperature range: -20 °C to +85 °C (-4 °F to +185 °F)
M	Insulation Sheet	An insulating sheet is attached to the keypad battery to prevent battery drain. Remove the insulation sheet before you use the keypad for the first time.

*1 Refer to *AUTO LED and HAND LED Indications on page 281* for more information about AUTO LED and HAND LED indications.

◆ LCD Display

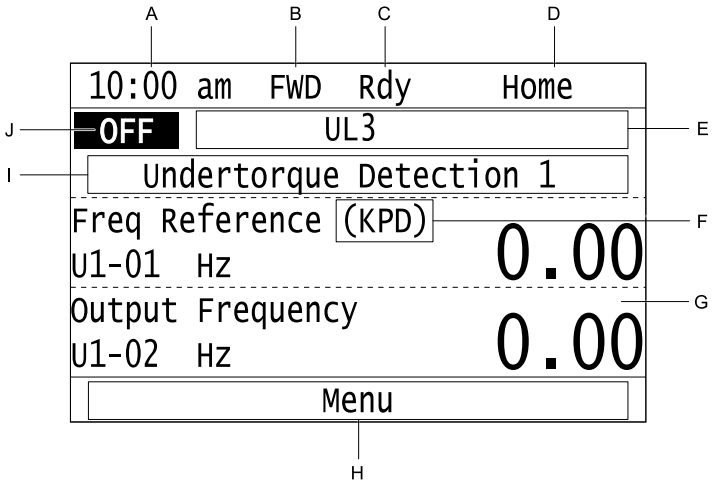


Figure 5.2 LCD Display Indications

Table 5.2 LCD Display Indications and Meanings

Symbol	Name	Description
A	Time display area	Shows the current time. Set the time on the default settings screen.
B	Forward/Reverse run indication	Shows direction of motor rotation. • FWD: Shown when set to Forward run. • REV: Shown when set to Reverse run. **Note:** In DriveWorksEZ operation, FWD or REV flash.

Symbol	Name	Description
C	Ready	The screen will show Rdy when the drive is ready for operation or when the drive is running.
D	Mode display area	Shows the name of the current mode or screen.
E	Alarm codes and drive status messages display area *1	Shows an alarm code or message of drive status.
F	Frequency reference source indication	Shows the current frequency reference source. • KPD: keypad • AI: analog input terminal (terminals A1 or A2) • COM: serial communications • OPT: option card
G	Data display area	Shows parameter values, monitor values, and details of the results of operations.
H	Function keys 1 to 3 (F1 to F3)	The function names shown in this area will change when the selected screen changes. Push one of the function keys F1 to F3 on the keypad to do the function.
I	Alarm and message texts display area *1	Shows a fault, minor fault, alarm, or error name and message text. **Note:** When the drive must show an alarm and a message on the keypad at the same time, the keypad will switch between the alarm code and message text in 2-second intervals.
J	HOA mode or alternative Run command source indication	• OFF: The drive is operating in OFF Mode. • AUTO: The drive is operating in AUTO Mode. • HAND: The drive is operating in HAND Mode. • JOG: The drive is operating in JOG Mode. • EMOV: The drive is operating in Emergency Override Mode.

*1 Refer to **Missing reference ID** for more information about the Status Monitor display.

◆ AUTO LED and HAND LED Indications

Table 5.3 AUTO LED and HAND LED Indications

AUTO LED 	HAND LED 	Status
OFF	OFF	OFF Mode
OFF	ON	HAND Mode
OFF	Long blink (50% duty)	HAND Mode • When the Frequency Reference is 0 or during deceleration • During PI Sleep
OFF	Double blink	HAND Mode When you clear the Run command and enter the Run command again during the time set in *C1-02 [Deceleration Time 1]*
ON	OFF	AUTO Mode
Long blink (50% duty)	OFF	AUTO Mode • When the Frequency Reference is 0 or during deceleration • During PI Sleep
Double blink	OFF	AUTO Mode When an MFDI sends a Fast Stop signal to stop the drive

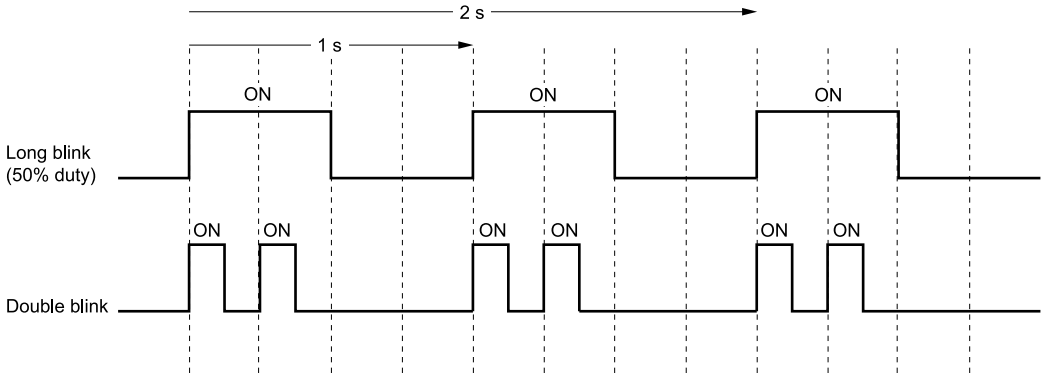


Figure 5.3 AUTO LED and HAND LED Timing Status

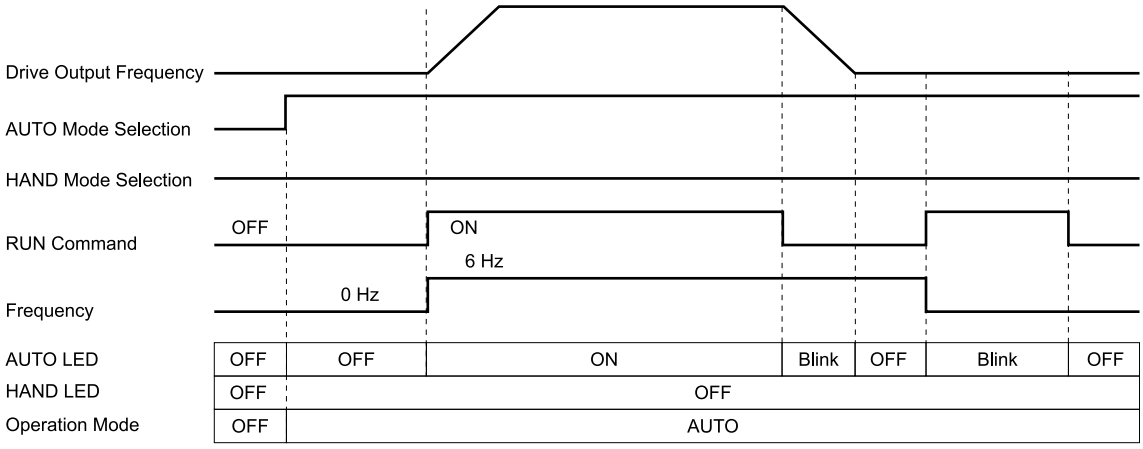


Figure 5.4 LEDs and Drive Operation in AUTO and HAND Modes

◆ Keypad Mode and Menu Displays

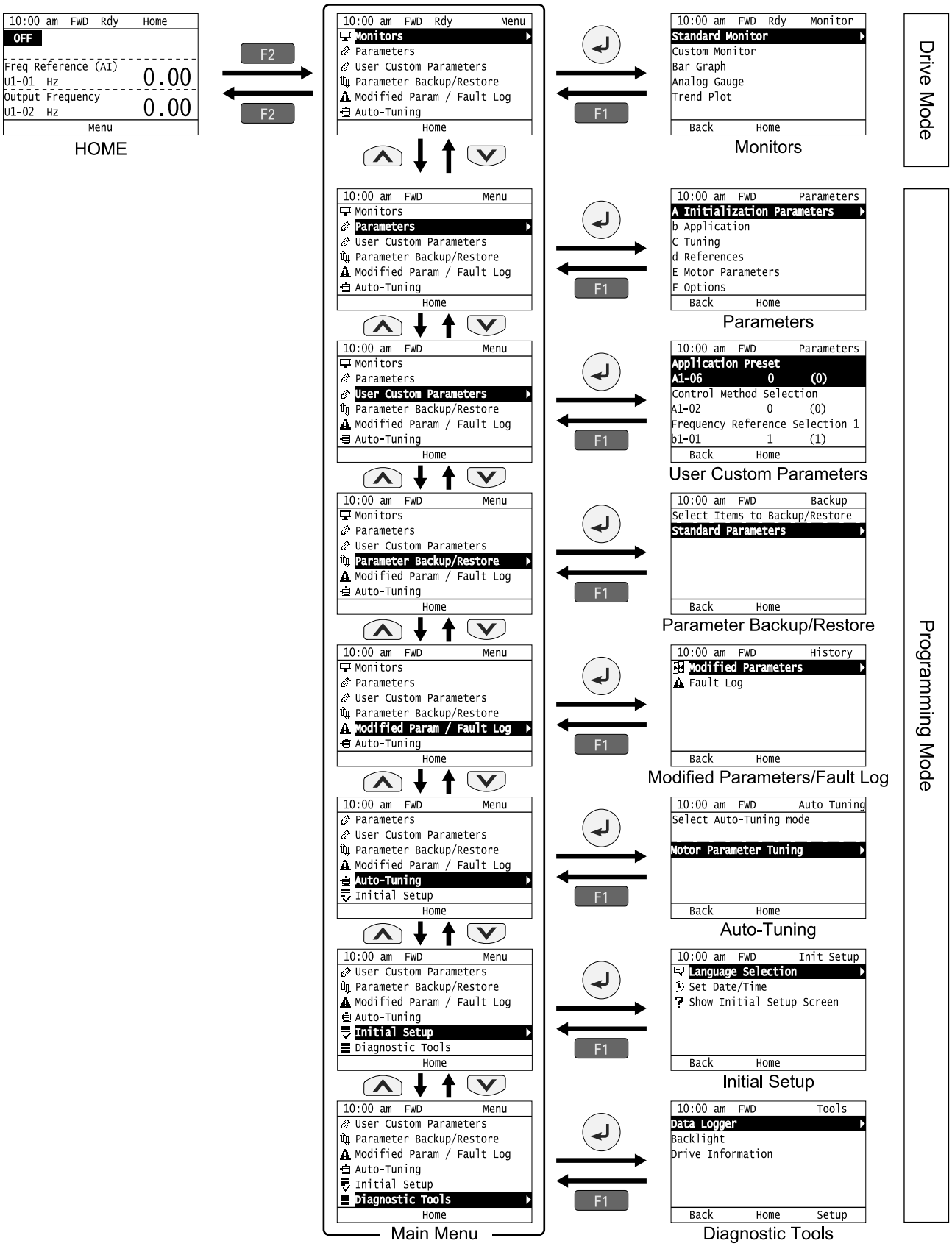


Figure 5.5 Keypad Functions and Display Levels

Note:

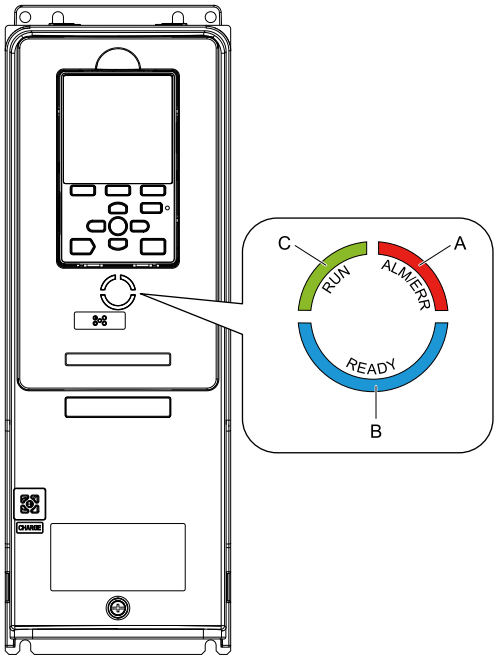
- Energize the drive with factory defaults to show the Initial Setup screen. Push F2 (Home) to show the HOME screen.
  – Select [No] from the [Show Initial Setup Screen] setting to not display the Initial Setup screen.
- Push < from the Home screen to show drive monitors.
- Push ↵ to set *d1-01 [Reference 1]* when you set *b1-01 = 0 [Frequency Reference Selection 1 = Keypad]* and the Home screen shows *U1-01 [Frequency Reference]*.
- The keypad will show [Rdy] when the drive is in Drive Mode. The drive is prepared to accept a Run command.
- The drive will not accept a Run command in Programming Mode in the default setting. Set *b1-08 [Run Command Select in PRG Mode]* to accept or reject a Run command from an external source while in Programming Mode.
  – Set *b1-08 = 0 [Disregard RUN while Programming]* to reject the Run command from an external source while in Programming Mode (default).
  – Set *b1-08 = 1 [Accept RUN while Programming]* to accept the Run command from an external source while in Programming Mode.
  – Set *b1-08 = 2 [Allow Programming Only at Stop]* to prevent changes from Drive Mode to Programming Mode while the drive is operating.

Table 5.4 Drive Mode Screens and Functions

Mode	Keypad Screen	Function
Drive Mode	Monitors	Sets monitor items to display.
Programming Mode	Parameters	Changes parameter settings.
	User Custom Parameters	Shows the User Parameters.
	Parameter Backup/Restore	Saves parameters to the keypad as backup.
	Modified Parameters/Fault Log	Shows modified parameters and fault history.
	Auto-Tuning	Auto-Tunes the drive.
	Initial Setup	Changes initial settings.
	Diagnostic Tools	Sets data logs and backlight.

5.3 LED Status Ring

The LED Status Ring on the drive cover shows the drive operating status.



A - ALM/ERR
B - Ready
C - RUN

LED		Status	Description
A	ALM/ERR	Illuminated	The drive detects a fault.
		Flashing *1	The drive detects: • An alarm • An oPE parameter setting error • An Auto-Tuning error **Note:** If the drive detects a fault and an alarm at the same time, the LED will illuminate to identify a fault.
		OFF	There are no drive faults or alarms.
B	Ready	Illuminated	The drive is operating or is prepared for operation.
		Flashing *1	The drive is in *STo [Safe Torque OFF]* condition.
		Flashing Quickly *1	The voltage of the main circuit power supply dropped, and only the external 24 V power supply is providing the power to the drive.
		OFF	• The drive detects a fault. • There is no fault and the drive received a Run command, but the drive cannot operate. For example, in Programming Mode.

LED		Status	Description
C	RUN	Illuminated	The drive is in regular operation.
		Flashing *1	• The drive is decelerating to stop. • The drive received a Run command with a frequency reference of 0 Hz. • The drive received a DC Injection Braking command.
		Flashing Quickly *1	• The drive received a Run command from the MFDI terminals when *b1-02 = 0 [Run Command Selection 1 = Keypad]* and you changed the setting to *b1-02 = 1 or 7 [Digital Input or AUTO Command + Term Run]*. • The drive received a Run command from the MFDI terminals when the drive is not in Drive Mode. • The drive received a Fast Stop command. • The safety function shuts off the drive output. • The user pushed OFF on the keypad when the drive is operated from a REMOTE source. • The drive is energized with an active Run command and *b1-17 = 0 [Run Command at Power Up = Disregard Existing RUN Command]*. • The drive is set to coast-to-stop with timer (*b1-03 = 3 [Stopping Method Selection = Coast to Stop with Timer]*), and the Run command is disabled then enabled during the Run wait time.
		OFF	The motor is stopped.

*1 Refer to Figure 5.6 for the difference between “flashing” and “flashing quickly”.

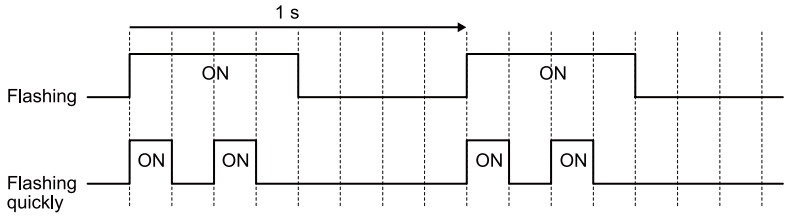


Figure 5.6 LED Flashing Statuses

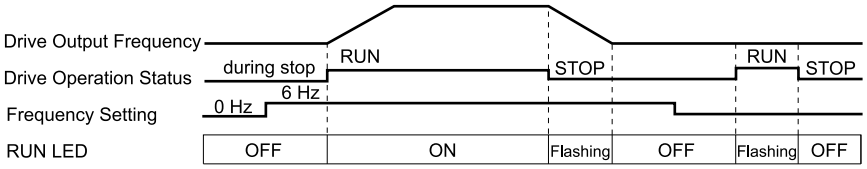


Figure 5.7 Relation between RUN LED and Drive Operation

5.4 Start-up Procedures

This section gives the basic steps necessary to start up the drive.

Use the flowcharts in this section to find the most applicable start-up method for your application.

This section gives information about only the most basic settings.

Note:

Refer to the *A1-06* section to use an Application Preset to set up the drive.

◆ Flowchart A: Connect and Run the Motor with Minimum Setting Changes

Flowchart A shows a basic start-up sequence to connect and run a motor with a minimum of setting changes. Settings can change when the application changes.

Use the drive default parameter settings for basic applications where high precision is not necessary.

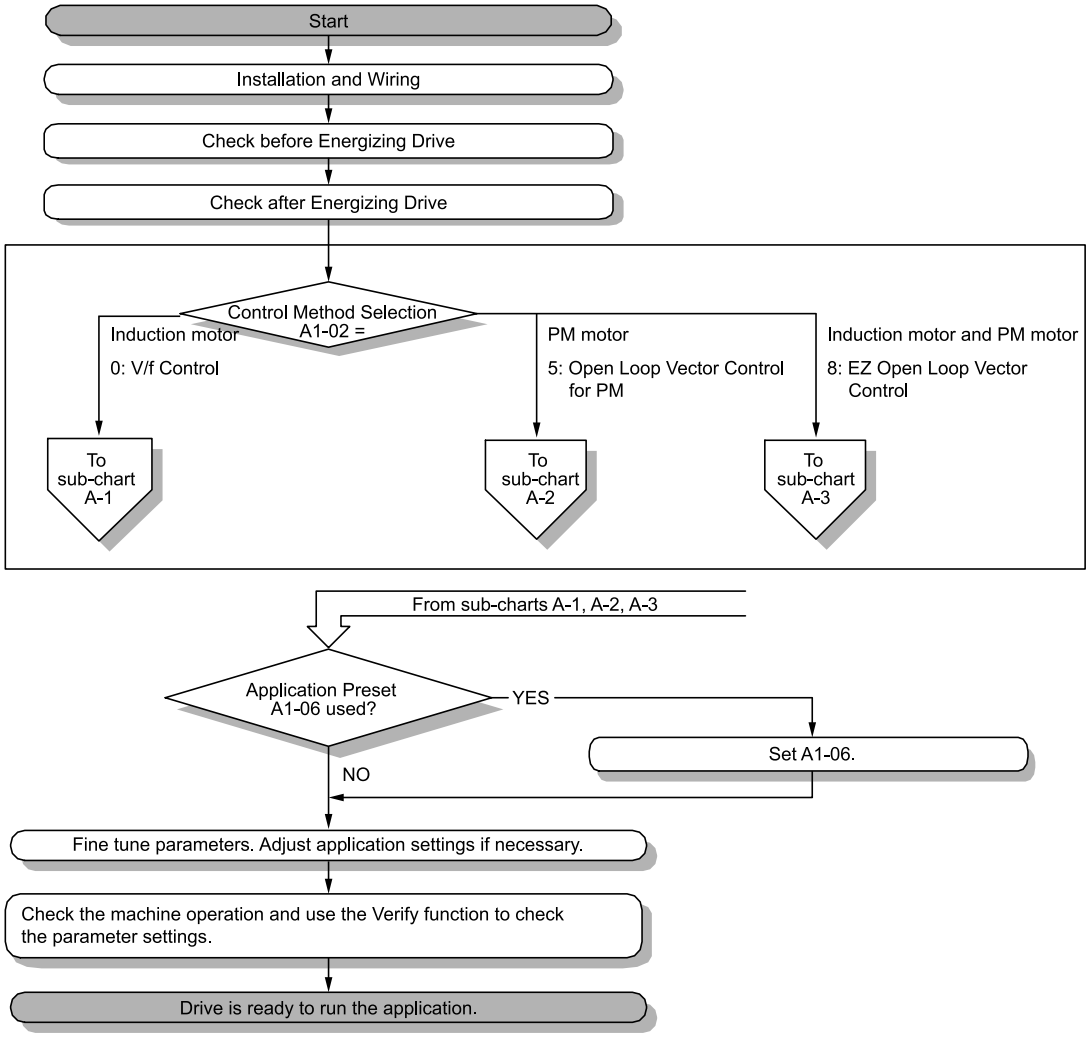


Figure 5.8 Basic Steps before Startup

◆ Sub-Chart A-1: Induction Motor Auto-Tuning and Test Run Procedure

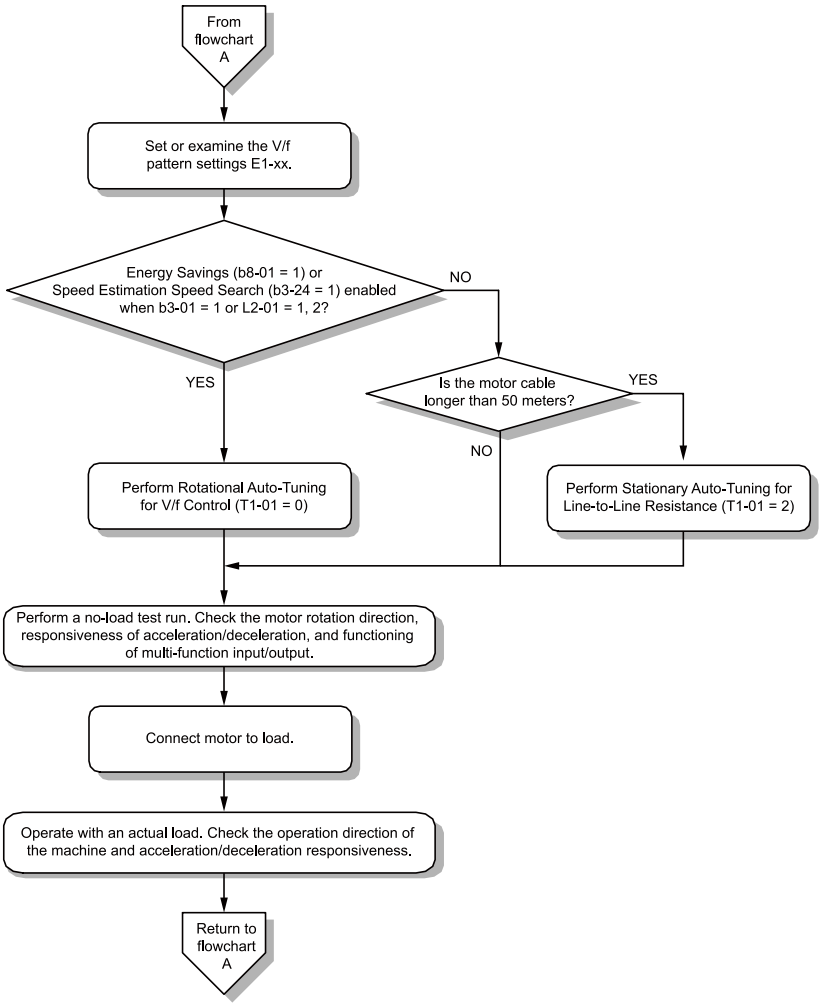


Figure 5.9 Induction Motor Auto-Tuning and Test Run Procedure

◆ Sub-Chart A-2: PM Motor Auto-Tuning and Test Run Procedure

Sub-Chart A-2 gives the basic steps to start up the drive for a PM motor.

WARNING! *Crush Hazard. Test the system to make sure that the drive operates safely after you wire the drive and set parameters. If you do not test the system, it can cause damage to equipment or serious injury or death.*

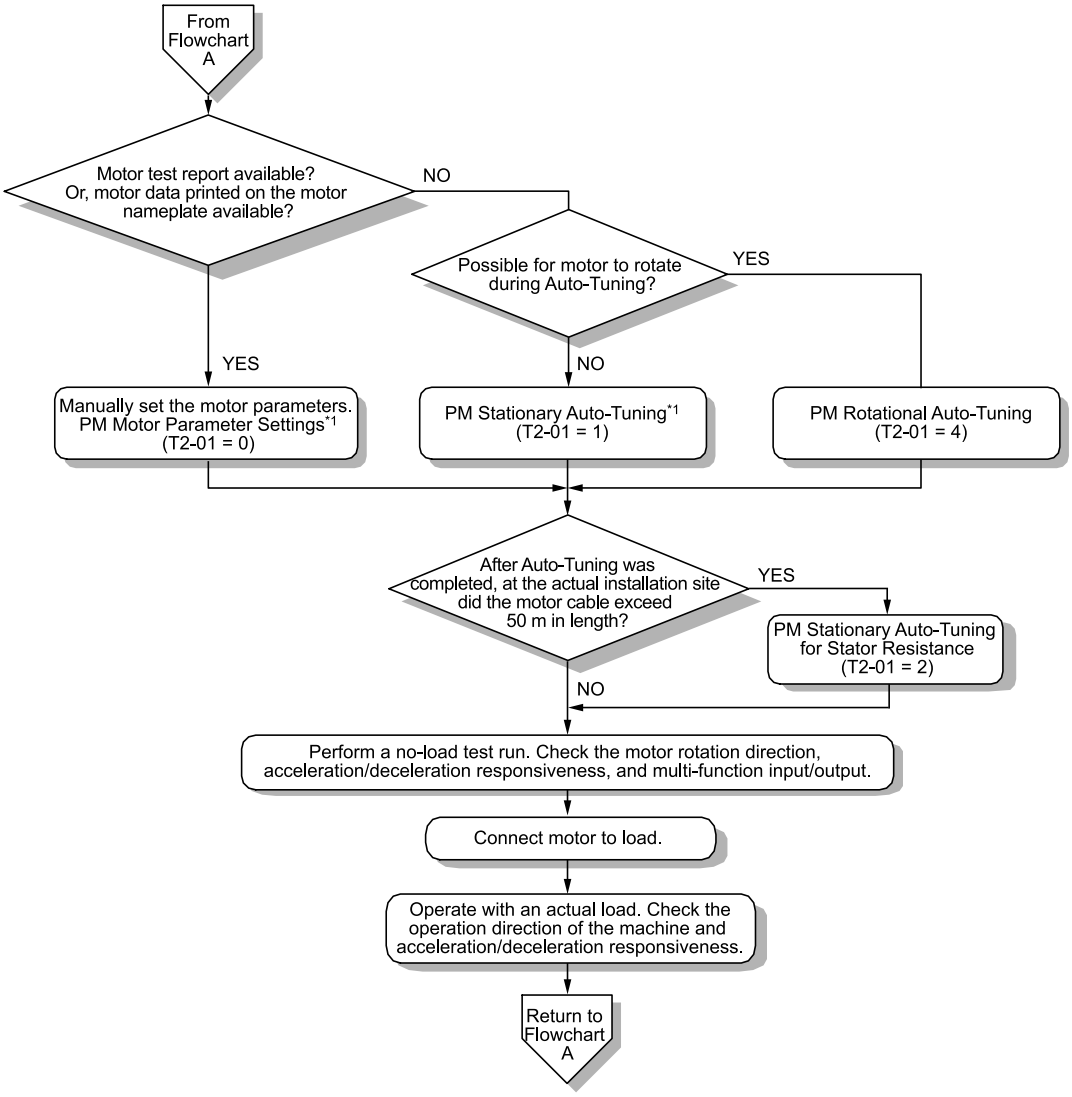


Figure 5.10 PM Motor Auto-Tuning and Test Run Procedure

*1 For PM motors, set *E5-01 [PM Motor Code Selection] = FFFF*.

◆ Subchart A-3: EZ Open Loop Vector Control Test Run Procedure

Subchart A-3 gives the setup procedure to run a PM motor in EZ Open Loop Vector Control.

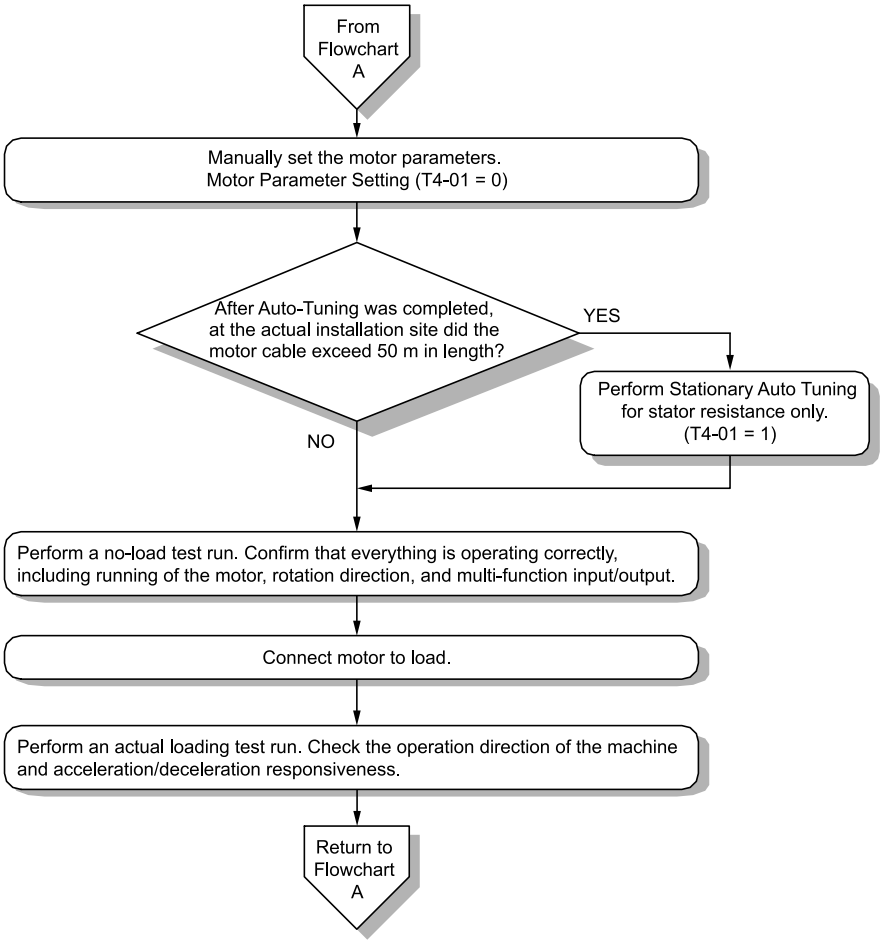


Figure 5.11 Procedure for Test Run of EZ Open Loop Vector Control Method

5.5 Items to Check before Starting Up the Drive

◆ Check before Energizing the Drive

Examine the items in Table 5.5 before you energize the drive.

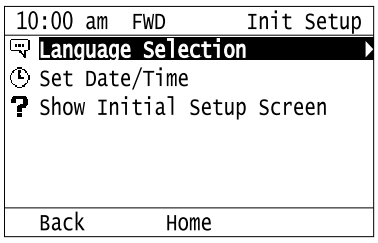
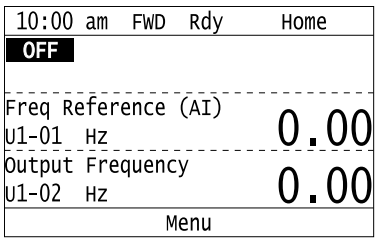
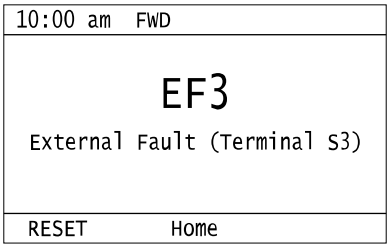
Table 5.5 Items to Check before Energizing the Drive

Items to Check	Description
Input Power Supply Voltage	The voltage of the input power supply must be: 208 V class: three-phase 200 Vac to 240 Vac 50/60 Hz, 270 Vdc to 340 Vdc 480 V class: three-phase 380 Vac to 480 Vac 50/60 Hz, 510 Vdc to 680 Vdc
	Correctly and safely wire power supply input terminals R/L1, S/L2, T/L3.
	Correctly ground the drive and motor.
Connection between Drive Output Terminals and Motor Terminals	Make sure that you connected drive output terminals U/T1, V/T2, and W/T3 in the correct sequence to agree with motor terminals U, V, and W without loosened screws.
Control Circuit Terminal Wiring	Make sure that you connected the drive control circuit terminals in the correct sequence to agree with devices and switches without loosened screws.
Control Circuit Terminal Status	Turn OFF the inputs from all devices and switches connected to the drive control circuit terminals.
Connection between Machinery and Motor	Disengage all couplings and belts that connect the motor and machinery.

◆ Check after Energizing the Drive

Examine the items in Table 5.6 after you energize the drive. The keypad will show these screens depending on the drive status.

Table 5.6 Display Status after Energizing the Drive

Status	Display	Description
During Usual Operation	 Initial Setup Screen or  HOME Screen	• The data display area will show the Initial Setup screen or the HOME screen • Energize the drive with factory defaults to show the Initial Setup screen. Select [No] from the [Show Initial Setup Screen] settings to show the HOME screen without showing the Initial Setup screen.
When the Drive Detects a Fault		The display changes depending on the fault. Refer to “Troubleshooting” to remove the cause of the fault. ALM will illuminate. **Note:** If the screen shows a different screen, do these steps to show the fault content again: 1. Push < from the HOME screen. 2. Push F2 (Home) from a different screen than the HOME screen.

Note:

Make sure that you use a keypad with FLASH number 1004 or later. Keypads with FLASH numbers 1003 and earlier will not show characters correctly.

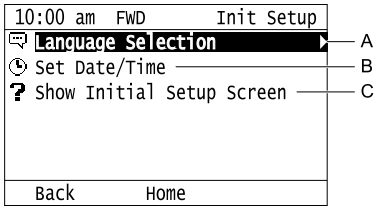
◆ Make the Initial Settings

The keypad will show the Initial Setup screen when you energize the drive for the first time. You can set the date and time or the language to show on the keypad.

Note:

If the keypad does not show the Initial Setup screen, select [Initial Setup] from the Main Menu to show the Initial Setup screen.

1. Make the initial settings for each item.



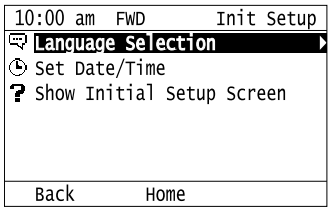
A - Language Selection
B - Set Date/Time
C - Show Initial Setup Screen

Note:

If you select [Yes] from the [Show Initial Setup Screen] setting, the keypad will show the Initial Setup screen each time the drive is energized.

If you select [NO], the keypad will not show the Initial Setup screen each time the drive is energized, starting with the next time.

2. Push F2 (Home).



The display shows the HOME screen.

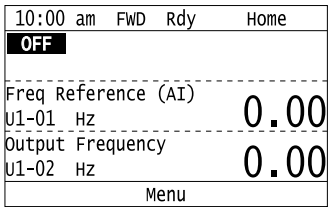
5.6 Keypad Operation

Note:

Make sure that you use a keypad with FLASH number 1004 or later. Keypads with FLASH numbers 1003 and earlier will not show characters correctly.

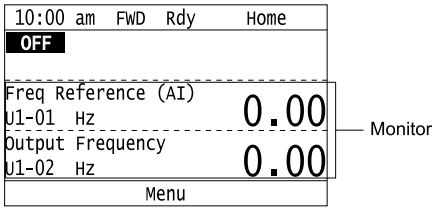
◆ Home Screen Display Selection

This section gives information about the functions that you can control from the HOME screen and the content shown on the HOME screen.



■ View Monitors Shown in Home Screen

This figure shows monitor data in the data display area of the HOME screen.



- To change what the screen shows, change the setting for *o1-40 [Home display selection]*.
- When *o1-40 [Home display selection]* is set to "Custom Monitor", and there is more than one screen, use ^ or v to switch between screens.

■ Show the Standard Monitor

Push < to show the standard monitor (*Ux-xx*). Push F2 (HOME) to go back to the HOME screen.

Note:

When a fault, minor fault, or an error occurs, push < to show the content of the fault. Push < again to show the standard monitor (*Ux-xx*).

■ Change the Frequency Reference Value

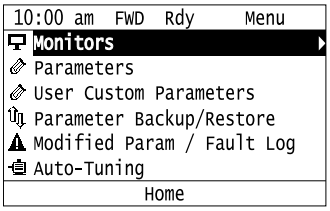
1. Push ↵ to access the screen to change the frequency.
2. Push < or > to select the digit, then push ^ or v to change the value.
3. Push ↵ to keep the changes.

Note:

The HOME screen must show *U1-01 [Frequency Reference]* or you must set *b1-01 = 0 [Frequency Reference Selection 1 = Keypad]* to use this function.

■ Show the Main Menu

Push F2 to show the main menu. Push F2 (HOME) to go back to the HOME screen.



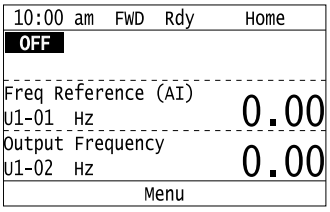
◆ Show the Monitors

This section shows how to show the standard monitors (*Ux-xx*).

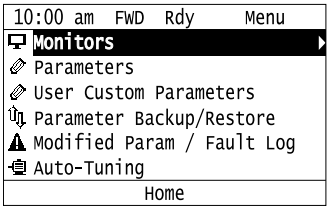
1. Push F2 (Home) to show the HOME screen.

Note:
- When the drive is in HOME Mode, the screen shows [Home] in the upper right-hand corner of the screen.
- If the screen does not show [Home] for F2, push F1 (Back), and then push F2 to show [Home].

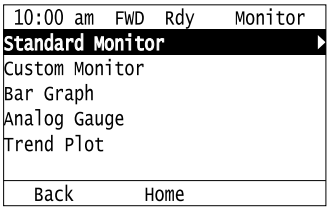
2. Push F2 (Menu).



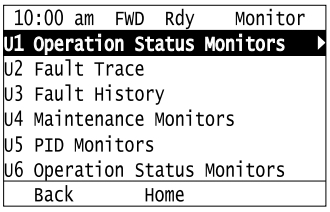
3. Push ^ or v to select [Monitors], then push ↵.



4. Push ^ or v to select [Standard Monitor], then push ↵.



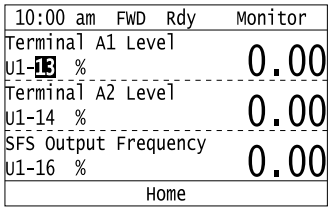
5. Push ^ or v to select the monitor group, then push ↵.



6. Push ^ or v to change the monitor number to show the monitor item.

Note:

Push < to return to the previous page.



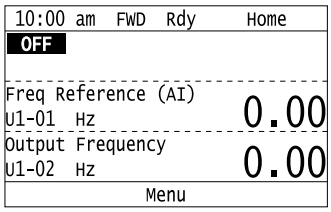
◆ Set Custom Monitors

You can select and register a maximum of 12 monitoring items to regularly show on the keypad.
This procedure shows how to set the motor speed to [Custom Monitor 1].

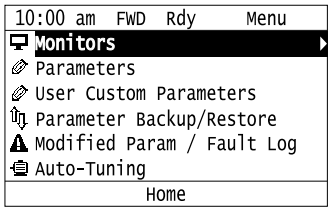
1. Push F2 (Home) to show the HOME screen.

Note:
- The keypad will show [Home] in the top right corner when the HOME screen is active.
- If the keypad does not show [Home] on F2, push F1 (Back) to show [Home] on F2.

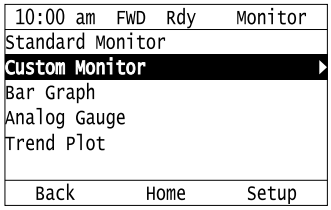
2. Push F2 (Menu).



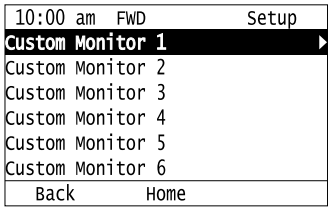
3. Push ▲ or ▼ to select [Monitors], then push ↵.



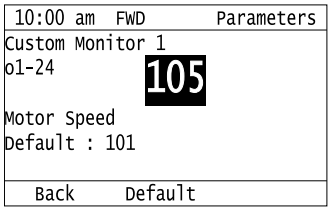
4. Push ▲ or ▼ to select [Custom Monitor], then push F3 (Setup).



5. Push ▲ or ▼ to select [Custom Monitor 1], then push ↵.



6. Push ▲ or ▼ to select the monitor number to register, then push ↵.
   Set the x-xx part of monitor *Ux-xx*. For example, to show monitor *U1-05*, set it to “105” as shown in this figure.



The configuration procedure is complete.

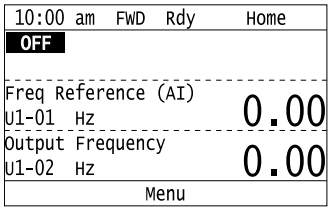
◆ Show Custom Monitors

The procedure in this section shows how to show the registered custom monitors.

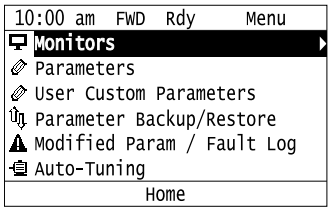
1. Push F2 (Home) to show the HOME screen.

Note:
- The keypad will show [Home] in the top right corner when the HOME screen is active.
- If [Home] is not shown on F2, push F1 (Back) to show [Home] on F2.

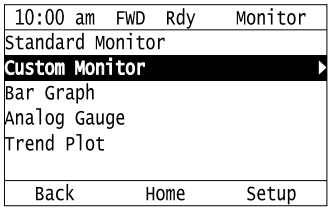
2. Push F2 (Menu).



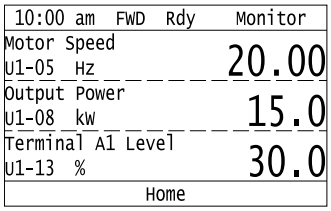
3. Push ▲ or ▼ to select [Monitors], then push ↵.



4. Push ▲ or ▼ to select [Custom Monitor], then push ↵.



The keypad shows the selected monitor as shown in this figure.



- When there are a minimum of two screens, push ▲ or ▼ to switch between screens.
- If you registered only one custom monitor to [Custom Monitor 1], the screen will show only one monitor. If you registered custom monitors only to [Custom Monitor 1] and [Custom Monitor 2], the screen will show only two monitors.

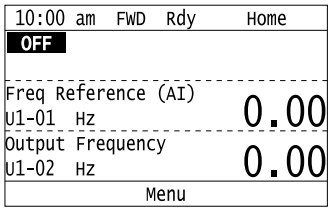
◆ Set the Monitors to Show as a Bar Graph

The procedure in this section shows how to show the frequency reference monitor as a bar graph.

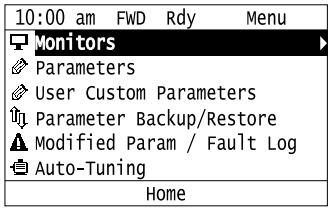
1. Push F2 (Home) to show the HOME screen.

Note:
- The keypad will show [Home] in the top right corner when the HOME screen is active.
- If [Home] is not shown on F2, push F1 (Back) to show [Home] on F2.

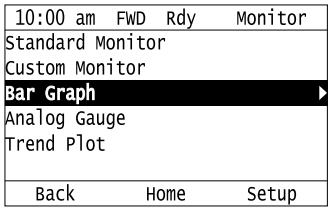
2. Push F2 (Menu).



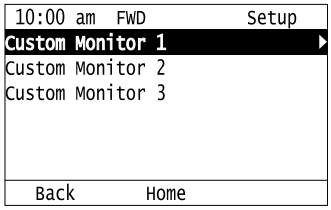
3. Push ▲ or ▼ to select [Monitors], then push ↵.



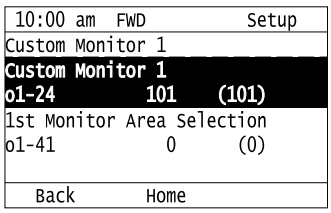
4. Push ▲ or ▼ to select [Bar Graph], then push F3 (Setup).



5. Push ▲ or ▼ to select the location to store the monitor, then push ↵.

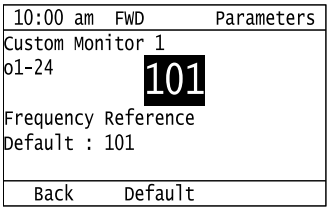


6. Push ↵.



7. Push ▲ or ▼ to select the monitor number to register, then push ↵.

   Enter the three digits in “x-xx” part of monitor *Ux-xx* to identify which monitor to output. For example, to show monitor *U1-01 [Frequency Reference]*, set it to "101" as shown in this figure.



The configuration procedure is complete.

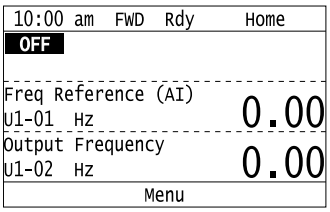
◆ Show Monitors as Bar Graphs

The procedure in this section shows how to show a specific monitor as a bar graph. You can show a maximum of three.

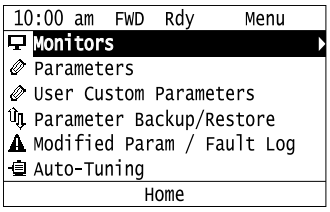
1. Push F2 (Home) to show the HOME screen.

Note:
- When the drive is in HOME Mode, the screen shows [Home] in the upper right-hand corner of the screen.
- If the screen does not show [Home] for F2, push F1 (Back), and then push F2 to show [Home].

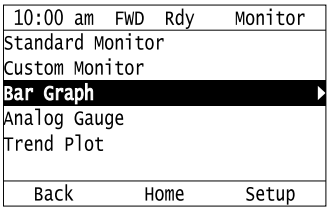
2. Push F2 (Menu).



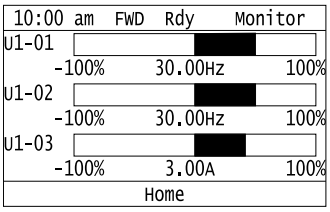
3. Push ^ or v to select [Monitors], then push ↵.



4. Push ^ or v to select [Display Bar Graph], then push ↵.



The screen will show the monitors as shown in this figure.



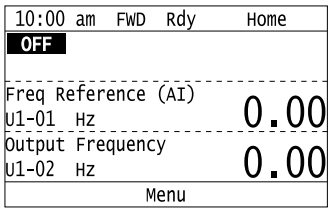
◆ Set the Monitors to Show as Analog Gauges

The procedure in this section shows how to show the frequency reference monitor as an analog gauge.

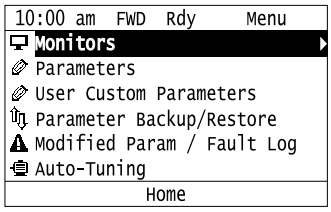
1. Push F2 (Home) to show the HOME screen.

Note:
• The keypad will show [Home] in the top right corner when the HOME screen is active.
• If [Home] is not shown on F2, push F1 (Back) to show [Home] on F2.

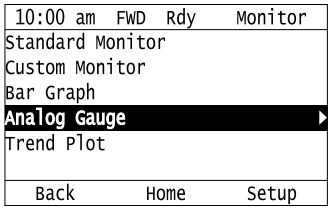
2. Push F2 (Menu).



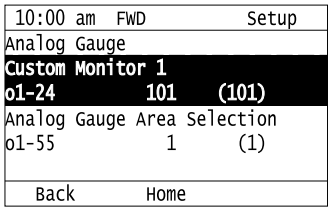
3. Push ^ or v to select [Monitors], then push ↵.



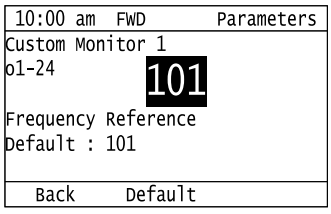
4. Push ^ or v to select [Analog Gauge], then push F3 (Setup).



5. Push ↵.



6. Push ^ or v to select the monitor number to register, then push ↵.
   Enter the three digits in "x-xx" part of monitor *Ux-xx* to identify which monitor to output. For example, to show monitor *U1-01 [Frequency Reference]*, set it to "101" as shown in this figure.



The configuration procedure is complete.

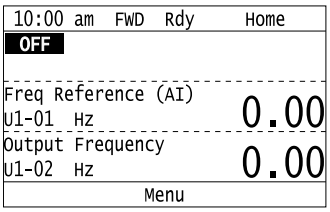
◆ Show Monitors as an Analog Gauge

The following explains how to display the contents selected for a monitor as an analog gauge.

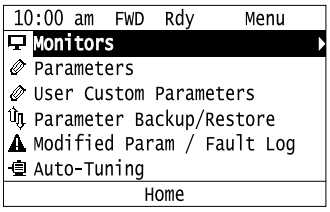
1. Push F2 (Home) to show the HOME screen.

Note:
• The keypad will show [Home] in the top right corner when the HOME screen is active.
• If [Home] is not on F2, push F1 (Back) to show [Home] on F2.

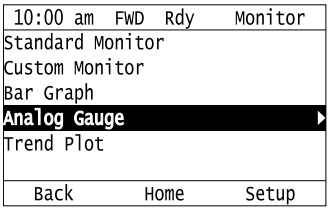
2. Push F2 (Menu).



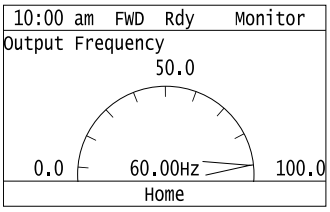
3. Push ▲ or ▼ to select [Monitors], then push ↵.



4. Push ▲ or ▼ to select [Analog Gauge], then push ↵.

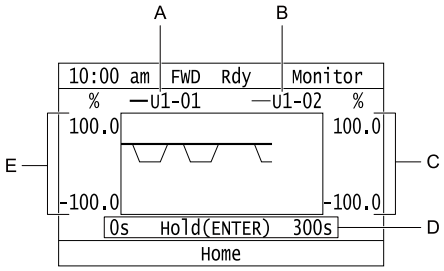


It will be displayed as follows.



◆ Set Monitor Items to Show as a Trend Plot

You must set the items in this figure to display as a trend plot.



A - Monitor Parameter 1 (set with [Custom Monitor 1])
B - Monitor Parameter 2 (set with [Custom Monitor 2])
C - Trend Plot 2 Scale Maximum/Minimum Value
D - Trend Plot Time Scale
E - Trend Plot 1 Scale Maximum/Minimum Value

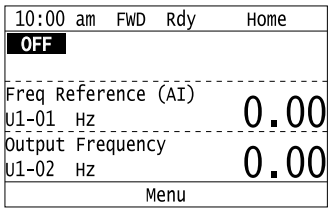
■ Select Monitor Items to Show as a Trend Plot

The procedure in this section shows how to show the frequency reference monitor as a trend plot.

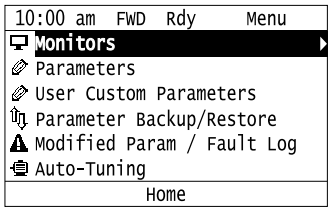
1. Push F2 (Home) to show the HOME screen.

Note:
- The keypad will show [Home] in the top right corner when the HOME screen is active.
- If [Home] is not shown on F2, push F1 (Back) to show [Home] on F2.

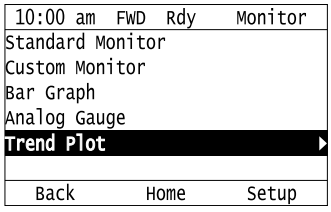
2. Push F2 (Menu).



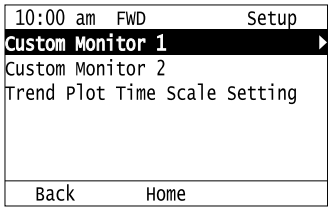
3. Push ▲ or ▼ to select [Monitors], then push ↵.



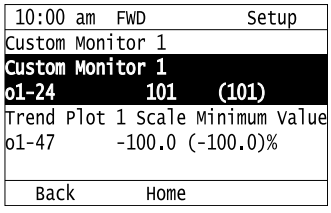
4. Push ▲ or ▼ to select [Trend Plot], then push F3 (Setup).



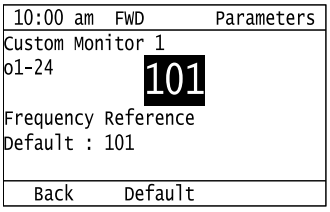
5. Push ▲ or ▼ to select [Custom Monitor 1], then push ↵.



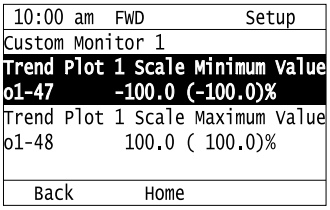
6. Push ↵.



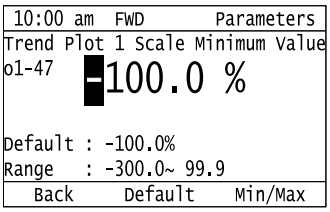
7. Push ▲ or ▼ to select the monitor number to register, then push ↵.
   When the *U parameters* are on the display as "Ux-xx", the three digits in "x-xx" identify which monitor to output. For example, to show monitor *U1-01 [Frequency Reference]*, set it to "101" as shown in this figure.



8. Push ▲ or ▼ to select [Trend Plot 1 Scale Minimum Value], then push ↵.

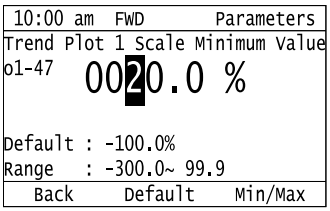


9. Push ◀ or ▶ to select the specified digit, then push ▲ or ▼ to select the correct number.

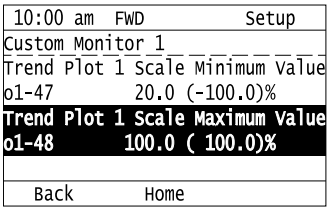


- Push F2 (Default) to set the parameters to the factory default.
- Push F3 (Min/Max) to move between the minimum value and maximum value.

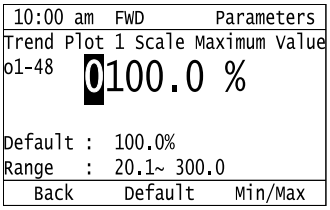
10. Push ↵ to keep the changes.



11. Push ▲ or ▼ to select [Trend Plot 1 Scale Maximum Value], then push ↵.

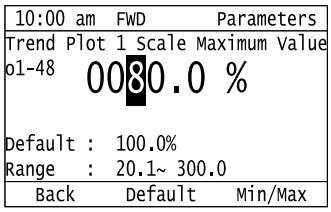


12. Push ◀ or ▶ to select the specified digit, then push ▲ or ▼ to select the correct number.



- Push F2 (Default) to set the parameters to the factory default.
- Push F3 (Min/Max) to move between the minimum value and maximum value.

13. Push ↵ to keep the changes.



14. Push F1 (Back).
    If necessary, use the same procedure to set [Custom Monitor 2].

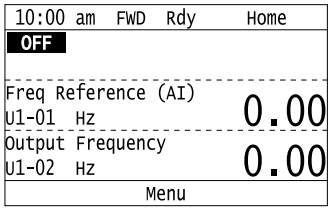
■ Set the Time Scale for the Trend Plot Monitor

The procedure in this section shows how to set the time scale for the trend plot monitor.

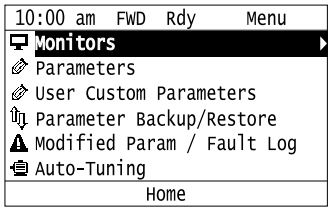
1. Push F2 (Home) to show the HOME screen.

Note:
- The keypad will show [Home] in the top right corner when the HOME screen is active.
- If [Home] is not shown on F2, push F1 (Back) to show [Home] on F2.

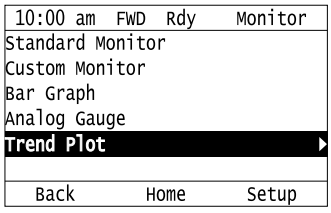
2. Push F2 (Menu).



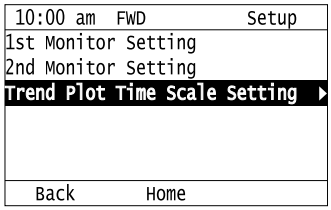
3. Push ∧ or ∨ to select [Monitors], then push ↵.



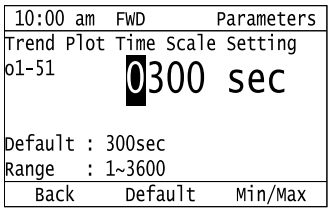
4. Push ∧ or ∨ to select [Trend Plot], then push F3 (Setup).



5. Push ∧ or ∨ to select [Trend Plot Time Scale Setting], then push ↵.

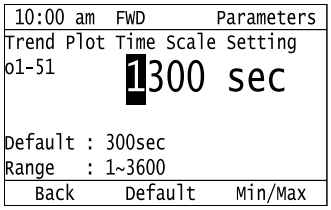


6. Push < or > to select the specified digit, then push ^ or v to select the correct number.



- Push F2 (Default) to set the parameters to the factory default.
- Push F3 (Min/Max) to move between the minimum value and maximum value.

7. Push ↵ to keep the changes.



The configuration procedure is complete.

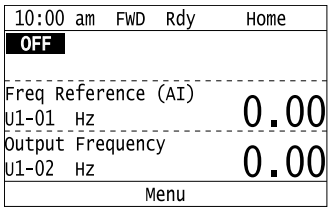
◆ Show Monitor Items as a Trend Plot

The procedure in this section shows how to show the selected monitor data as a trend plot.

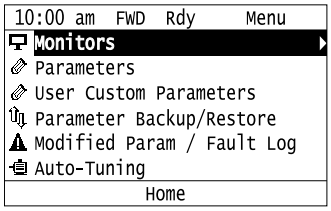
1. Push F2 (Home) to show the HOME screen.

Note:
- The keypad will show [Home] in the top right corner when the HOME screen is active.
- If [Home] is not shown on F2, push F1 (Back) to show [Home] on F2.

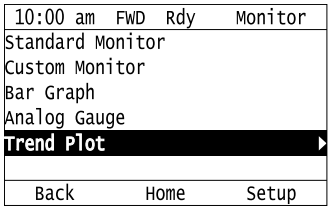
2. Push F2 (Menu).



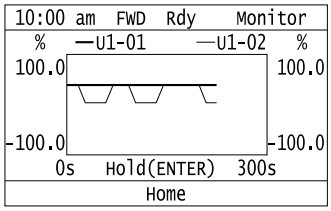
3. Push ^ or v to select [Monitors], then push ↵.



4. Push ^ or v to select [Trend Plot], then push ↵.



The screen will show the monitors as shown in this figure.



Note:

Push (Hold) to switch between Pause and Restart for the monitor display. The "Hold (ENTER)" message flashes while you pause monitoring.

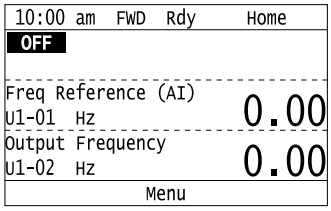
◆ Change Parameter Settings

This example shows how to change the setting value for *C1-01 [Acceleration Time 1]*. Do the steps in this procedure to set parameters for the application.

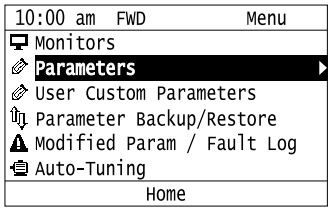
1. Push F2 (Home) to show the HOME screen.

Note:
- When the drive is in HOME Mode, the screen shows [Home] in the upper right-hand corner of the screen.
- If [Home] is not shown above the F2, push F1 (Back).

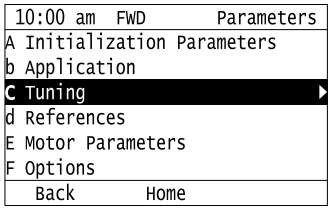
2. Push F2 (Menu).



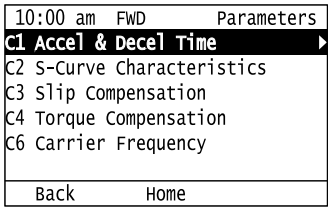
3. Push or to select [Parameters], then push .



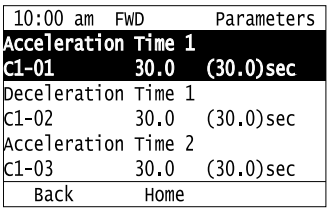
4. Push or to select [C Tuning], then push .



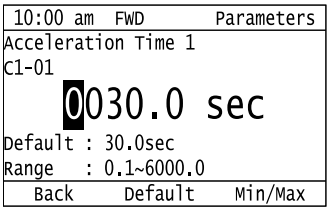
5. Push or to select [C1 Accel & Decel Time], then push .



6. Push ▲ or ▼ to select *C1-01*, then push ↵.

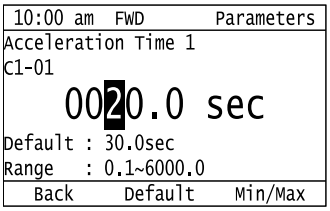


7. Push ◀ or ▶ to select the specified digit, then push ▲ or ▼ to select the correct number.



- Push F2 [Default] to set the parameters to factory defaults.
- Push F3 [Min/Max] to show the minimum value or the maximum value on the display.

8. Push ↵ to keep the changes.



9. Continue to change parameters, then push F1 [Back], F2 [Home] to go back to the home screen after you change all the applicable parameters.

◆ Examine User Custom Parameters

The User Custom Parameters show the parameters set in *A2-01 to A2-32 [User Parameter 1 to User Parameter 32]* to let you quickly access and change settings to these parameters.

Note:

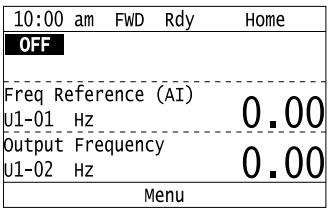
The User Custom Parameters always show *A1-06 [Application Selection]* at the top of the list. The *A2-01 to A2-32* settings change when the *A1-06* setting changes, which makes it easier to set and reference the necessary parameter settings.

1. Push F2 (Home) to show the HOME screen.

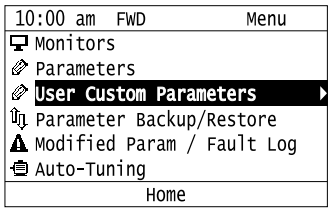
Note:

- The keypad will show [Home] in the top right corner when the HOME screen is active.
- If [Home] is not shown on F2, push F1 (Back) to show [Home] on F2.

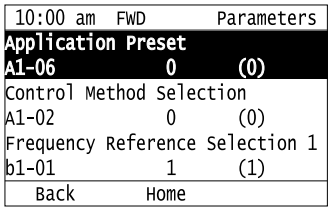
2. Push F2 (Menu).



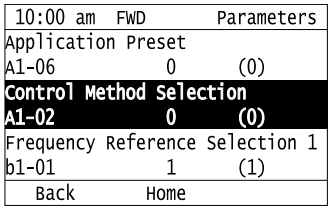
3. Push ▲ or ▼ to select [User Custom Parameters], then push ↵.



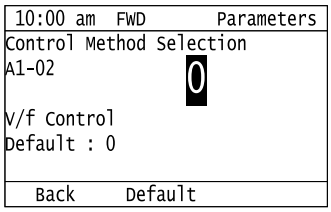
4. Push ▲ or ▼ to show the parameter to examine.



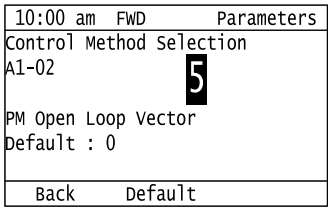
5. To change the parameter settings, push ▲ or ▼ to select the parameter, then push ↵.



6. Push ◀ or ▶ to select the digit, then push ▲ or ▼ to change the value.



7. Change the value, push ↵.



The parameter setting procedure is complete.

◆ Save a Backup of Parameters

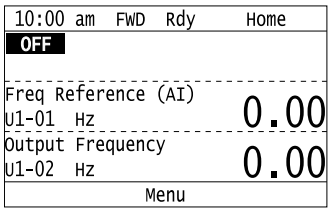
You can save a backup of the drive parameters to the keypad. The keypad can store parameter setting values for a maximum of four drives in different storage areas. Backups of the parameter settings can save time when you set parameters after you replace a drive. When you set up more than one drive, you can copy the parameter settings from a drive that completed a test run to the other drives.

Note:
- Stop the motor before you back up parameters.
- The drive will not accept a Run command while it makes a backup.
- The DriveWorksEZ PC software password is necessary to back up *qx-xx [DriveWorksEZ Parameter]* and *rx-xx [DWEZ Connection Parameter]*. If you enter an incorrect password, the drive detects *PWEr [DWEZ Password Missmatch]*.

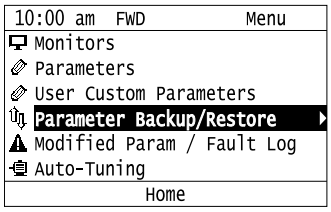
1. Push F2 (Home) to show the HOME screen.

Note:
- When the drive is in HOME Mode, the screen shows [Home] in the upper right-hand corner of the screen.
- If the screen does not show [Home] for F2, push F1 (Back), and then push F2 to show [Home].

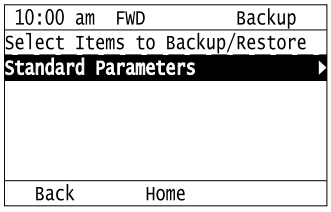
2. Push F2 (Menu).



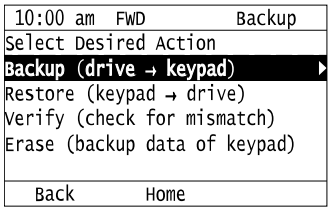
3. Push ^ or v to select [Parameter Backup/Restore], then push ↵.



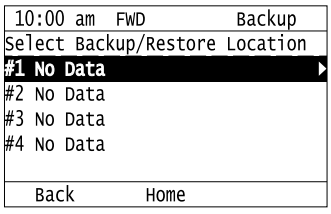
4. Push ^ or v to select the items to back up, then push ↵.



5. Push ^ or v to select [Backup (drive → keypad)], then push ↵.



6. Push ^ or v to select a memory location, then push ↵.



The keypad shows "End" when the backup procedure completes successfully.

◆ Write Backed-up Parameters to the Drive

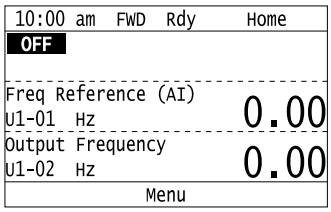
You can back up parameters on the keypad and write them to different drives.

Note:
- Always stop the drive before you start to restore the parameter backups.
- The drive will not accept a Run command while it restores parameters.

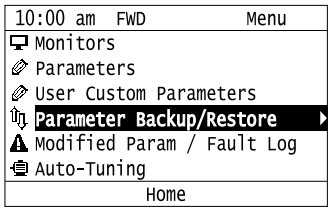
1. Push F2 (Home) to show the HOME screen.

Note:
- When the drive is in HOME Mode, the screen shows [Home] in the upper right-hand corner of the screen.
- If the screen does not show [Home] for F2, push F1 (Back), and then push F2 to show [Home].

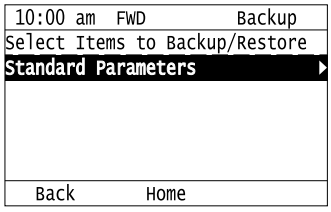
2. Push F2 (Menu).



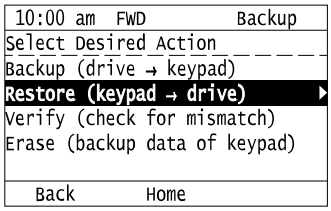
3. Push ^ or v to select [Parameter Backup/Restore], then push ↵.



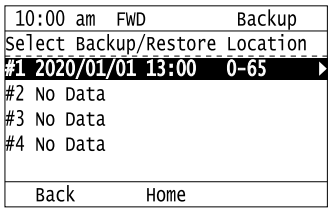
4. Push ^ or v to select the item to restore, then push ↵.



5. Push ^ or v to select [Restore (keypad → drive)], then push ↵.

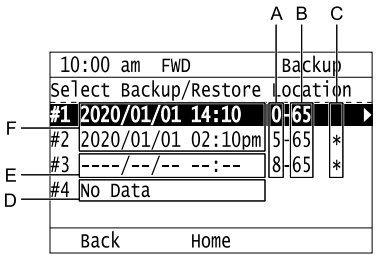


6. Push ^ or v to select the backed-up parameter data, then push ↵.



The keypad will show the "End" message when the write process is complete.

Note:
Different settings and conditions will change the keypad display.



A - *A1-02 [Control Method Selection]* settings
B - *o2-04 [Drive Model (KVA) Selection]* settings (2 or 3 digits)
C - Presence of DriveWorksEZ parameter backup
D - Parameter backup data is not registered
E - Backup data does not contain the date Information
F - Backup date

◆ Verify Keypad Parameters and Drive Parameters

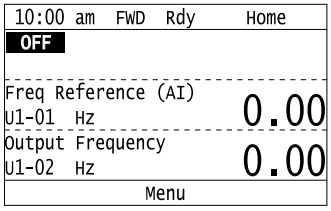
This procedure verifies that the parameter setting values that were backed up in the keypad agree with the parameter setting values in the drive.

Note:
• Always stop the drive before you start to verify the parameters.
• The drive will not accept a Run command while it verifies parameters.

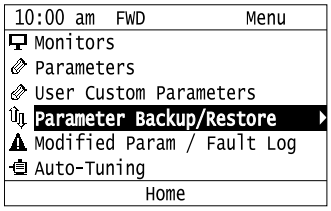
1. Push F2 (Home) to show the HOME screen.

Note:
• When the drive is in HOME Mode, the screen shows [Home] in the upper right-hand corner of the screen.
• If the screen does not show [Home] for F2, push F1 (Back), and then push F2 to show [Home].

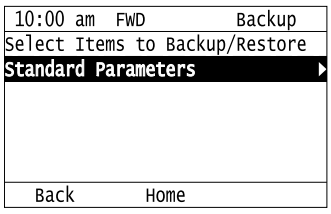
2. Push F2 (Menu).



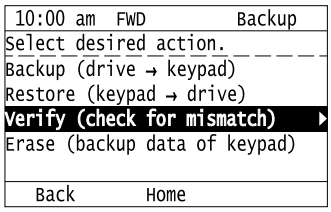
3. Push ▲ or ▼ to select [Parameter Backup/Restore], then push ↵.



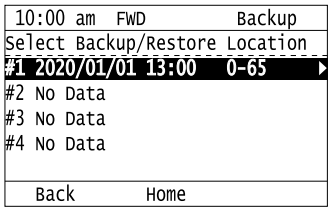
4. Push ▲ or ▼ to select the item to verify, then push ↵.



5. Push ▲ or ▼ to select [Verify (drive → keypad)], then push ENTER.



6. Push ▲ or ▼ to select the data to verify, then push ENTER.



The keypad shows "End" when the parameter settings backed up in the keypad agree with the parameter settings copied to the drive.

Note:

The keypad shows *vFyE [Parameters do not Match]* when the parameter settings backed up in the keypad do not agree with the parameter settings copied to the drive. Push one of the keys to return to the screen in Step 6.

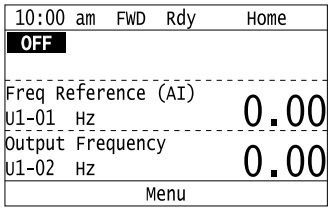
◆ Delete Parameters Backed Up to the Keypad

This procedure deletes the parameters that were backed up to the keypad.

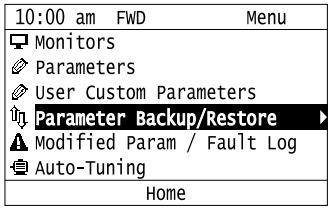
1. Push F2 (Home) to show the HOME screen.

Note:
- When the drive is in HOME Mode, the screen shows [Home] in the upper right-hand corner of the screen.
- If the screen does not show [Home] for F2, push F1 (Back), and then push F2 to show [Home].

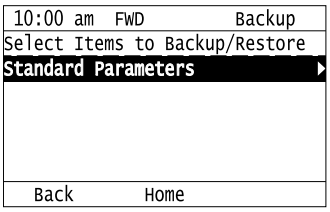
2. Push F2 (Menu).



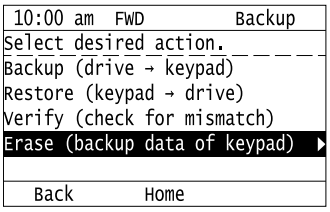
3. Push ▲ or ▼ to select [Parameter Backup/Restore], then push ENTER.



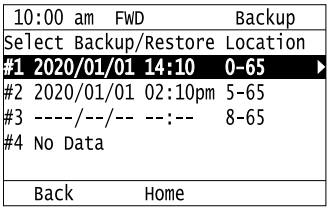
4. Push ▲ or ▼ to select the item to verify, then push ↵.



5. Push ▲ or ▼ to select [Delete (keypad)], then push ↵.



6. Push ▲ or ▼ to select the data to delete, then push ↵.



The keypad will show the "End" message when the write process is complete.

◆ Checking Modified Parameters

■ Modified Parameters Screen Displays

The keypad display for Modified Parameters screen changes when the *A1-06 [Application Preset]* and *A1-07 [DriveWorksEZ Function Selection]* settings change:

A1-06 Settings	A1-07 Settings	Keypad Display	Description
0	0	10:00 am FWD Modified User Modified Parameters Standard: 2 Parameters Modified Back Home	When you set *A1-06 = 0 [No Preset Selected]* and *A1-07 = 0 [DWEZ Disabled]*, the Modified Parameters screen will only show [Standard].
1 - 8	0	10:00 am FWD Modified User Modified Parameters Standard: 8 Parameters Modified Application Presets: 2 Parameters Modified Back Home	When you set an application macro (*A1-06 ≠ 0*), the Modified Parameters screen will show the Standard menu and Application Presets menu. • Standard: This menu shows all parameters modified by the *A1-06* setting and any standard drive parameters modified after you changed the *A1-06* setting. • Application Presets: This menu only shows parameters not set by *A1-06*.
0 - 8	1	10:00 am FWD Modified User Modified Parameters Application Presets: 2 Parameters Modified DWEZ: 6 Parameters Modified Back Home	When *A1-07 = 1 [DWEZ Enabled]*, the keypad will also show the DWEZ menu selection. If the modified parameters are returned back to Application Preset default, causing the numbers of parameters modified for Application Preset to be 0, the user will be returned back to the User Modified Parameters menu screen with the Standard list selected.

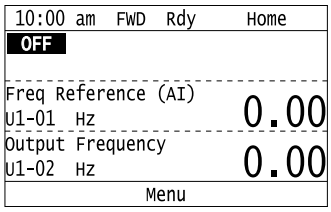
■ Check Modified Parameters

This procedure will show all parameters that are not at their default values. This helps find settings have been changed, and is very useful when you replace a drive. This lets you quickly access and re-edit changed parameters. The keypad will show “0 Parameters” when all parameters are at their default values.

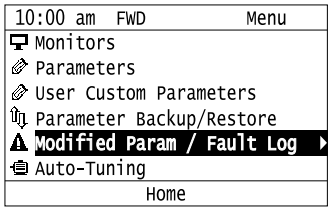
1. Push F2 (Home) to show the HOME screen.

Note:
• The keypad will show [Home] in the top right corner when the HOME screen is active.
• If [Home] is not shown on F2, push F1 (Back) to show [Home] on F2.

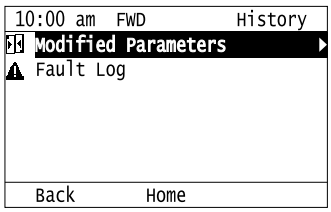
2. Push F2 (Menu).



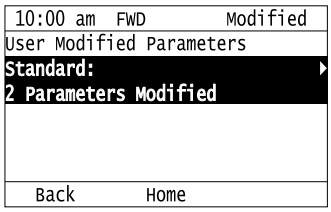
3. Push ^ or v to select [Modified Param / Fault Log], then prush ↵.



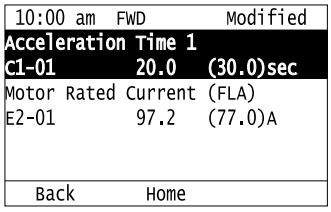
4. Push ^ or v to select [Modified Parameters], then push ↵.



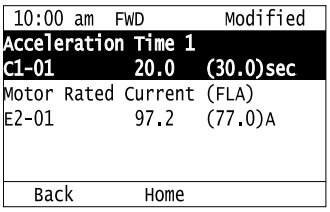
5. Push ↵.



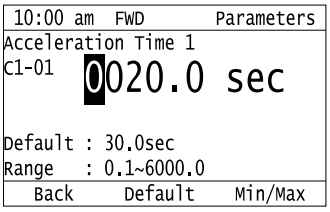
6. Push ^ or v to show the parameter to check.



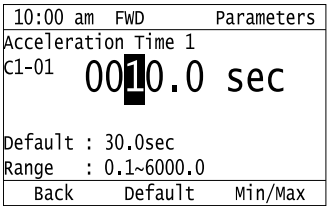
7. To re-edit a parameter, push ▲ or ▼, select the parameter to edit, then push ↵.



8. Push ◀ or ▶ to select the digit, then push ▲ or ▼ to change the value.



9. When you are done changing the value, push ↵.



The parameter revision procedure is complete.

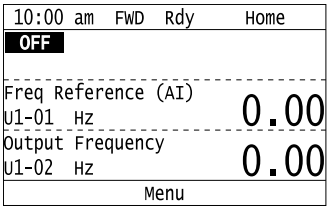
◆ Restore Modified Parameters to Defaults

This procedure will set all parameters with changed values to their default settings.

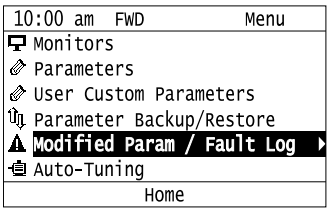
1. Push F2 (Home) to show the HOME screen.

Note:
- The keypad will show [Home] in the top right corner when the HOME screen is active.
- If [Home] is not shown on F2, push F1 (Back) to show [Home] on F2.

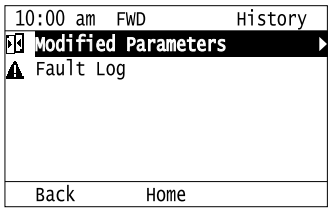
2. Push F2 (Menu).



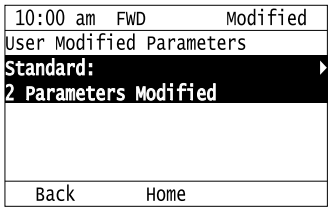
3. Push ▲ or ▼ to select [Modified Param / Fault Log], then push ↵.



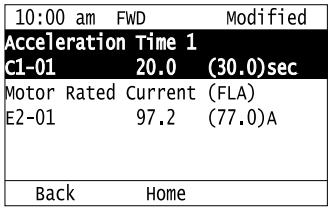
4. Push ▲ or ▼ to select [Modified Parameters], then push ↵.



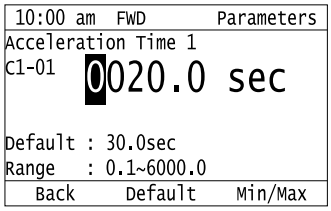
5. Push ↵.



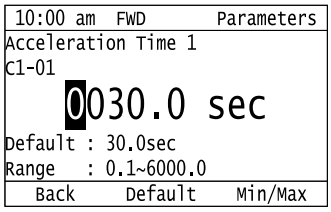
6. Push ▲ or ▼ to select the parameters to return to their default settings, then push ↵.



7. Push F2 (Default).



8. Push ↵.



The modified parameters are now set to default values.

◆ Show Fault History

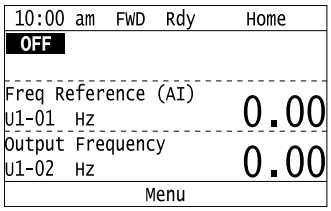
You can examine a maximum of 10 fault codes and dates and times that the faults occurred.

Note:
- To monitor the date and time of faults, you must first set the date and time on the keypad.
- If the keypad does not have a clock battery, you must set the date and time each time you energize the drive.

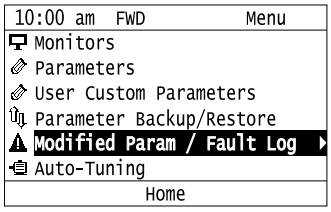
1. Push F2 (Home) to show the HOME screen.

Note:
- The keypad will show [Home] in the top right corner when the HOME screen is active.
- If [Home] is not shown on F2, push F1 (Back) to show [Home] on F2.

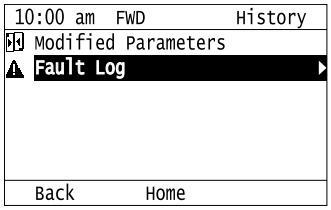
2. Push F2 (Menu).



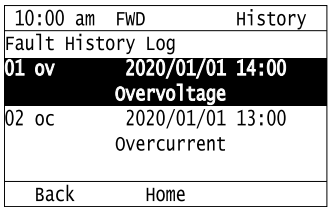
3. Push ▲ or ▼ to select [Modified Parameters/Fault History], then push ↵.



4. Push ▲ or ▼ to select [Fault History], then push ↵.



5. Push ▲ or ▼ to show the fault history you will examine.



◆ Auto-Tuning the Drive

Auto-Tuning uses motor characteristics to automatically set drive parameters.

Refer to the motor nameplate or the motor test report for the necessary information for Auto-Tuning.

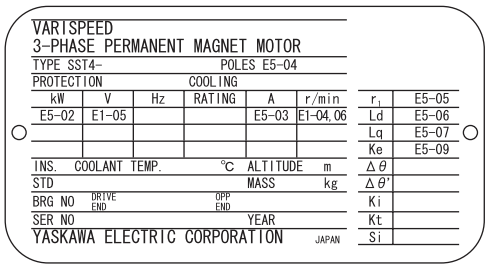


Figure 5.12 Motor Nameplate (Example)

WARNING! *Sudden Movement Hazard. Before you do Auto-Tuning, remove all personnel and objects from the area around the drive, motor, and load. The drive and motor can start suddenly during Auto-Tuning and cause serious injury or death.*

WARNING! *Electrical Shock Hazard. During Auto-Tuning, the motor will receive high voltage when the motor is stopped. Do not touch the motor until Auto-Tuning is complete. If you touch a motor that is energized, it can cause serious injury or death.*

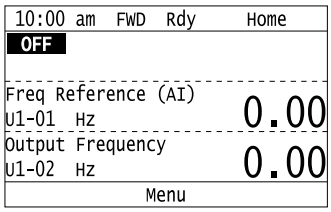
WARNING! *Sudden Movement Hazard. Before you do Rotational Auto-Tuning, disconnect the load from the motor. The load can move suddenly and cause serious injury or death.*

This procedure shows how to do Rotational Auto-Tuning.

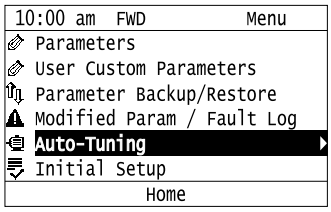
1. Push F2 (Home) to show the HOME screen.

Note:
- When the drive is in HOME Mode, the screen shows [Home] in the upper right-hand corner of the screen.
- If the screen does not show [Home] for F2, push F1 (Back), and then push F2 to show [Home].

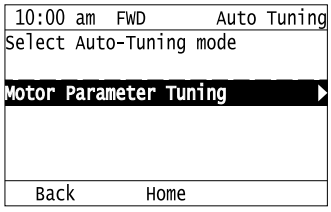
2. Push F2 (Menu).



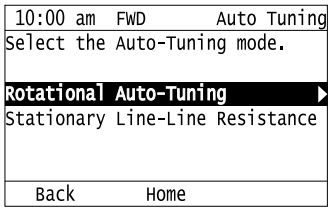
3. Push ^ or v to select [Auto-Tuning], then push ↵.



4. Push ↵.

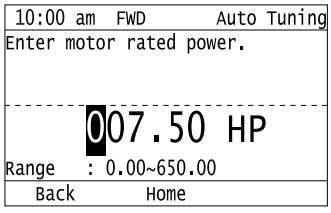


5. Push ^ or v to select [Rotational Auto-Tuning], then push ↵.



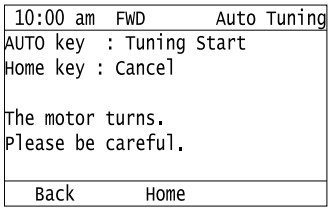
6. Follow the messages shown on the keypad to input the necessary Auto-Tuning data.

   Example: Push < or > to select the specified digit, then push ^ or v to change the number. Push ↵ to save the change and move to the next entry field.



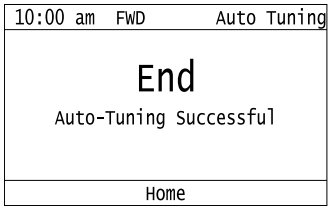
7. Follow the messages shown on the keypad to do the next steps.

8. When the keypad shows the Auto-Tuning start screen, push AUTO.



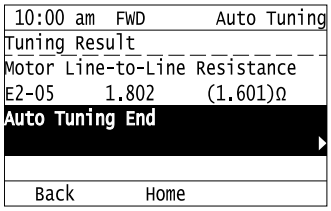
Auto-Tuning starts.
When doing Rotational Auto-Tuning, the motor will stay stopped for approximately one minute with power energized and then the motor will start to rotate.

9. When the keypad shows this screen after Auto-Tuning is complete for 1 or 2 minutes, push ENTER or RIGHT.



The keypad will show a list of the changed parameters as the result of Auto-Tuning.

10. Push UP or DOWN in the parameter change confirmation screen to check the changed parameters, then select [Auto-Tuning Successful] at the bottom of the screen and push ENTER.

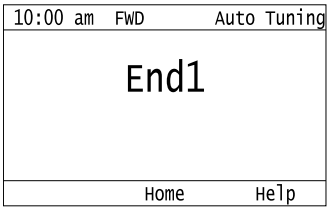


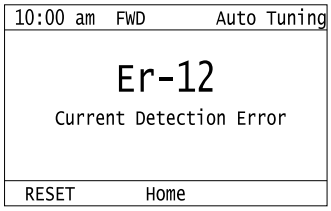
To change a parameter again, push UP or DOWN to select the parameter to change, then push ENTER to show the parameter setting screen.

Auto-Tuning is complete.

Note:

If the drive detects an error or you push OFF before Auto-Tuning is complete, Auto-Tuning will stop and the keypad will show an error code. *Endx* identifies that Auto-Tuning was successful with calculation errors. Find and repair the cause of the error and do Auto-Tuning again, or set the motor parameters manually. You can use the drive in the application if you cannot find the cause of the *Endx* error. *Er-xx* identifies that Auto-Tuning was not successful. Find and repair the cause of the error and do Auto-Tuning again.





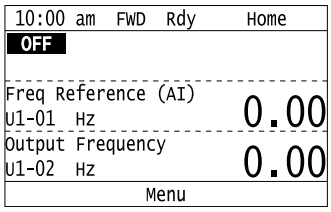
◆ Set the Keypad Language Display

The procedure in this section shows how to set the language shown on the keypad.

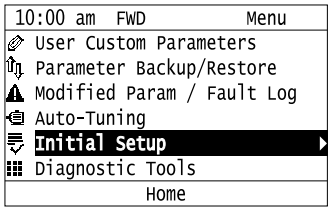
1. Push F2 (Home) to show the HOME screen.

Note:
- The keypad will show [Home] in the top right corner when the HOME screen is active.
- If [Home] is not shown on F2, push F1 (Back), to show [Home] on F2.

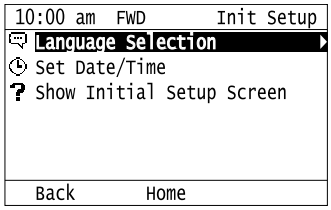
2. Push F2 (Menu).



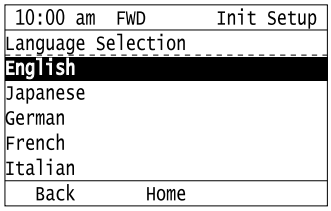
3. Push ^ or v to select [Initial Settings], then push ↵.



4. Push ^ or v to select [Language Selection], then push ↵.



5. Push ^ or v to select the language, then push ↵.



The procedure to set the keypad language is complete.

◆ Set the Date and Time

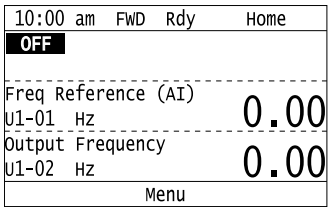
The procedure in this section shows how to set the date and time.

Note:
- Refer to *Replace the Keypad Battery on page 51* for information about the battery installation procedure.
  The drive can detect an alarm when the battery dies or when you do not set the clock. Set *o4-24 = 1 [bAT Detection selection = Enable (Alarm Detected)]* to enable this alarm.
- If the keypad does not have a clock battery, you must set the date and time each time you energize the drive.

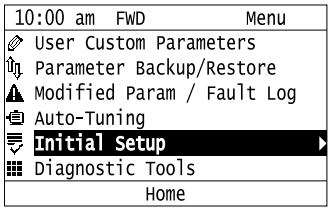
1. Push F2 (Home) to show the HOME screen.

Note:
- The keypad will show [Home] in the top right corner when the HOME screen is active.
- If [Home] is not shown on F2, push F1 (Back) to show [Home] on F2.

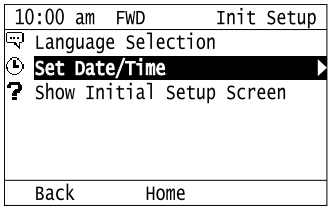
2. Push F2 (Menu).



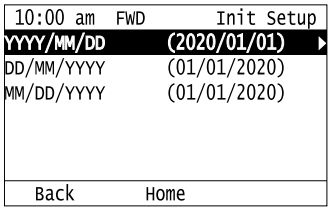
3. Push ▲ or ▼ to select [Initial Setup], then push ↵.



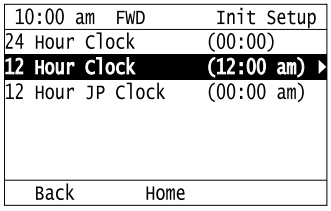
4. Push ▲ or ▼ to select [Set Date/Time], and push ↵.



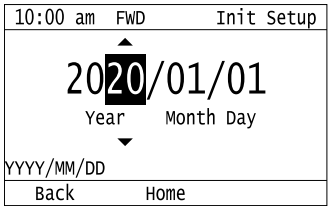
5. Push ▲ or ▼ to select the format of date display, then push ↵.



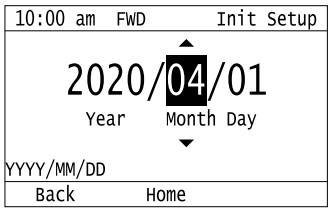
6. Push ▲ or ▼ to select the format of time display, then push ↵.



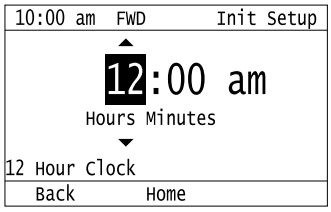
7. Push ◀ or ▶ to select a number from Year/Month/Day, then push ▲ or ▼ to change the value.



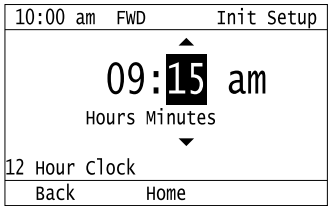
8. When you are done changing the value, push ↵.



9. Push < or > to select the hour or minute, then push ∧ or ∨ to change the value.



10. When you are done setting the time, push ↵.



The procedure for setting the date and time is complete.

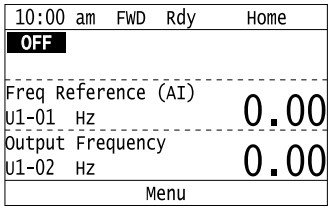
◆ Disable the Initial Setup Screen

Do the steps in this procedure to not show the initial start-up screen when the drive is energized.

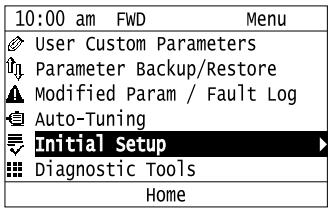
1. Push F2 (Home) to show the HOME screen.

Note:
- When the drive is in HOME Mode, the screen shows [Home] in the upper right-hand corner of the screen.
- If the screen does not show [Home] for F2, push F1 (Back), and then push F2 to show [Home].

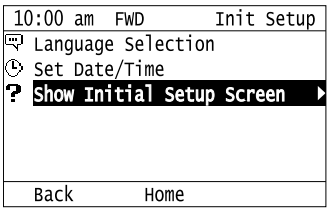
2. Push F2 (Menu).



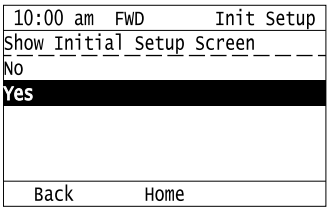
3. Push ∧ / ∨ to select [Initial Setup], then push ↵.



4. Push ▲ / ▼ to select [Show Initial Setup Screen], then push ↵.



5. Push ▲ / ▼ to select [No], then push ↵.



- [No]: The keypad will not show the Initial Setup Screen when the drive is energized.
- [Yes]: The keypad will show the Initial Setup Screen when the drive is energized.

◆ Start Data Logging

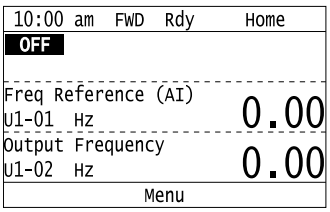
The data log function saves drive status information. Monitors *Ux-xx* are the source of log information. The procedure in this section shows how to start logging data.

You can record a maximum of 10 monitors.

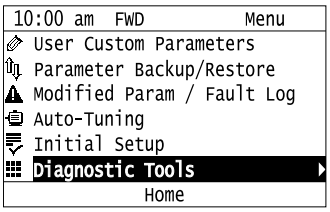
1. Insert a microSD card in the keypad.
2. Push F2 (Home) to show the HOME screen.

Note:
- When the drive is in HOME Mode, the screen shows [Home] in the upper right-hand corner of the screen.
- If the screen does not show [Home] for F2, push F1 (Back), and then push F2 to show [Home].

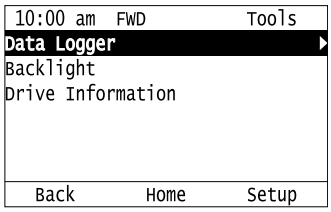
3. Push F2 (Menu).



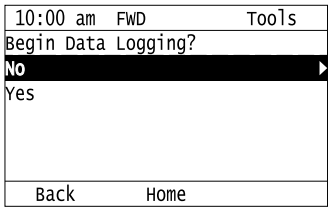
4. Push ▲ or ▼ to select [Diagnostic Tools], then push ↵.



5. Push ▲ or ▼ to select [Data Logger], then push ↵.

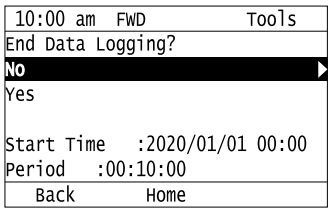


6. Push ▲ or ▼ to select [Yes] or [No], then push ↵.



- [Yes]: Data logging starts.
- [No]: Data logging will not start.

If the drive was logging data when you entered the command, the keypad looks like this:



◆ Configuring the Data Log Content

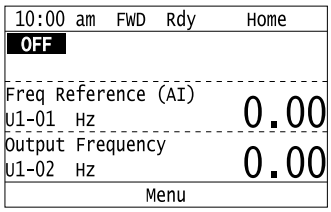
■ Set Monitor to Log

The procedure in this section shows how to set the monitor for which to log data.

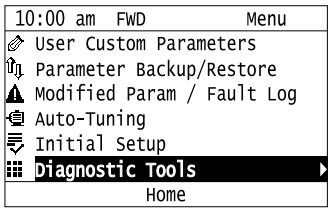
1. Push F2 (Home) to show the HOME screen.

Note:
- When the drive is in HOME Mode, the screen shows [Home] in the upper right-hand corner of the screen.
- If the screen does not show [Home] for F2, push F1 (Back), and then push F2 to show [Home].

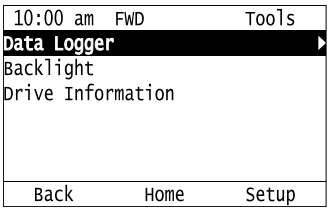
2. Push F2 (Menu).



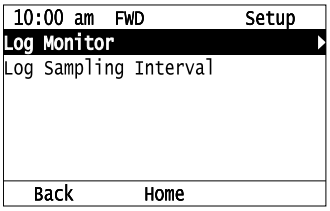
3. Push ▲ or ▼ to select [Diagnostic Tools], then push ↵.



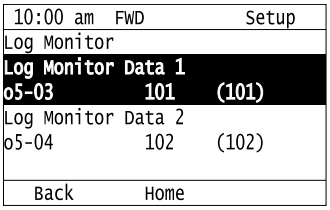
4. Push ▲ or ▼ to select [Data Logger], then push F3 (Setup).



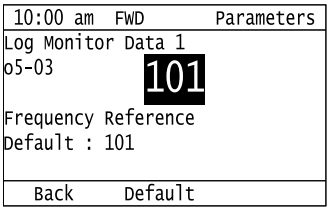
5. Push ▲ or ▼ to select [Log Monitor], then push ↵.



6. Push ▲ or ▼ to select the save-destination monitor parameter, then push ↵.



7. Push ▲ or ▼ to select the monitor number to be logged, then push ↵.



The configuration procedure is complete.

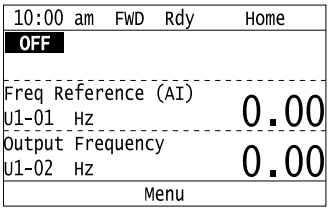
■ Set the Sampling Time

The procedure in this section shows how to set the sampling time for data logging.

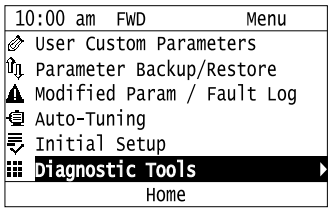
1. Push F2 (Home) to show the HOME screen.

Note:
- When the drive is in HOME Mode, the screen shows [Home] in the upper right-hand corner of the screen.
- If the screen does not show [Home] for F2, push F1 (Back), and then push F2 to show [Home].

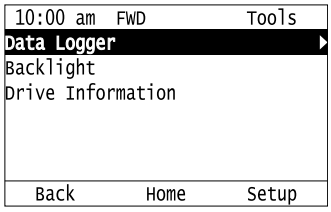
2. Push F2 (Menu).



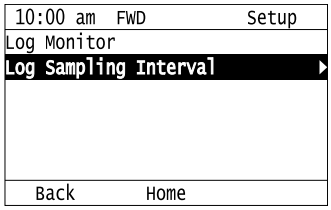
3. Push ▲ or ▼ to select [Diagnostic Tools], then push ↵.



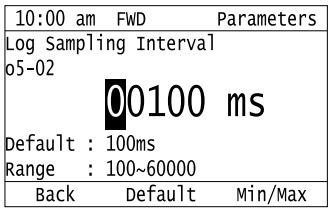
4. Push ▲ or ▼ to select [Data Logger], then push F3 (Setup).



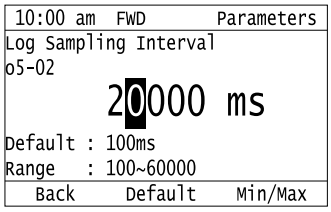
5. Push ▲ or ▼ to select [Log Sampling Interval], then push ↵.



6. Push ◀ or ▶ to select the digit, then push ▲ or ▼ to change the value.



7. When you complete changing the value, push ↵.



The procedure to set the sampling time is complete.

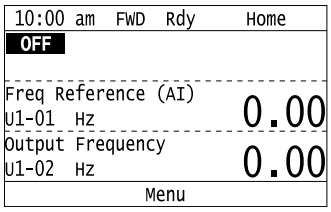
◆ Set Backlight to Automatically Turn OFF

You can set the backlight of the keypad screen to automatically turn OFF after a set length of time since the last key operation on the keypad. The procedure in this section shows how to turn ON and turn OFF the backlight.

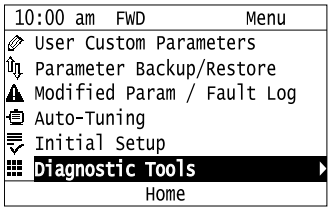
1. Push F2 (Home) to show the HOME screen.

Note:
- The keypad will show [Home] in the top right corner when the HOME screen is active.
- If [Home] is not shown on F2, push F1 (Back) to show [Home] on F2.

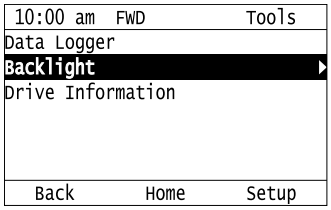
2. Push F2 (Menu).



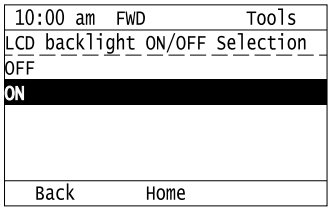
3. Push ▲ or ▼ to select [Diagnostic Tools], then push ↵.



4. Push ▲ or ▼ to select [Backlight], then push ↵.

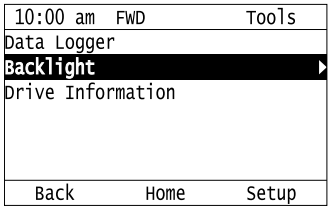


5. Push ▲ or ▼ to select [ON] or [OFF], then push ↵.

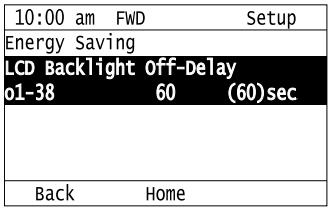


- [ON]: Backlight is always ON
- [OFF]: Backlight turns OFF after set length of time.

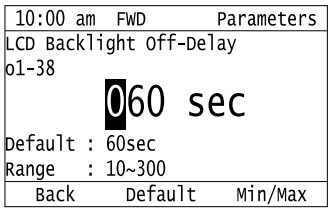
6. Push F3 (Setup).



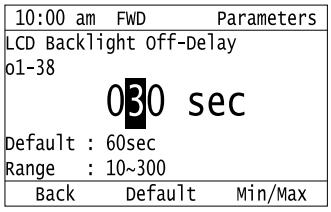
7. Push ↵.



8. Push < or > to select the digit, then push ^ or v to change the value.



9. When you are done changing the value, push Enter.



The procedure to set the backlight to turn OFF automatically is complete.

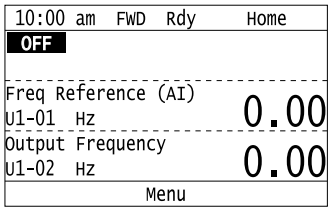
◆ Show Information about the Drive

The procedure in this section shows how to show the drive model, maximum applicable motor output, rated output current, software version, and the serial number on the keypad.

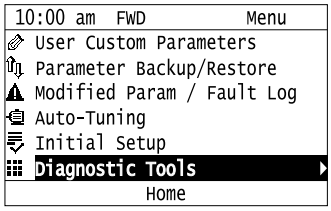
1. Push F2 (Home) to show the HOME screen.

Note:
- The keypad will show [Home] in the top right corner when the HOME screen is active.
- If [Home] is not shown on F2, push F1 (Back) to show [Home] on F2.

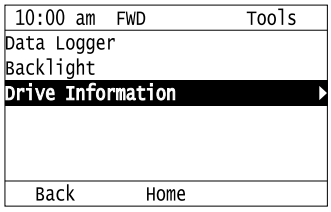
2. Push F2 (Menu).



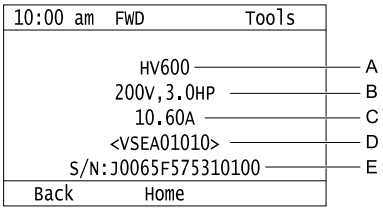
3. Push ^ or v to select [Diagnostic Tools], then push Enter.



4. Push ^ or v to select [Drive Information], then push Enter.



The keypad will show the drive information.



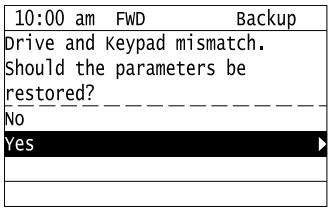
A - Drive Series
B - Maximum Applicable Motor Output
C - Rated Output Current
D - Drive Software Version
E - Serial Number

◆ Write Automatically Backed-up Parameters to the Drive

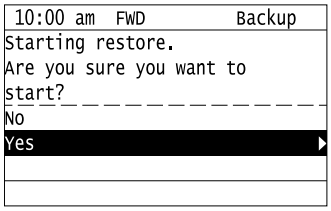
You can automatically back up parameters to the keypad connected to the drive and write those parameters to a different drive as specified by the settings of *o3-06 [Auto Parameter Backup Selection]* and *o3-07 [Auto Parameter Backup Interval]*.

Note:
- Set *o3-06 = 1 [Auto Parameter Backup Selection = Enabled]* in each drive to which you will write the parameters.
- This operation is not available when the parameters in the keypad and the parameters on the other drives are set to the same values.

1. Connect the keypad to the drive.
2. Push ▲ or ▼ to select [Yes] and then push ↵.



3. Push ▲ or ▼ to select [Yes] and then push ↵.



The keypad will show the “End” message when the write process is complete.

5.7 Automatic Parameter Settings Optimized for Specific Applications (Application Presets)

The drive has application presets to set the necessary parameters for different applications to their best values. To examine the parameters that *A1-06 [Application Preset]* automatically changed, use [User Custom Parameters] on the Main menu.

Note:

Make sure that you set *A1-03 = 2220, 3330 [Initialize Parameters = 2-Wire Initialization, 3-Wire Initialization]* to initialize parameters before you set *A1-06*.

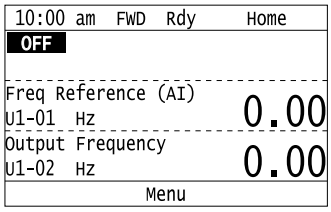
This section shows the procedure to set an application preset.

1. Push F2 (Home) to show the HOME screen.

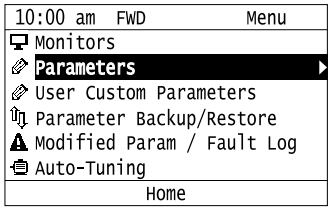
Note:

- The keypad will show [Home] in the top right corner when the HOME screen is active.
- If [Home] is not shown on F2, push F1 (Back) to show [Home] on F2.

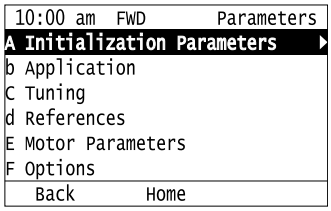
2. Push F2 (Menu).



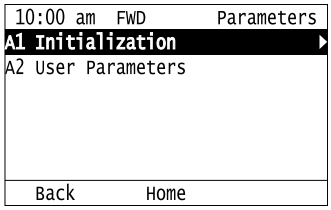
3. Push ▲ or ▼ to select [Parameters], then push ↵.



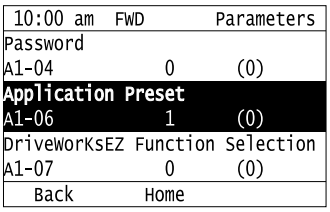
4. Push ▲ or ▼ to select [A Initialization Parameters], then push ↵.



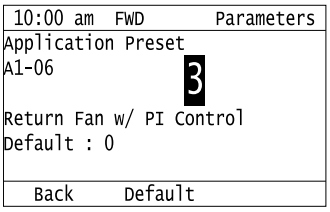
5. Push ▲ or ▼ to select [A1 Initialization], then push ↵.



6. Push ▲ or ▼ to select *A1-06*, then push ↵.



7. Push ▲ or ▼ to change the value, then push ↵.



The parameter setting procedure is complete.

Note:

- You cannot change the value set in *A1-06*. To select an application preset, first set *A1-03 = 2220* to initialize parameters and then make a selection to *A1-06*. If initializing all parameters will cause a problem, it is not necessary to change settings.
- When the drive changes to the *A1-06* setting, it will also reset the parameters automatically registered to *A2-17 to A2-32 [User Parameters 17 to 32]* when *A2-33 = 1 [User Parameter Auto Selection = Enabled: Auto Save Recent Parms]*.

5.8 Auto-Tuning

Auto-Tuning uses motor characteristics to automatically set drive parameters for vector control. Think about the type of motor, drive control method, and the motor installation environment and select the best Auto-Tuning method.

The keypad will show the messages with prompts to input the necessary parameter information. These prompts are specified by the selected Auto-Tuning method and the control method setting in *A1-02*.

◆ Auto-Tuning for Induction Motors

This section gives information about Auto-Tuning for induction motors. Auto-Tuning sets motor parameters *E1-xx, E2-xx* (*E3-xx, E4-xx* for motor 2).

Note:

Do Stationary Auto-Tuning if you cannot do Rotational Auto-Tuning. There can be large differences between the measured results and the motor characteristics when Auto-Tuning is complete. Examine the parameters for the measured motor characteristics after you do Stationary Auto-Tuning.

Table 5.7 Types of Auto-Tuning for Induction Motors

Mode	Parameter Settings	Application Conditions and Benefits	Applicable Control Method (A1-02 Setting)
			V/f (0)
Rotational Auto-Tuning	T1-01 = 0	• When you can decouple the motor and load the motor can rotate freely while Auto-Tuning. • When operating motors that have fixed output characteristics. • When it is necessary to use motors that have high-precision control. • When you cannot decouple the motor and load, but the motor load is less than 30%.	x
Line-to-Line Resistance	T1-01 = 2	• After Auto-Tuning, the wiring distance between the drive and motor changed by 50 m or more. • When the wiring distance is 50 m or more in the V/f Control mode. • When the motor output and drive capacity are different.	x

■ Input Data for Induction Motor Auto-Tuning

To do Auto-Tuning, input data for the items in Table 5.8 that have an "x". Before starting Auto-Tuning, prepare the motor test report or record the information on the motor nameplate as a reference.

Table 5.8 Input Data for Induction Motor Auto-Tuning

Input Data	Parameter	Unit	Auto-Tuning Mode (T1-01 Setting)	
			Rotational Auto-Tuning (0)	Line-to-Line Resistance (2)
Motor Rated Power	T1-02	kW	x	x
Motor Rated Voltage	T1-03	V	x	-
Motor Rated Current	T1-04	A	x	x
Motor Base Frequency	T1-05	Hz	x	-
Number of Motor Poles	T1-06	-	x	-
Motor Base Speed	T1-07	min^{-1}	x	-
Motor Iron Loss	T1-11	W	x *1	-

*1 Input this value when *A1-02 = 0 [Control Method Selection = V/f Control]*.

◆ Auto-Tuning for Motor Parameters for PM Motor

This section gives information about Auto-Tuning for PM motors. Auto-Tuning sets motor parameters *E1-xx, E5-xx*.

Table 5.9 Auto-Tuning for PM Motors

Mode	Parameter Settings	Application Conditions and Benefits	Applicable Control Method (A1-02 Setting)
			OLV/PM (5)
PM Motor Parameter Settings	T2-01 = 0	• When the information from the motor test report or motor nameplate is available. • Rotational/Stationary Auto-Tuning that energizes the motor is not done. Manually input the necessary motor parameters.	x
PM Stationary Auto-Tuning	T2-01 = 1	• When the information from the motor test report or motor nameplate is not available. **Note:** With Stationary Auto-Tuning, the energized drive stays stopped for approximately 1 minute. During this time, the drive automatically measures the necessary motor parameters.	x
PM Stationary Auto-Tuning for Stator Resistance	T2-01 = 2	• After Auto-Tuning, the wiring distance between the drive and motor changed by 50 m or more. • When the motor output and drive capacity are different.	x
PM Rotational Auto-Tuning	T2-01 = 4	• When the information from the motor test report or motor nameplate is not available. • When you can decouple the motor and load the motor can rotate freely while Auto-Tuning. • Values measured during Auto-Tuning are automatically set to the motor parameters.	x
High Frequency Injection Auto-Tuning	T2-01 = 5	• Automatically determines the control parameters required to set *n8-35 = 1 [Initial Pole Detection Method = High Frequency Injection]*. • Applicable to IPM motors only. • Perform tuning with the motor connected to the drive. **Note:** When you want to set *n8-35 = 1*, perform High Frequency Injection Auto-Tuning. Configure the drive with the data from the motor nameplate before performing High Frequency Injection Auto-Tuning. High Frequency Injection Auto-Tuning automatically makes adjustments while it is stopped but still energized.	x

■ Input Data for PM Motor Auto-Tuning

To do Auto-Tuning, input data for the items in Table 5.10 and Table 5.11 that have an "x". Before starting Auto-Tuning, prepare the motor test report or record the information on the motor nameplate as a reference.

Table 5.10 Input Data for PM Motor Auto-Tuning

Input Data	Parameter	Unit	Auto-Tuning Mode (T2-01 Setting)			
			PM Motor Parameter Settings (0)		PM Stationary Auto-Tuning (1)	PM Stationary Auto-Tuning for Stator Resistance (2)
Control Method Selection	**A1-02**	**-**	**5**		**5**	**5**
PM Motor Code Selection	**T2-02**	**-**	**Motor Code of Yaskawa Motor** **1*	**FFFF** **2*	**-**	**-**
PM Motor Type	T2-03	-	-	-	x	-
PM Motor Rated Power	T2-04	kW	-	x	x	-
PM Motor Rated Voltage	T2-05	V	-	x	x	-
PM Motor Rated Current	T2-06	A	-	x	x	x
PM Motor Base Frequency	T2-07	Hz	-	x	x	-
Number of PM Motor Poles	T2-08	-	-	x	x	-
PM Motor Stator Resistance	T2-10	Ω	x	x	-	-
PM Motor d-Axis Inductance	T2-11	mH	x	x	-	-
PM Motor q-Axis Inductance	T2-12	mH	x	x	-	-
Back-EMF Units Selection	T2-13	-	x	x	-	-

Input Data	Parameter	Unit	Auto-Tuning Mode (T2-01 Setting)			
			PM Motor Parameter Settings (0)		PM Stationary Auto-Tuning (1)	PM Stationary Auto-Tuning for Stator Resistance (2)
Control Method Selection	**A1-02**	**-**	**5**		**5**	**5**
PM Motor Code Selection	**T2-02**	**-**	**Motor Code of Yaskawa Motor** *1	**FFFF** *2	**-**	**-**
Back-EMF Voltage Constant (Ke)	T2-14	*3	x	x	-	-
Pull-In Current Level	T2-15	%	-	-	x	-

*1 Set the motor code for a Yaskawa PM motor.
*2 Set the motor code to FFFF for a PM motor from a different manufacturer.
*3 Changes when the value set in *T2-13* changes.

Table 5.11 Input Data for PM Motor Auto-Tuning

Input Data	Parameter	Unit	Auto-Tuning Mode (T2-01 Setting)	
			PM Rotational Auto-Tuning (4)	High Frequency Injection Auto-Tuning (5)
Control Method Selection	**A1-02**	**-**	**5**	**5**
PM Motor Code Selection	**T2-02**	**-**	**-**	**-**
PM Motor Type	T2-03	-	x	-
PM Motor Rated Power	T2-04	kW	x	-
PM Motor Rated Voltage	T2-05	V	x	-
PM Motor Rated Current	T2-06	A	x	-
PM Motor Base Frequency	T2-07	Hz	x	-
Number of PM Motor Poles	T2-08	-	x	-
PM Motor Stator Resistance	T2-10	Ω	-	-
PM Motor d-Axis Inductance	T2-11	mH	-	-
PM Motor q-Axis Inductance	T2-12	mH	-	-
Back-EMF Units Selection	T2-13	-	-	-
Back-EMF Voltage Constant (Ke)	T2-14	*1	-	-
Pull-In Current Level	T2-15	%	x	-

*1 Changes when the value set in *T2-13* changes.

◆ Auto-Tuning in EZ Open Loop Vector Control Method

This section gives information about the Auto-Tuning mode for EZ Open Loop Vector Control. Auto-Tuning will set the *E9-xx* parameters.

Table 5.12 EZ Tuning Mode Selection

Mode	Parameter Settings	Application Conditions and Benefits	Applicable Control Method (A1-02 Setting)
Motor Parameter Setting	T4-01 = 0	• Applicable when driving SynRM (Synchronous Reluctance Motors). • Suitable for derating torque applications, for example fans and pumps.	EZOLV (8)
Line-to-Line Resistance	T4-01 = 1	• After Auto-Tuning, the wiring distance between the drive and motor changed by 50 m or more. • When the motor output and drive capacity are different.	EZOLV (8)

■ Auto-Tuning Input Data in EZ Open Loop Vector Control Method

To do Auto-Tuning, input data for the items in Table 5.13 that have an "x". Before starting Auto-Tuning, prepare the motor test report or record the information on the motor nameplate as a reference.

Table 5.13 Auto-Tuning Input Data in EZ Open Loop Vector Control Method

Input Data	Parameter	Unit	Auto-Tuning Mode (T4-01 Setting)	
			Motor Parameter Setting (0)	Line-to-Line Resistance (1)
Motor Type Selection	T4-02	-	x	-
Motor Max Revolutions	T4-03	min^{-1}	x	-
Motor Rated Revolutions	T4-04	min^{-1}	x	-
Motor Rated Frequency	T4-05	Hz	x	-
Motor Rated Voltage	T4-06	V	x	-
PM Motor Rated Current (FLA)	T4-07	A	x	x
PM Motor Rated Power (kW)	T4-08	kW	x	-
Number of Motor Poles	T4-09	-	x	-

◆ Precautions before Auto-Tuning

Examine the topics in this section before you start Auto-Tuning.

■ Prepare for Basic Auto-Tuning

- You must input data from the motor nameplate or motor test report to do Auto-Tuning. Make sure that this data is available before Auto-Tuning the drive.
- For best performance, make sure that the drive input supply voltage is equal to or more than the motor rated voltage.

  Note:
  Better performance is possible when you use a motor with a rated voltage that is less than the input supply voltage (by 20 V for 208 V class models or by 40 V for 480 V class models). This is very important when operating the motor at more than 90% of base speed, where high torque precision is necessary. If the input power supply is equal to the motor rated voltage, the drive output voltage will not be sufficient, and performance will decrease.

- Push OFF on the keypad to cancel Auto-Tuning.
- If a Safe Disable input signal is input to the drive during Auto-Tuning, Auto-Tuning measurements will not complete successfully. If this occurs, cancel the Auto-Tuning, then do it again.
- Table 5.14 shows the status of input/output terminals during Auto-Tuning.

Table 5.14 Status of Input/Output Terminals during Auto-Tuning

Auto-Tuning Type	Mode		Multi-Function Inputs	Multi-Function Outputs *1
Induction Motor Auto-Tuning	Rotational	Rotational Auto-Tuning	Disabled	Functions the same as during usual operation.
	Stationary	Line-to-Line Resistance	Disabled	Keeps the status at the start of Auto-Tuning.
PM Motor Auto-Tuning	Rotational	PM Rotational Auto-Tuning	Disabled	Functions the same as during usual operation.
	Stationary	PM Motor Parameter Settings	Disabled	Keeps the status at the start of Auto-Tuning.
		PM Stationary Auto-Tuning	Disabled	Keeps the status at the start of Auto-Tuning.
		PM Stationary Auto-Tuning for Stator Resistance	Disabled	Keeps the status at the start of Auto-Tuning.
EZ Tuning	Stationary	Motor Parameter Setting	Disabled	Keeps the status at the start of Auto-Tuning.
		Line-to-Line Resistance	Disabled	Keeps the status at the start of Auto-Tuning.

*1 A terminal to which *H2-xx = E [MFDO Function Selection = Fault]* is assigned functions the same as during usual operation.

WARNING! *Crush Hazard. Wire a sequence that will not let a multi-function output terminal open the holding brake during Stationary Auto-Tuning. If the holding brake is open during Stationary Auto-Tuning, it can cause serious injury or death.*

WARNING! *Sudden Movement Hazard. Before you do Rotational Auto-Tuning, disconnect the load from the motor. The load can move suddenly and cause serious injury or death.*

WARNING! *Injury to Personnel. Rotational Auto-Tuning rotates the motor at 50% or more of the motor rated frequency. Make sure that there are no issues related to safety in the area around the drive and motor. Increased motor frequency can cause serious injury or death.*

WARNING! *Electrical Shock Hazard. During Auto-Tuning, the motor will receive high voltage when the motor is stopped. Do not touch the motor until Auto-Tuning is complete. If you touch a motor that is energized, it can cause serious injury or death.*

■ Precautions before Rotational Auto-Tuning

WARNING! *Electrical Shock Hazard. During Auto-Tuning, the motor will receive high voltage when the motor is stopped. Do not touch the motor until Auto-Tuning is complete. If you touch a motor that is energized, it can cause serious injury or death.*

- Before you do Rotational Auto-Tuning to prevent drive malfunction, uncouple the motor from the load. If you do Rotational Auto-Tuning with the motor connected to a load that is more than 30% of the motor duty rating, the drive will not correctly calculate the motor parameters and the motor can operate incorrectly.
- When the load is 30% or less of the motor duty rating, you can do Auto-Tuning with the motor connected to a load.
- Make sure that the motor magnetic brake is released.
- Make sure that external force from the machine will not cause the motor to rotate.

■ Precautions before Stationary Auto-Tuning

- Make sure that the motor magnetic brake is not open.
- Make sure that external force from the machine will not cause the motor to rotate.

WARNING! *Electrical Shock Hazard. During Auto-Tuning, the motor will receive high voltage when the motor is stopped. Do not touch the motor until Auto-Tuning is complete. If you touch a motor that is energized, it can cause serious injury or death.*

■ Precautions before Stationary Auto-Tuning for Line-to-Line Resistance and Stator Resistance Auto-Tuning

In V/f control, when the motor cable is 50 meters (164 feet) or longer, do Stationary Auto-Tuning for Line-to-Line Resistance.

WARNING! *Electrical Shock Hazard. During Auto-Tuning, the motor will receive high voltage when the motor is stopped. Do not touch the motor until Auto-Tuning is complete. If you touch a motor that is energized, it can cause serious injury or death.*

5.9 Test Run

After you Auto-Tune the drive, the next step is to do a test run.

WARNING! *Crush Hazard. Test the system to make sure that the drive operates safely after you wire the drive and set parameters. If you do not test the system, it can cause damage to equipment or serious injury or death.*

◆ No-Load Test Run

Before connecting the motor to the machine, make sure that you check the operation status of the motor.

■ Precautions before Operation

Before rotating the motor, check these items:

- Check for safety issues near the drive, motor, and machine.
- Make sure that all emergency stop circuits and machine safety mechanisms are operating correctly.

■ Items to Check before Operation

Check these items before operation:

- Is the motor rotating in the forward direction?
- Is the motor rotating smoothly (no unusual sounds or unusual vibrations)?
- Does the motor accelerate/decelerate smoothly?

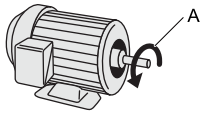
◆ Do a No-Load Test Run

Do these steps for a no-load test run:

1. Energize the drive, or push F2 to show the HOME screen.
   If [Home] is not shown on F2, push F1 (Back) to show [Home] on F2.
2. Push ↵ to show *S5-05 [HAND Frequency Reference]*, and set it to 6.00 Hz.

Note:
The Run command from AUTO Mode must be OFF.

3. Push F2 to show the HOME screen again.
4. Push HAND to give the drive a Run command from HAND Mode.
   When *o2-24 = 0 or 1 [LED Light Function Selection = Enable Status Ring & Keypad LED or LED Status Ring Disable]*, HAND illuminates and the motor runs at 6.00 Hz in the forward direction.
5. Make sure that the motor is rotating in the correct direction and that the drive does not show a fault.
   If the drive detects a fault, remove the cause.



A - Forward Rotation of Motor (Counter Clockwise Direction as Seen from Load Shaft)

6. Push ∧ to increase the frequency reference value.
   Change the setting value in increments of 10 Hz if necessary and examine the response.
7. Each time you increase the setting value, use *U1-03 [Output Current]* to check the drive output current.
   When the output current of the drive is not more than the motor rated current, the status is correct.
   Example: 6 Hz → 20 Hz → 30 Hz → 40 Hz → 50 Hz → 60 Hz
8. Make sure that the motor rotates correctly, then push OFF.
   HAND is OFF and the motor coasts to stop.

◆ Actual-Load Test Run

Test the operation without a load, then connect the motor and machine to do a test run.

■ Precautions before Operation

Before rotating the motor, check these items:

- Check for safety issues near the drive, motor, and machine.
- Make sure that all emergency stop circuits and machine safety mechanisms are operating correctly.
- Make sure that the motor is fully stopped.
- Connect the motor with the machine.
  Make sure that there are no loose installation screws and that the motor load shafts and machine junctions are correctly secured.
- Keep the keypad near you to push OFF immediately if there is unusual or incorrect operation.

■ Items to Check before Operation

- Make sure that the direction of the machine operation is correct (The motor must rotate in the correct direction).
- Make sure that the motor accelerates and decelerates smoothly.

◆ Do an Actual-Load Test Run

Connect the motor and machine, then do the test run with the same procedure you used for the no-load test run.

- Make sure that *U1-03 [Output Current]* is not too high.

1. Energize the drive, or push F2 (Home) to show the HOME screen.
   If [Home] is not shown on F2, push F1 (Back) to show [Home] on F2
2. Set *S5-05 [HAND Frequency Reference]* to 6.00 Hz.
3. Push F2 to show the HOME screen again.
4. Push HAND to give the drive a Run command from HAND Mode.
   When *o2-24 = 0 or 1 [LED Light Function Selection = Enable Status Ring & Keypad LED or LED Status Ring Disable]*, HAND illuminates and the motor runs at 6.00 Hz in the forward direction.
5. Make sure that the motor is rotating in the correct direction and that the drive does not show a fault.
   If the drive detects a fault, remove the cause.
6. Push ^ to increase the frequency reference value.
   Change the setting value in increments of 10 Hz if necessary and examine the response.
7. Each time you increase the setting value, use *U1-03 [Output Current]* to check the drive output current.
   When the output current of the drive is not more than the motor rated current, the status is correct.
   Example: 6 Hz → 20 Hz → 30 Hz → 40 Hz → 50 Hz → 60 Hz
8. Make sure that the motor rotates correctly, then push OFF.
   HAND is OFF and the motor coasts to stop.
9. Change the frequency reference and direction of motor rotation, and make sure that there are no unusual sounds or vibrations.
10. If there are hunting or oscillation errors caused by control function or mechanical resonant, adjust the settings to stop the errors.

5.10 Fine Tuning during Test Runs (Adjust the Control Function)

This section gives information about the adjustment procedures to stop hunting or oscillation errors caused by control function during a test run. Adjust the applicable parameters as specified by your control method and drive status.

Note:

This section only lists frequently adjusted parameters. If you must adjust parameters that have a higher degree of precision, contact Yaskawa.

◆ V/f Control

Table 5.15 Parameters for Fine Tuning the Drive (V/f)

Issue	Parameter Number	Possible Solutions	Default	Recommended Setting
Hunting or oscillation at mid-range speeds (10 Hz to 40 Hz)	n1-02 [Hunting Prevention Gain Setting]	• If torque is not sufficient with heavy loads, decrease the setting value. • If hunting or oscillation occur with light loads, increase the setting value. • If hunting occurs with a low-inductance motor, for example a motor with a larger frame size or a high-frequency motor, lower the setting value.	1.00	0.10 - 2.00
• The volume of the motor excitation sound is too high. • Hunting or oscillation at low speeds (10 Hz or lower), or at mid-range speeds (10 Hz to 40 Hz)	C6-02 [Carrier Frequency Selection]	• If the volume of the motor excitation sound is too high, increase the carrier frequency. • If hunting or oscillation occur at low or mid-range speeds, decrease the carrier frequency.	1 (2 kHz) *1	1 to upper limit value
• Unsatisfactory motor torque and speed response • Hunting or oscillation	C4-02 [Torque Compensation Delay Time]	• If torque or speed response are slow, decrease the setting value. • If hunting or oscillation occur, increase the setting value.	200 ms *2	100 - 1000 ms
• Torque at low speeds (10 Hz or lower) is not sufficient. • Hunting or oscillation	C4-01 [Torque Compensation Gain]	• If torque at low speeds (10 Hz or lower) is not sufficient, increase the setting value. • If hunting or oscillation occur with light loads, decrease the setting value.	1.00	0.50 - 1.50
• Torque at low speeds (10 Hz or lower) is not sufficient. • Large initial vibration at start up.	• E1-08 [Mid Point A Voltage] • E1-10 [Minimum Output Voltage]	• If torque at low speeds (10 Hz or lower) is not sufficient, increase the setting value. • If there is large initial vibration at start up, decrease the setting value	• E1-08: 15.0 V *3 • E1-10: 9.0 V *3	Default setting +/- 5 V *4
Speed precision is unsatisfactory. (V/f Control)	C3-01 [Slip Compensation Gain]	Set *E2-01 [Motor Rated Current]*, *E2-02 [Motor Rated Slip]*, and *E2-03 [Motor No-Load Current]*, then adjust *C3-01*.	0.0 (no slip compensation)	0.5 - 1.5

*1 The default setting changes when the settings for *o2-04 [Drive Model (KVA) Selection]* change.
*2 The default setting changes when the settings for *A1-02 [Control Method Selection]* and *o2-04 [Drive Model (KVA) Selection]* change.
*3 The default setting changes when the settings for *A1-02 [Control Method Selection]* and *E1-03 [V/f Pattern Selection]* change.
*4 Recommended settings are for 208 V class drives. Multiply the voltage by 2 for 480 V class drives.

◆ Open Loop Vector Control for PM Motors

Table 5.16 Parameters for Fine Tuning the Drive (*A1-02 = 5[OLV/PM]*)

Issue	Parameter Number	Possible Solutions	Default	Recommended Setting
Unsatisfactory motor performance	E1-xx parameters, E5-xx parameters	• Check the settings for *E1-06, E1-04 [Base Frequency, Maximum Output Frequency]*. • Check the *E5-xx* and make sure that all motor data has been set correctly. **Note:** Do not set *E5-05 [PM Motor Resistance (ohms/phase)]* to a line-to-line resistance value. • Do Auto-Tuning.	-	-
Unsatisfactory motor torque and speed response	n8-55 [Motor to Load Inertia Ratio]	Adjust to match the load inertia ratio of the motor and machine.	0	Near the actual load inertia ratio.
	n8-45 [Speed Feedback Detection Gain]	Decrease the setting value in increments of 0.05.	0.80	-
	C4-01 [Torque Compensation Gain]	Adjust the setting value. **Note:** Setting this value too high can cause overcompensation and motor oscillation.	0.00	1.00
• Oscillation when the motor starts. • Motor stalls.	n8-51 [Pull-in Current @ Accel/ Decel]	Increase the setting value in increments of 5%.	50%	-
	• b2-02 [DC Injection Braking Current] • b2-03 [DC Inject Braking Time at Start]	Use DC Injection Braking at start. **Note:** This can cause the motor to rotate in reverse for approximately 1/8 of a turn at start.	• b2-02: 50% • b2-03: 0.00 s	• b2-02: Adjust as necessary. • b2-03: 0.5 s
	n8-55 [Motor to Load Inertia Ratio]	Increase the setting value. **Note:** When operating a single motor or with a minimum amount of inertia, setting this value too high can cause motor oscillation.	0	Near the actual load inertia ratio.
There is too much current during deceleration.	n8-79 [Pull-in Current at Deceleration]	Set *n8-79* < *n8-51*.	50% **Note:** When *n8-79 = 0*, the drive will apply the *n8-51* setting to the pull-in current during deceleration.	Decrease in increments of 5%.
Stalling or oscillation occurs when load is applied during constant speed	n8-47 [Pull-in Current Comp Filter Time]	Decrease the setting value in increments of 0.2 s.	5.0 s	-
	n8-48 [Pull-in/Light Load Id Current]	Increase the setting value in increments of 5%.	30%	-
	n8-55 [Motor to Load Inertia Ratio]	Increase the setting value. **Note:** When operating a single motor or with a minimum amount of inertia, setting this value too high can cause motor oscillation.	0	Near the actual load inertia ratio.
Hunting or oscillation	n8-45 [Speed Feedback Detection Gain]	Increase the setting value in increments of 0.05.	0.80	-
The drive detects *STPo [Motor Step-Out Detected]* fault when the load is not too high.	• E5-09 [PM Back-EMF Vpeak (mV/(rad/s))] • E5-24 [PM Back-EMF L-L Vrms (mV/rpm)]	• Adjust the setting value. • Examine the motor code on the motor nameplate or the data sheet, then set correct values for *E5-09* or *E5-24*.	**1*	• Yaskawa motor Set the motor code from the motor nameplate. • Motor from another manufacturer Set the values from the test report.
The drive detected stalling or *STPo [Motor Step-Out Detected]* at high speed and maximum output voltage.	n8-62 [Output Voltage Limit Level]	Set to a value lower than the actual input voltage.	• 200.0 V • 400.0 V	-

*1 The default setting changes when the settings for *E5-01 [Motor Code Selection]* and *o2-04 [Drive Model (KVA) Selection]* change.

◆ EZ Open Loop Vector Control Method

Table 5.17 Parameters for Fine Tuning the Drive (*A1-02 = 8[EZOLV]*)

Issue	Parameter Number	Possible Solutions	Default	Recommended Setting
• Unsatisfactory motor torque and speed response • Hunting or oscillation	• High speed C5-01 [ASR Proportional Gain 1] • Low speed C5-03 [ASR Proportional Gain 2]	• If torque or speed response are slow, increase the setting value in increments of 5.00. • If hunting or oscillation occur, decrease the setting value.	10.00	10.00 to 50.00 *1
	• High speed C5-02 [ASR Integral Time 1] • Low speed C5-04 [ASR Integral Time 2]	• If torque or speed response are slow, decrease the setting value. • If hunting or oscillation occur, increase the setting value.	0.500 s	0.300 s to 1.000 s *1
The drive cannot find ASR proportional gain or integral time for low speed or high speed.	C5-07 [ASR Gain Switchover Frequency]	Change the ASR proportional gain and ASR integral time to conform to the output frequency.	0.0%	0.0% to maximum rotation speed
Hunting or oscillation	C5-06 [ASR Delay Time]	If the rigidity of the machine is unsatisfactory and vibration is possible, increase the setting value in increments of 0.010.	0.004 s	0.004 s to 0.020 s *1
Step-out	E9-xx parameters	Refer to the motor nameplate or test report and set *E9-xx* correctly.	-	-
Oscillation when the motor starts.	n8-51 [Accel / Decel Pull-In Current]	Increase the setting value.	80%	Increase in increments of 5%.
Motor stalls.	L7-01 to L7-04 [Torque Limit]	Increase the setting value.	200%	Increase in increments of 10%.

*1 The best values for a no-load operation are different than the best values for actual loading operation.

5.11 Test Run Checklist

Examine the items in this checklist and check each item before a test run.

Checked	No.	Description
	1	Correctly install and wire the drive as specified by this manual.
	2	Energize the drive.
	3	Set the voltage for the power supply in *E1-01 [Input AC Supply Voltage]*.

Check the applicable items as specified by your control method.

WARNING! *Sudden Movement Hazard. Correctly wire the start/stop and safety circuits before you energize the drive. If you momentarily close a digital input terminal, it can start a drive that is programmed for 3-Wire control and cause serious injury or death from moving equipment.*

Table 5.18 V/f Control [A1-02 = 0]

Checked	No.	Description
	4	Select the best V/f pattern for your application and motor characteristics. Example: For a motor with a rated frequency of 60 Hz, set *E1-03 = 1 [V/f Pattern Selection = Const Trq, 60Hz base, 60Hz max]* as a standard V/f pattern.

Table 5.19 PM Open Loop Vector Control [A1-02 = 5]

Checked	No.	Description
	5	Set *E5-01 to E5-24 [PM Motor Settings]*.

Checked	No.	Description
	6	The keypad will show “Rdy” after starting to operate the motor.
	7	To give the Run command and frequency reference from the keypad, push HAND to set the drive to HAND Mode. **Note:** When in HAND Mode, HAND illuminates.
	8	If the motor rotates in the opposite direction during test run, switch two of the motor cables (U/T1, V/T2, W/T3).
	9	Set *E2-01 [Motor Rated Current (FLA)]* and *L1-01 [Motor Overload (oL1) Protection]* correctly for motor thermal protection.
	10	To supply the Run command and frequency reference from REMOTE source, make sure that the drive is in OFF Mode in HOME screen.
	11	When terminal A1 is used for the frequency reference: • Voltage input – Set Jumper switch S1 on the drive to “V”. – Set *H3-01 = 0 [Terminal A1 Signal Level Select = 0 to 10V (Lower Limit at 0)]*. – Set *H3-02 = 0 [Terminal A1 Function Selection = Frequency Reference]*. • Current input – Set Jumper switch S1 on the drive to “I”. – Set *H3-01 = 2, 3 [Terminal A1 Signal Level Select = 4 to 20 mA, 0 to 20 mA]*. – Set *H3-02 = 0 [Terminal A1 Function Selection = Frequency Reference]*.

Checked	No.	Description
	12	When terminal A2 is used for the frequency reference: • Voltage input – Set Jumper switch S1 on the drive to “V”. – Set *H3-09 = 0 [Terminal A2 Signal Level Select = 0 to 10V (Lower Limit at 0)]*. – Set *H3-10 = 0 [Terminal A2 Function Selection = Frequency Reference]*. • Current input – Set Jumper switch S1 on the drive to “I”. – Set *H3-09 = 2, 3 [Terminal A2 Signal Level Select = 4 to 20 mA, 0 to 20 mA]*. – Set *H3-10 = 0 [Terminal A2 Function Selection = Frequency Reference]*.
	13	Make sure that the frequency reference reaches the necessary minimum and maximum values. → If drive operation is incorrect, make these adjustments: Gain adjustment: Set the maximum voltage and current values, then adjust the analog input gain until the frequency reference reaches the necessary value. (For terminal A1 input: *H3-03*, for terminal A2 input: *H3-11*) Bias adjustment: Set the maximum voltage/current values, then adjust the analog input bias until the frequency reference reaches the necessary minimum value. (For terminal A1 input: *H3-04*, for terminal A2 input: *H3-12*)

6

Specifications

6.1 Section Safety

⚠DANGER

Do not ignore the safety messages in this manual.

If you ignore the safety messages in this manual, it will cause serious injury or death. The manufacturer is not responsible for injuries or damage to equipment.

6.2 Model Specifications (208 V Class)

Table 6.1 Rating (208 V Class)

Model			2011	2017	2024	2031	2046	2059	2075	2088	2114
Maximum Applicable Motor Output (kW) *1			2.2	3.7	5.5	7.5	11	15	18.5	22	30
Maximum Applicable Motor Output (HP) *2			3	5	7.5	10	15	20	25	30	40
Input	Rated Input Current (A)	AC	8.8	14	20	27	40	54	66	78	106
		DC	10.0	17.0	25	34	49	66	80	95	129
Output	Rated Output Current (A)		10.6	16.7	24.2	30.8	46.2	59.4	74.8	88	114
Power Supply	Input Power (kVA)		3.7	5.8	8	11	17	22	27	33	44

*1 The maximum applicable motor output is based on 4-pole, general-purpose 220 V motor ratings. The rated output current of the drive output amps must be equal to or more than the motor rated current.

*2 The maximum applicable motor output complies with 208 V motor ratings as specified in NEC Table 430.250. The rated output current of the drive output amps must be equal to or more than the motor rated current.

Table 6.2 Rating (208 V Class)

Model			2143	2169	2211	2273
Maximum Applicable Motor Output (kW) *1			37	45	55	75
Maximum Applicable Motor Output (HP) *2			50	60	75	100
Input	Rated Input Current (A)	AC	130	157	191	258
		DC	159	191	233	315
Output	Rated Output Current (A)		143	169	211	273
Power Supply	Input Power (kVA)		54	65	79	107

*1 The maximum applicable motor output is based on 4-pole, general-purpose 220 V motor ratings. The rated output current of the drive output amps must be equal to or more than the motor rated current.

*2 The maximum applicable motor output complies with 208 V motor ratings as specified in NEC Table 430.250. The rated output current of the drive output amps must be equal to or more than the motor rated current.

6.3 Model Specifications (480 V Class)

Table 6.3 Rating (480 V Class)

Model			4005	4008	4011	4014	4021	4027
Maximum Applicable Motor Output (kW) at 400 V Output *1			1.5	3	4	5.5	7.5	11
Maximum Applicable Motor Output (HP) at 460 V Output *2			3	5	7.5	10	15	20
Input	Rated Input Current (A) at 400 V Input	AC	4.1	7.1	8.9	11.9	17.5	23.4
		DC	5.0	8.7	11.0	15.0	21	29
	Rated Input Current (A) at 460 V Input	AC	3.8	6.2	9	12.1	17.4	23.5
		DC	4.7	7.6	11.0	14.8	21.3	28.8
Output	Rated Output Current (A)		4.8	7.6	11	14	21	27
Power Supply	Input Power (kVA) at 400 V Input		2.8	4.9	6.2	8.2	12	16
	Input Power (kVA) at 460 V Input		3.2	5.2	7	10	14	20

*1 The motor capacity (kW) refers to a IEC 60947-4-1, Annex G 400 V motor. The rated output current of the drive output amps should be equal to or greater than the motor rated current.

*2 The maximum applicable motor output complies with 460 V motor ratings as specified in NEC Table 430.250. The rated output current of the drive output amps must be equal to or more than the motor rated current.

Table 6.4 Rating (480 V Class)

Model			4034	4040	4052	4065	4077	4096
Maximum Applicable Motor Output (kW) at 400 V Output *1			15	18.5	22	30	37	45
Maximum Applicable Motor Output (HP) at 460 V Output *2			25	30	40	50	60	75
Input	Rated Input Current (A) at 400 V Input	AC	31	38	44	59.6	74.9	89.2
		DC	38	47	54	73	92	109
	Rated Input Current (A) at 460 V Input	AC	28.7	34	45.9	56.3	68.1	82.8
		DC	35.2	41.6	56.2	69.0	83.4	101
Output	Rated Output Current (A)		34	40	52	65	77	96
Power Supply	Input Power (kVA) at 400 V Input		21	26	30	41	52	62
	Input Power (kVA) at 460 V Input		24	28	38	47	57	69

*1 The motor capacity (kW) refers to a IEC 60947-4-1, Annex G 400 V motor. The rated output current of the drive output amps should be equal to or greater than the motor rated current.

*2 The maximum applicable motor output complies with 460 V motor ratings as specified in NEC Table 430.250. The rated output current of the drive output amps must be equal to or more than the motor rated current.

Table 6.5 Rating (480 V Class)

Model			4124	4156	4180	4240	4302
Maximum Applicable Motor Output (kW) at 400 V Output *1			55	75	90	110	160
Maximum Applicable Motor Output (HP) at 460 V Output *2			100	125	150	200	250
Input	Rated Input Current (A) at 400 V Input	AC	103	140	168	205	296
		DC	126	171	206	251	363
	Rated Input Current (A) at 460 V Input	AC	112	134	163	221	289
		DC	137	164	200	271	354
Output	Rated Output Current (A)		124	156	180	240	302
Power Supply	Input Power (kVA) at 400 V Input		71	97	116	142	205
	Input Power (kVA) at 460 V Input		93	111	136	184	240

*1 The motor capacity (kW) refers to a IEC 60947-4-1, Annex G 400 V motor. The rated output current of the drive output amps should be equal to or greater than the motor rated current.

*2 The maximum applicable motor output complies with 460 V motor ratings as specified in NEC Table 430.250. The rated output current of the drive output amps must be equal to or more than the motor rated current.

6.4 Common Drive Specifications

Note:

To get the longest product life, install the drive in an environment that meets the necessary specifications.

Table 6.6 Control Characteristics

Item	Specification
Control Methods	• V/f Control (V/f) • PM Open Loop Vector Control (OLV/PM) • EZ Open Loop Vector Control (EZOLV)
Frequency Control Range	• EZOLV: 0.01 Hz to 120 Hz • V/f and OLV/PM: 0.01 Hz to 400 Hz
Frequency Accuracy (Temperature Fluctuation)	Digital inputs: Within ±0.01% of the maximum output frequency (-10 °C to +40 °C (14 °F to 104 °F)) Analog inputs: Within ±0.1% of the maximum output frequency (25 °C ±10 °C (77 °F ±18 °F))
Frequency Setting Resolution	Digital inputs: 0.01 Hz Analog inputs: 1/2048 of the maximum output frequency (11-bit)
Output Frequency Resolution	0.001 Hz
Frequency Setting Signal	Main speed frequency reference: 0 Vdc to 10 Vdc (20 kΩ), 4 mA to 20 mA (250 Ω), 0 mA to 20 mA (250 Ω)
Starting Torque	• V/f: 140%/3 Hz • OLV/PM: 100%/10% speed • EZOLV: 100%/10% speed
Speed Control Range	• For Induction Motors: – V/f: 1:40 – EZOLV: 1:10 • For Permanent Magnet Motors and Synchronous Reluctance Motors: – OLV/PM: 1:20 – EZOLV: 1:10
Torque Limits	Parameter settings allow different limits in four quadrants in EZOLV control method.
Accel/Decel Time	0.1 s to 6000.0 s The drive can set two pairs of different acceleration and deceleration times.
V/f Characteristics	Select from 15 pre-defined V/f patterns, or a user-set V/f pattern.
Main Control Functions	Restart After Momentary Power Loss, Speed Search, Overtorque/Undertorque Detection, Torque Limit, 8 Step Speed (max.), Accel/Decel Switch, S-curve Acceleration/Deceleration, 3-wire Sequence, Auto-Tuning (Rotational and Stationary), Cooling Fan ON/OFF Switch, Slip Compensation, Torque Compensation, Jump Frequency, Upper/Lower Limits for Frequency Reference, DC Injection Braking at Start and Stop, Overexcitation Braking, High Slip Braking, PID Control (with Sleep Function), Energy Saving Control, APOGEE FLN Communication (RS-485 4.8 kbps), BACnet Communication (RS-485 max. 76.8 kbps), MEMOBUS/Modbus Communication (RS-485 max. 115.2 kbps), Metasys N2 Communication (RS-485 9.6 kbps), Auto Restart, Application Presets, DriveWorksEZ (customized functions), KEB, Overexcitation Deceleration, Overvoltage Suppression

Table 6.7 Protection Functions

Item	Specification
Motor Protection	Electronic thermal overload protection
Momentary Overcurrent Protection	Drive stops when the output current is more than 175% of the drive rated output current.
Overload Protection	Drive stops when the output current is more than these overload tolerances: • 110% of the rated output current for 60 seconds • 140% of the rated output current for 2.5 seconds when the drive output frequency is 3 Hz The permitted frequency of overload is one time each 10 minutes. **Note:** If output frequency < 6 Hz, the drive can trigger the overload protection function when the output current is in the overload tolerance range.
Overvoltage Protection	208 V class: Stops when the DC bus voltage is more than approximately 410 V 480 V class: Stops when the DC bus voltage is more than approximately 820 V
Undervoltage Protection	208 V class: Stops when the DC bus voltage decreases to less than approximately 190 V 480 V class: • Stops when the DC bus voltage decreases to less than approximately 350 V when you use an input voltage less than 400 V • Stops when the DC bus voltage decreases to less than approximately 380 V when you use an input voltage less than 460 V • Stops when the DC bus voltage decreases to less than approximately 440 V when you use an input voltage of 460 V or more

Item	Specification
Momentary Power Loss Ride-thru	Immediately stops when power loss is 15 ms or longer. Continues operation if power loss is shorter than 2 s (depending on parameter settings). **Note:** Stop time may be shortened depending on the load and motor speed.
Heatsink Overheat Protection	The drive stops when the thermistor detects an IGBT temperature more than approximately 100 °C (212 °F). The trip temperature level is different for different drive models.
Stall Prevention	Stall prevention is available during acceleration, deceleration, and during run.
Ground Fault Protection	Electronic circuit protection **Note:** This protection detects ground faults during run. The drive will not provide protection when: • There is a low-resistance ground fault for the motor cable or terminal block • Energizing the drive when there is a ground fault.
DC Bus Charge LED	Charge LED illuminates when DC bus voltage is more than 50 V.

Table 6.8 Environment

Item	Specification
Area of Use	Indoors
Power Supply	Overvoltage Category III
Ambient Temperature Setting	IP20/UL Type 1 and IP55/UL Type 12: -10 °C to +40 °C (14 °F to 104 °F) IP20/UL Open Type: -10°C to +50 °C (14 °F to 122 °F) • When you install the drive in an enclosure, use a cooling fan or air conditioner to keep the internal air temperature in the permitted range. • Do not let the drive freeze. • You can use IP20/UL Open Type and IP20/UL Type 1 drives at a maximum of 60 °C (140 °F) when you derate the output current. • You can use IP55/UL Type 12 drives at a maximum of 50 °C (122 °F) when you derate the output current.
Humidity	95% RH or less Do not let condensation form on the drive.
Storage Temperature	-20 °C to +70 °C (-40 °F to +158 °F) (short-term temperature during transportation)
Surrounding Area	Pollution degree 2 or less Install the drive in an area without: • Oil mist, corrosive or flammable gas, or dust • Metal powder, oil, water, or other unwanted materials • Radioactive materials or flammable materials, including wood • Harmful gas or fluids • Salt • Direct sunlight
Altitude	1000 m (3281 ft) maximum **Note:** Derate the output current by 1% for each 100 m (328 ft) to install the drive in altitudes between 1000 m to 4000 m (3281 ft to 13123 ft). It is not necessary to derate the rated voltage in these conditions: • When you install the drive at 2000 m (6562 ft) or lower • When you install the drive between 2000 m to 4000 m (6562 ft to 13123 ft) and ground the neutral point on the power supply.
Vibration	• 10 Hz to 20 Hz: 1 G (9.8 m/s^2, 32.15 ft/s^2) • 20 Hz to 55 Hz: 2011 to 2031, 4005 to 4034: 0.6 G (5.9 m/s^2, 19.36 ft/s^2) 2046 to 2273, 4040 to 4302: 0.2 G (1.96 m/s^2, 6.43 ft/s^2)
Installation Orientation	Install the drive vertically for sufficient airflow to cool the drive.

Table 6.9 Certifications and Standard Compliance

Item	Specification
c-UL-us	UL 508C
CE Low Voltage Directive 2014/35/EU	• EN 61800-5-1:2007 • IEC 61800-5-1:2007
CE EMC Directive 2014/30/EU	EN 61800-3:2004/A1:2012 First environment restricted distribution

Item	Specification
CE Machinery Directive 2006/42/EC	• EN 61800-5-2:2007 (SIL3) • IEC 61800-5-2:2007 (SIL3) • EN 62061:2005/A2:2015 (SIL CL3) • IEC62061:2005+AMD1:2012+AMD2:2015 CSV (SIL CL3) • EN ISO 13849-1:2015 (PL e (Cat.lll))
TUV SUD	• Functional Safety – IEC 61800-5-2:2016 (SIL3) – EN 61800-5-2:2017 (SIL3) – EN 61508:2010 (SIL3) – IEC 61508:2010 (SIL3) – EN 62061:2005/A1:2013 (SIL CL3) – IEC 62061:2005+AMD1:2012+AMD2:2015 CSV (SIL CL3) • Machinery Safety – EN ISO 13849-1:2015 (Cat.lll, PL e) – ISO 13849-1:2015 (Cat.lll, PL e) • EMC – EN 61000-6-7:2015 – EN 61326-3-1:2008 – EN 61326-3-1:2017 – EN 61800-3:2004+A1:2012 – EN 61800-5-2:2017 • LVD – EN 61800-5-1:2007 – IEC 61800-5-1:2007
RoHS Directive 2011/65/EU	-
WEEE Directive 2012/19/EU	-

Table 6.10 Enclosure Ratings

Item	Specification
Protection Design	IP20/UL Open Type IP20/UL Type 1 IP55/UL Type 12 **Note:** Install a UL Type 1 kit on an IP20/UL Open Type drive to convert the drive to an IP20/UL Type 1.

6.5 Drive Watt Loss

◆ 208 V Class

Table 6.11 Drive Watt Loss (NEMA Rating)

Model	Rated Output Current A	Carrier Frequency kHz	Interior Unit Loss W	Cooling Fin Loss W	Total Loss W
2011	10.6	5.0	45	86	131
2017	16.7	5.0	56	140	196
2024	24.2	5.0	75	184	259
2031	30.8	5.0	89	244	333
2046	46.2	5.0	116	314	430
2059	59.4	5.0	148	418	566
2075	74.8	5.0	175	538	713
2088	88	5.0	201	615	816
2114	114	5.0	246	780	1026
2143	143	5.0	244	937	1180
2169	169	5.0	279	1132	1411
2211	211	5.0	331	1321	1651
2273	273	5.0	423	1821	2244

◆ 480 V Class

Table 6.12 Drive Watt Loss (NEMA Rating)

Model	Rated Output Current A	Carrier Frequency kHz	Interior Unit Loss W	Cooling Fin Loss W	Total Loss W
4005	4.8	5.0	36	39	75
4008	7.6	5.0	45	63	108
4011	11	5.0	56	142	198
4014	14	5.0	66	196	262
4021	21	5.0	89	212	301
4027	27	5.0	112	285	397
4034	34	5.0	128	327	455
4040	40	5.0	145	373	518
4052	52	5.0	178	470	648
4065	65	5.0	224	600	824
4077	77	5.0	271	819	1090
4096	96	5.0	323	973	1295
4124	124	5.0	423	1294	1717
4156	156	5.0	332	1448	1780
4180	180	5.0	395	1707	2102
4240	240	4.0	406	1810	2216
4302	302	4.0	866	2847	3712

6.6 Drive Derating

You must derate the drive capacity to operate the drive above the rated temperature, altitude, and default carrier frequency.

◆ Carrier Frequency Settings and Rated Current Values

Table 6.13 and Table 6.14 show how the drive rated output current changes when the *C6-02 [Carrier Frequency Selection]* value changes. The output current value changes linearly as the carrier frequency changes. You can use the values from the tables to calculate a frequency that is not shown.

Note:

The drive will apply derating for the rated output current value based on the carrier frequency only to the reference output current value of the *oL2 [Drive Overload]*. The derated value for the 100% rated output current in parameters and monitors will not be the same as the rated output current value shown in *Model Specifications (208 V Class) on page 345* and *Model Specifications (480 V Class) on page 346*.

■ 208 V Class

Table 6.13 Carrier Frequency and Rated Current Derating

Model	Rated Current (A)				
	2 kHz	5 kHz	8 kHz	10 kHz	12.5 kHz
2011	10.6	10.6	8.9	7.8	6.4
2017	16.7	16.7	14.0	12.2	10.0
2024	24.2	24.2	20.3	17.7	14.5
2031	30.8	30.8	25.9	22.6	18.5
2046	46.2	46.2	38.8	33.9	27.7
2059	59.4	59.4	49.9	43.6	35.6
2075	74.8	74.8	62.8	54.9	44.9
2088	88.0	88.0	73.9	64.5	52.8
2114	114	114	95.8	83.6	68.4
2143	143	143	114.4	95.3	-
2169	169	169	135.2	112.7	-
2211	211	211	168.8	140.7	-
2273	273	273	218.4	182	-

■ 480 V Class

Table 6.14 Carrier Frequency and Rated Current Derating

Model	Rated Current (A)				
	2 kHz	5 kHz	8 kHz	10 kHz	12.5 kHz
4005	4.8	4.8	4.0	3.5	2.9
4008	7.6	7.6	6.4	5.6	4.6
4011	11.0	11.0	9.2	8.1	6.6
4014	14.0	14.0	11.8	10.3	8.4
4021	21.0	21.0	17.6	15.4	12.6
4027	27.0	27.0	22.7	19.8	16.2
4034	34.0	34.0	28.6	24.9	20.4
4040	40.0	40.0	33.6	29.3	24.0
4052	52.0	52.0	43.7	38.1	31.2
4065	65.0	65.0	54.6	47.7	39.0

Model	Rated Current (A)				
	2 kHz	5 kHz	8 kHz	10 kHz	12.5 kHz
4077	77.0	77.0	64.7	56.5	46.2
4096	96.0	96.0	80.6	70.4	57.6
4124	124	124	99.2	82.7	-
4156	156	156	124.8	104	-
4180	180	180	144	120	-
4240	240	224	176	144	-
4302	302	281.9	221.5	181.2	-

◆ Derating Depending on Ambient Temperature

When you install drives in a place where ambient temperatures are higher than the rated conditions or install drives side-by-side in the enclosure panel, set *L8-12 [Ambient Temperature]* and *L8-35 [Installation Method Selection]*. Derate the output current as specified in Figure 6.1 to Figure 6.4.

No. (Hex.)	Name	Description	Default (Range)
L8-12 (04B8)	Ambient Temperature Setting	Sets the ambient temperature of the drive installation area.	40 °C (Determined by L8-35)

No. (Hex.)	Name	Description	Default (Range)
L8-35 (04EC)	Installation Method Selection	Sets the type of drive installation.	Determined by the drive (0 - 3)

Note:

The drive will detect an *oPE02 [Parameter Range Setting Error]* in these conditions:
- If you set *L8-12 = 60 °C* and *L8-35 = 1 or 3* for models 2011 to 2114 and 4005 to 4124
- If you set *L8-35 = 1 or 3* for models 2143 to 2273 and 4156 to 4302

0 : IP20/UL Open Type

Use this setting to install an IP20/UL Open Type drive. The applicable output current to operate the drive changes when the ambient temperature changes:

- -10 °C to +50 °C (14 °F to 122 °F): You can operate the drive with 100% output current without derating.
- 50 °C to 60 °C (122 °F to 140 °F): Derate the output current from 100% to 80%.

Make sure that there is 60 mm (2.4 in) minimum of space between drives or between the drive and side of the enclosure panel.

1 : Side-by-Side Mounting

Use this setting to install more than one drive Side-by-Side. The applicable output current to operate the drive changes when the ambient temperature changes:

- -10 °C to +40 °C (14 °F to 104 °F): You can operate the drive with 100% output current without derating.
- 40 °C to 50 °C (104 °F to 122 °F): Derate the output current from 100% to 80%.

Make sure that there is 2 mm (0.08 in) minimum of space between drives.

2 : IP20/UL Type 1

Use this setting to install an IP20/UL Type 1 drive. The applicable output current to operate the drive changes when the drive model and ambient temperature change:

- For the drive models 4005 and 4008
  - -10 °C to +40 °C (14 °F to 104 °F): You can operate the drive with 100% output current without derating.
  - 40 °C to 60 °C (104 °F to 140 °F): Derate the output current from 100% to 80%.
- For the drive models 4011 to 4027

– -10 °C to +50 °C (14 °F to 122 °F): You can operate the drive with 100% output current without derating.
– 50 °C to 60 °C (122 °F to 140 °F): Derate the output current from 100% to 80%.

- For the drive models 4034 to 4065
  – -10 °C to +45 °C (14 °F to 113 °F): You can operate the drive with 100% output current without derating.
  – 45 °C to 50 °C (113 °F to 122 °F): Derate the output current from 100% to 90%.
  – 50 °C to 60 °C (122 °F to 140 °F): Derate the output current from 90% to 70%.
- For the drive models 2011 to 2273 and 4077 to 4302
  – -10 °C to +40 °C (14 °F to 104 °F): You can operate the drive with 100% output current without derating.
  – 40 °C to 60 °C (104 °F to 140 °F): Derate the output current from 100% to 60%.

3 : IP55/UL Type 12

Use this setting to install an IP55/UL Type 12 drive. The applicable output current to operate the drive changes when the ambient temperature changes:

- -10 °C to +40 °C (14 °F to 104 °F): You can operate the drive with 100% output current without derating.
- 40 °C to 50 °C (104 °F to 122 °F): Derate the output current from 100% to 80%.

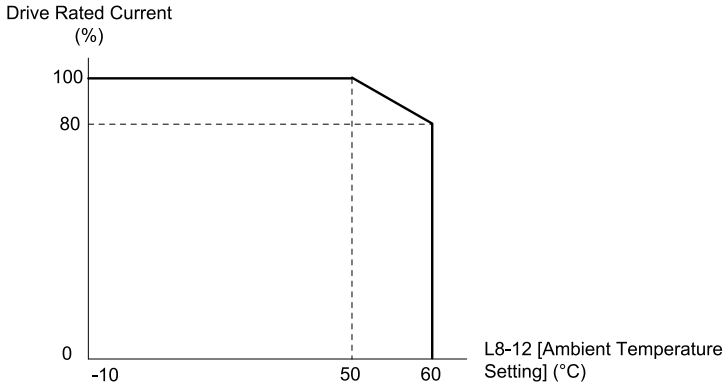


Figure 6.1 Derating for IP20/UL Open Type (L8-35 = 0)

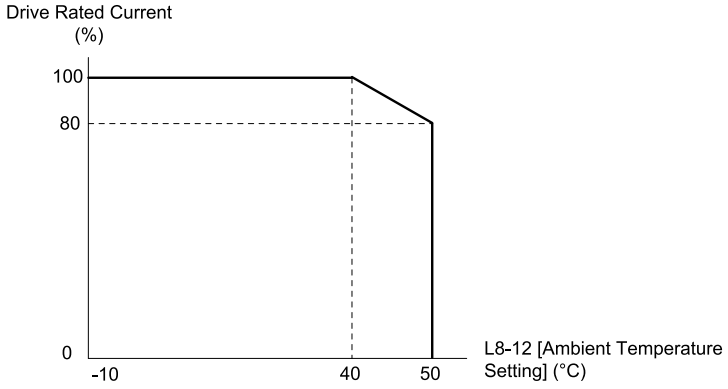
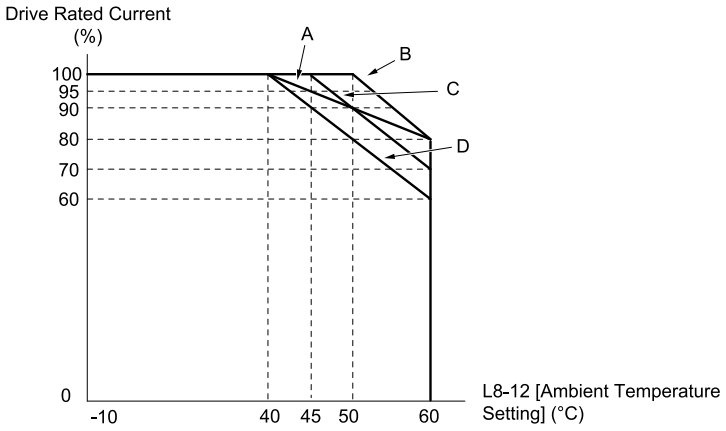


Figure 6.2 Derating for Side-by-Side Mounting (L8-35 = 1)



A - Drive Models: 4005 and 4008
B - Drive Models: 4011 to 4027
C - Drive Models: 4034 to 4065
D - Drive Models: 2011 to 2273 and 4077 to 4302

Figure 6.3 Derating for IP20/UL Type 1 (L8-35 = 2)

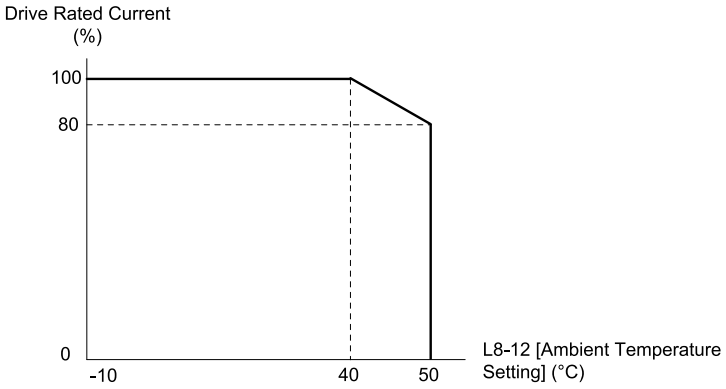


Figure 6.4 Derating for IP55/UL Type 12 (L8-35 = 3)

◆ Altitude Derating

Install the drive in a location that has an altitude of 1000 m (3281 ft) or lower.

Derate the output current by 1% for each 100 m (328 ft) to install the drive in altitudes between 1000 to 4000 m (3281 to 13123 ft).

It is not necessary to derate the rated voltage in these conditions:

- Installing the drive at 2000 m (6562 ft) or lower
- Installing the drive between 2000 to 4000 m (6562 to 13123 ft) and grounding the neutral point on the power supply.
  If you do not ground the drive with a neutral network, contact Yaskawa or your nearest sales representative.

6.7 Drive Exterior and Mounting Dimensions

◆ Drive Models and Exterior/Mounting Dimensions

Table 6.15 Three-Phase 208 V Class

Model	Reference Page		
	IP20/UL Open Type	IP20/UL Type 1	IP55/UL Type 12
2011, 2017	-	359	365
2024, 2031	-	360	366
2046, 2059	-	361	367
2075 - 2114	-	362	368
2143, 2169	-	363	-
2211, 2273	356	-	-

Table 6.16 Three-Phase 480 V Class

Model	Reference Page		
	IP20/UL Open Type	IP20/UL Type 1	IP55/UL Type 12
4005, 4008	-	358	364
4011, 4014	-	359	365
4021 - 4034	-	360	366
4040 - 4065	-	361	367
4077 - 4124	-	362	368
4156	-	363	-
4180, 4240	356	-	-
4302	357	-	-

◆ IP20/UL Open Type

■ Drive Models: 2211, 2273, 4180, 4240

Note:

When you use non-metric hardware to install the drive, use Type B narrow washers or equivalent and make sure that the size of the screw head and washer are applicable for your drive before installation.

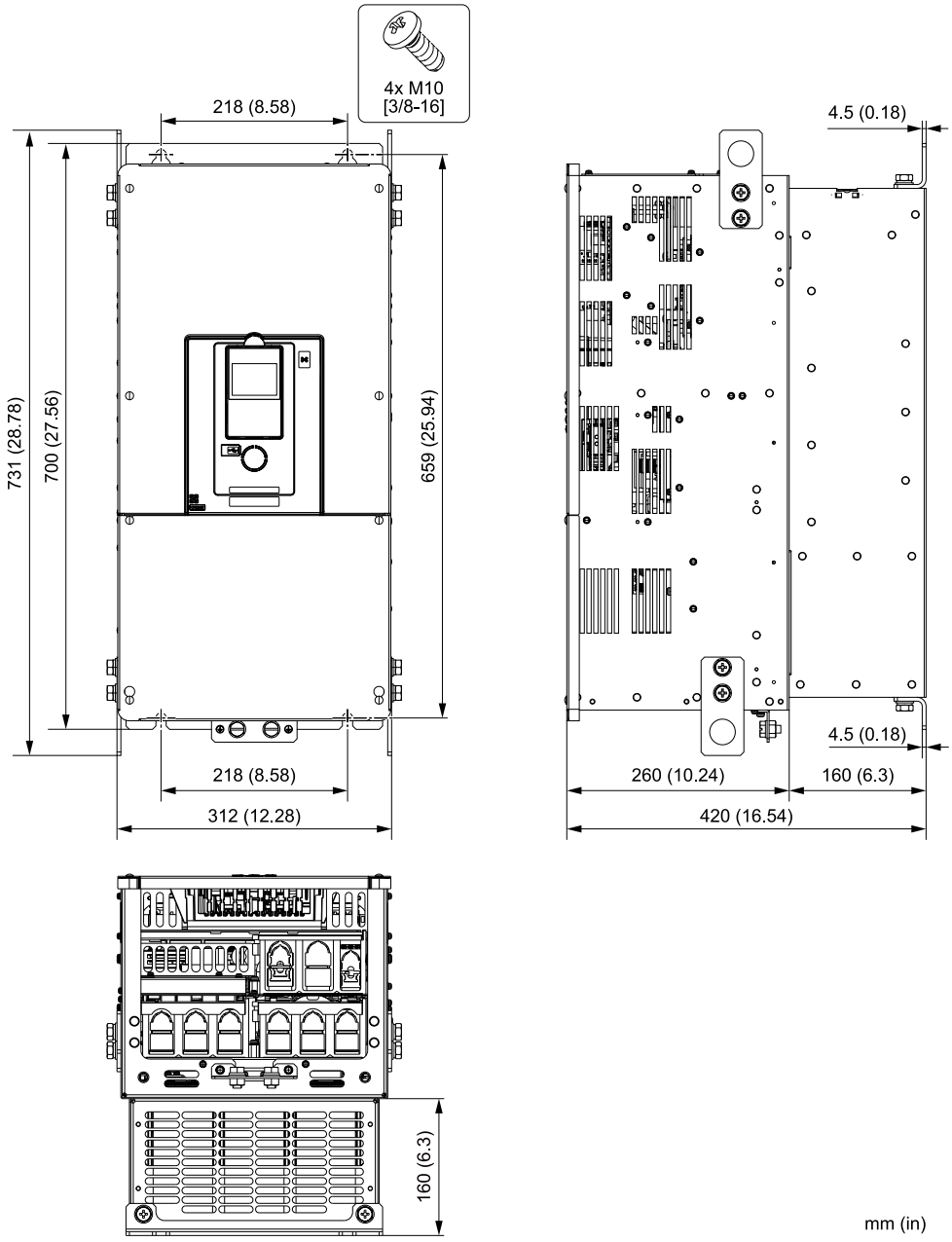


Figure 6.5 Exterior and Mounting Dimensions Diagram 1

Estimated Weight kg (lb)			
2211	**2273**	**4180**	**4240**
78 (172.0)	82 (180.8)	79 (174.2)	82 (180.8)

■ Drive Models: 4302

Note:

When you use non-metric hardware to install the drive, use Type B narrow washers or equivalent and make sure that the size of the screw head and washer are applicable for your drive before installation.

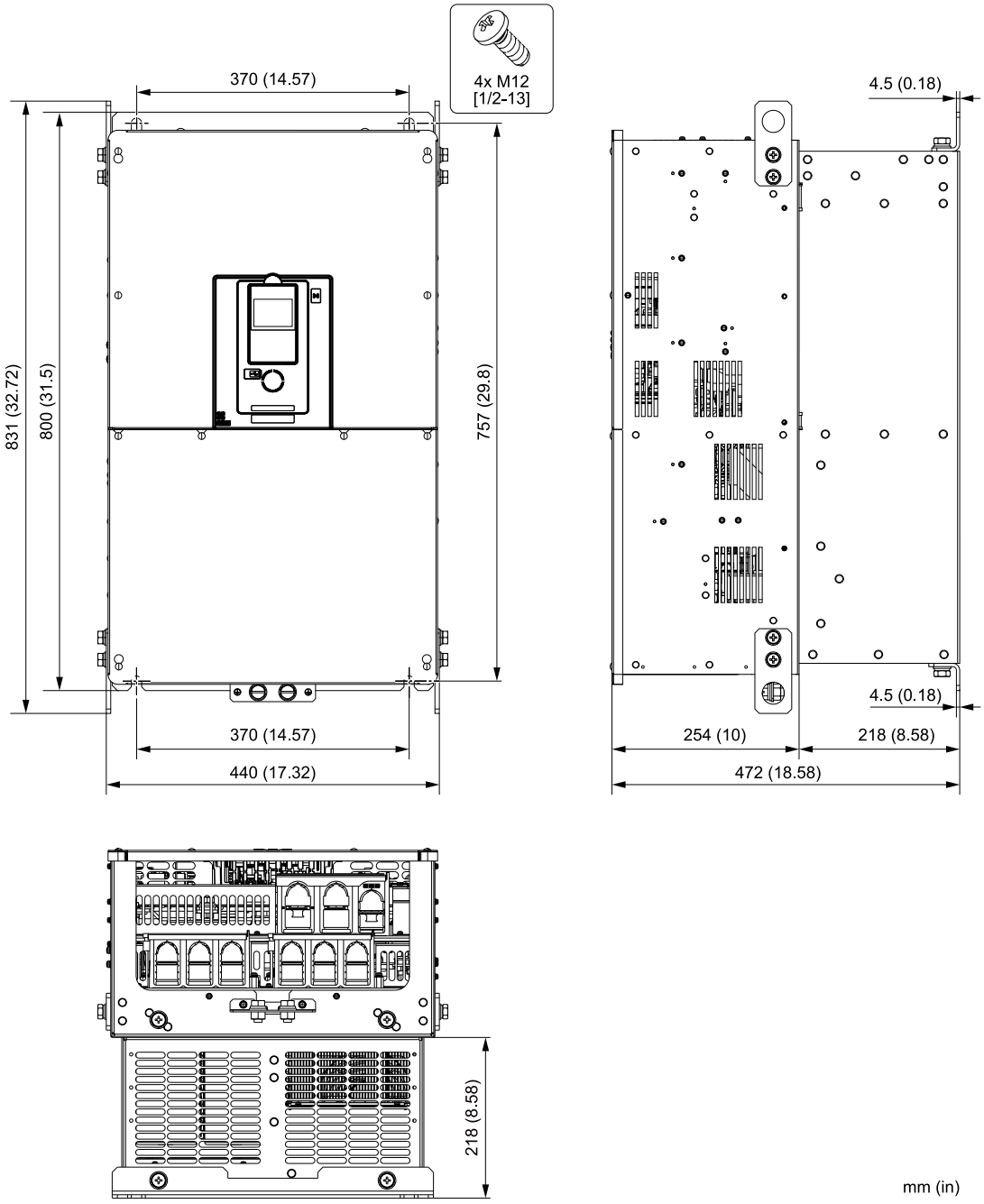


Figure 6.6 Exterior and Mounting Dimensions Diagram 2

Estimated Weight kg (lb)
4302
125 (275.6)

◆ IP20/UL Type1

■ Drive Models: 4005, 4008

Note:

When you use non-metric hardware to install the drive, use Type B narrow washers or equivalent and make sure that the size of the screw head and washer are applicable for your drive before installation.

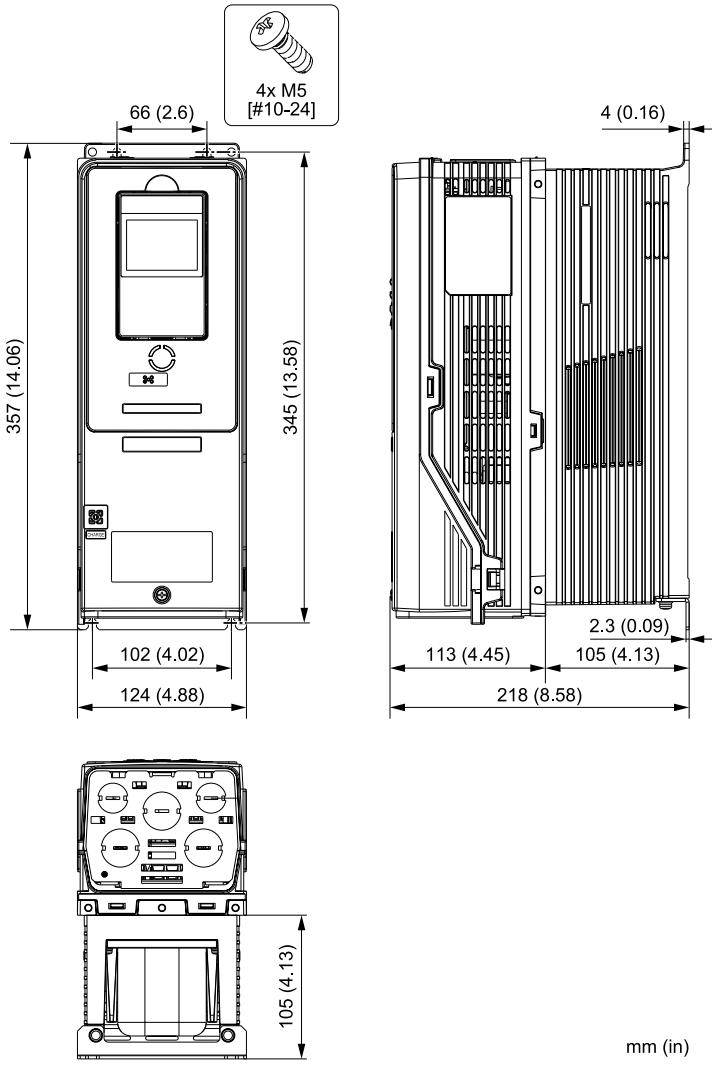


Figure 6.7 Exterior and Mounting Dimensions Diagram 1

Estimated Weight kg (lb)	
4005	**4008**
7.0 (15.4)	7.5 (16.5)

■ Drive Models: 2011, 2017, 4011, 4014

Note:

When you use non-metric hardware to install the drive, use Type B narrow washers or equivalent and make sure that the size of the screw head and washer are applicable for your drive before installation.

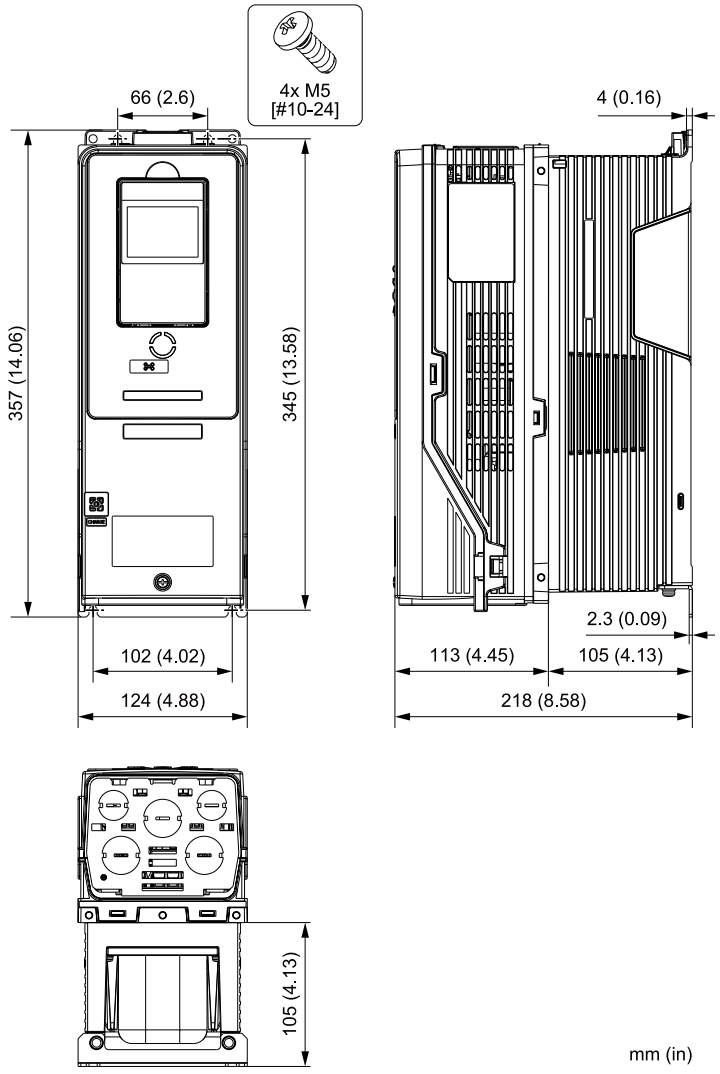


Figure 6.8 Exterior and Mounting Dimensions Diagram 2

Estimated Weight kg (lb)			
2011	**2017**	**4011**	**4014**
6.5 (14.3)	6.5 (14.3)	7.0 (15.4)	7.0 (15.4)

■ Drive Models: 2024, 2031, 4021 to 4034

Note:

When you use non-metric hardware to install the drive, use Type B narrow washers or equivalent and make sure that the size of the screw head and washer are applicable for your drive before installation.

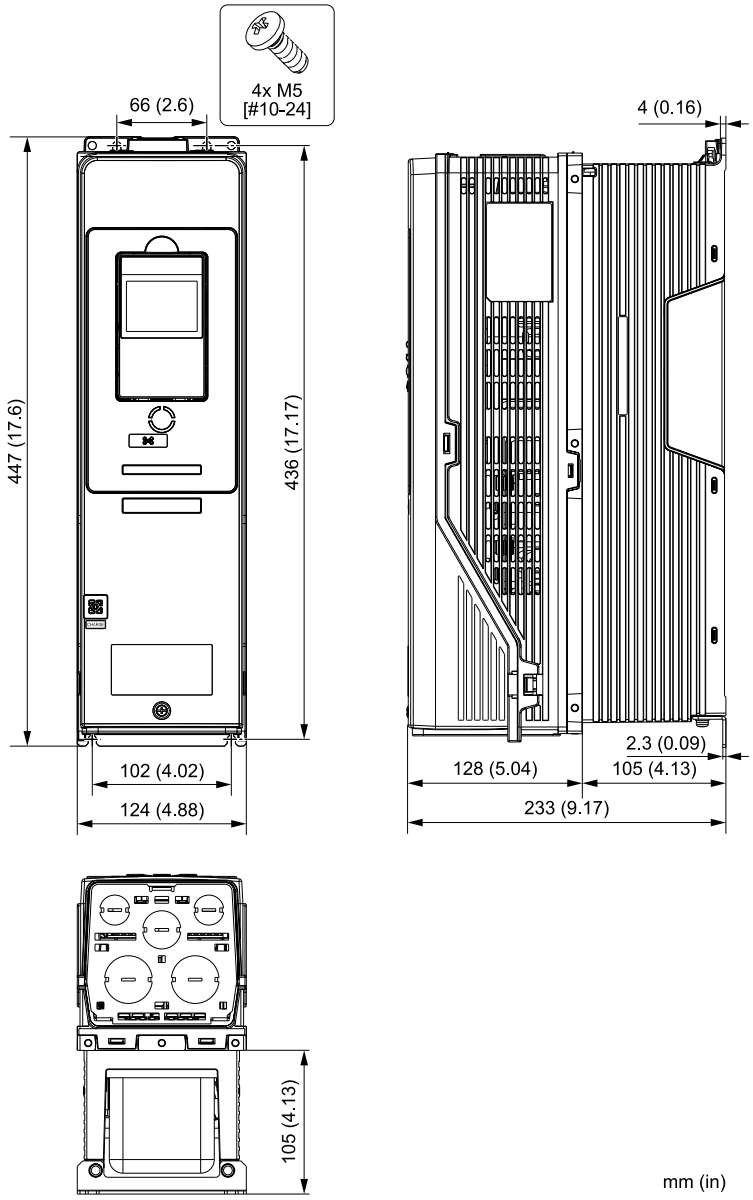


Figure 6.9 Exterior and Mounting Dimensions Diagram 3

Estimated Weight kg (lb)				
2024	**2031**	**4021**	**4027**	**4034**
8.5 (18.7)	9.0 (19.8)	9.0 (19.8)	10 (22.0)	11 (24.3)

■ Drive Models: 2046, 2059, 4040 to 4065

Note:

When you use non-metric hardware to install the drive, use Type B narrow washers or equivalent and make sure that the size of the screw head and washer are applicable for your drive before installation.

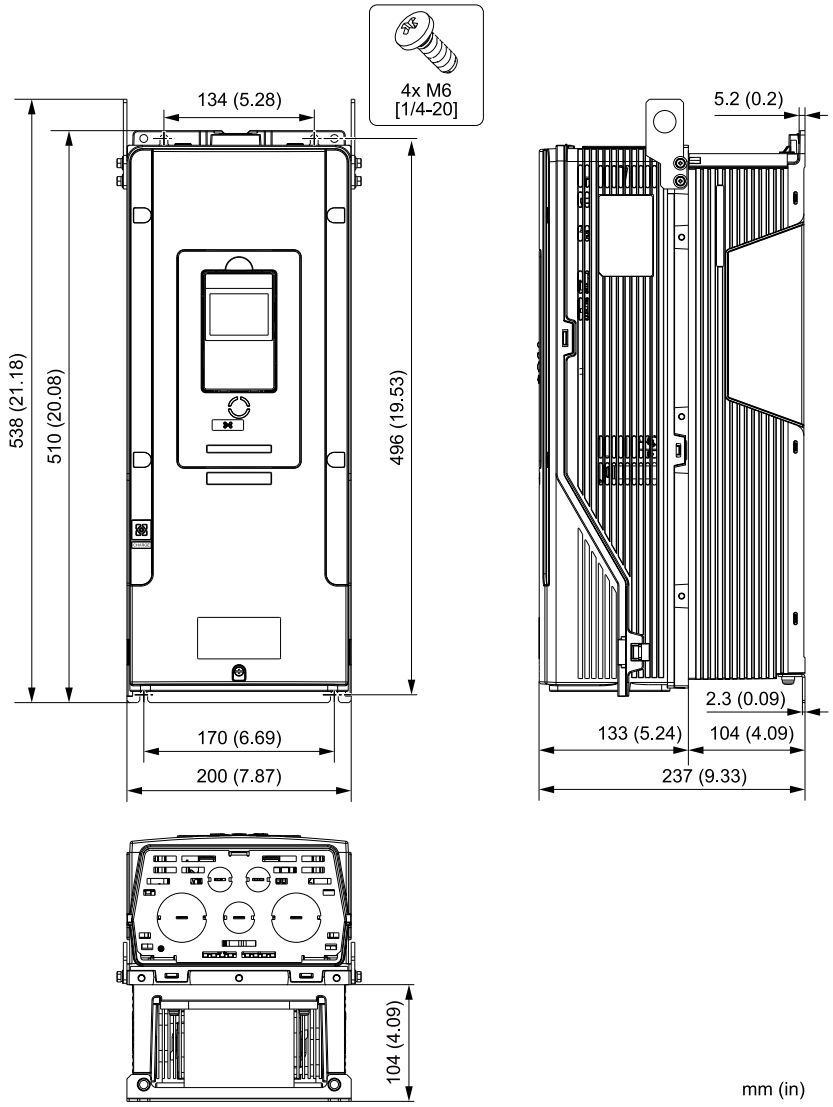


Figure 6.10 Exterior and Mounting Dimensions Diagram 4

Estimated Weight kg (lb)				
2046	**2059**	**4040**	**4052**	**4065**
15 (33.1)	16 (35.3)	16 (35.3)	18 (39.7)	20 (44.1)

■ Drive Models: 2075 to 2114, 4077 to 4124

Note:

When you use non-metric hardware to install the drive, use Type B narrow washers or equivalent and make sure that the size of the screw head and washer are applicable for your drive before installation.

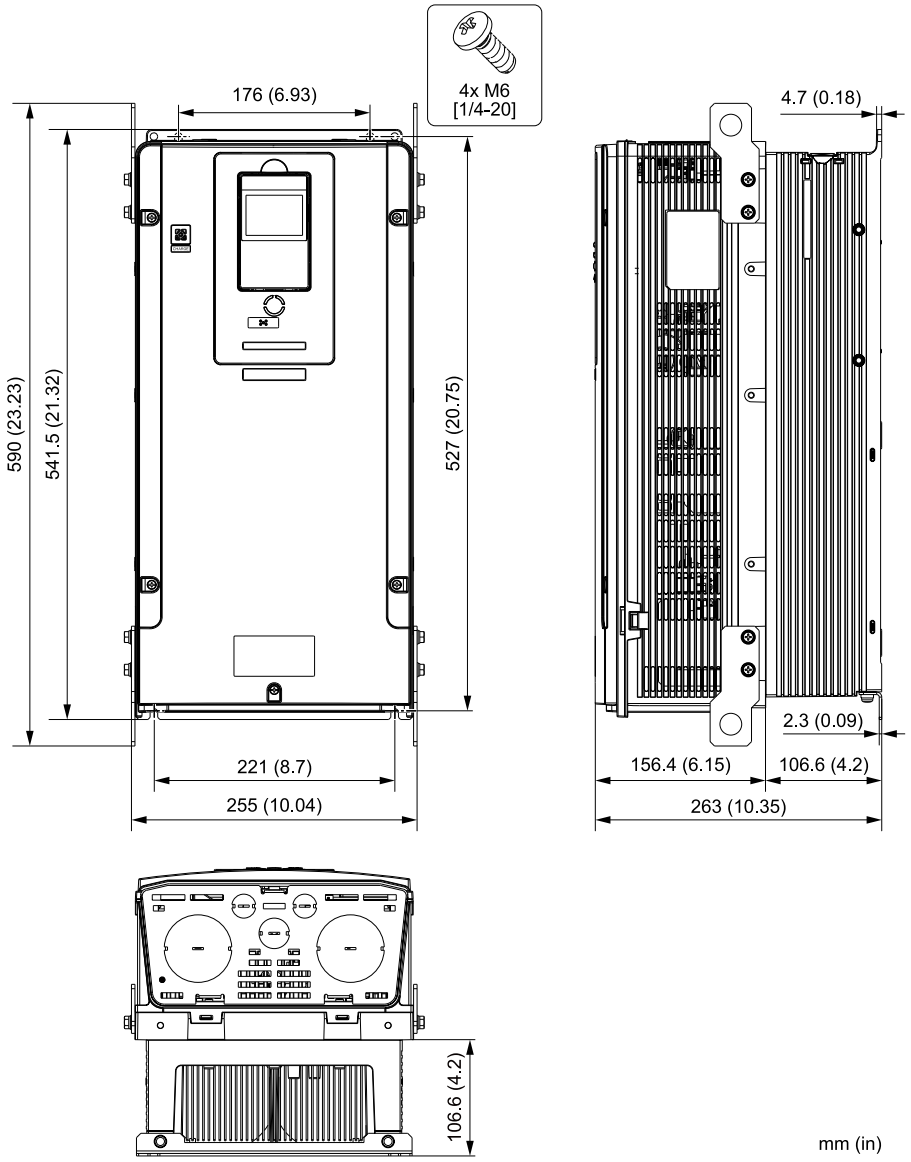


Figure 6.11 Exterior and Mounting Dimensions Diagram 5

Estimated Weight kg (lb)					
2075	**2088**	**2114**	**4077**	**4096**	**4124**
25 (55.1)	25 (55.1)	28 (61.7)	28 (61.7)	30 (66.1)	33 (72.8)

■ Drive Models: 2143, 2169, 4156

Note:

When you use non-metric hardware to install the drive, use Type B narrow washers or equivalent and make sure that the size of the screw head and washer are applicable for your drive before installation.

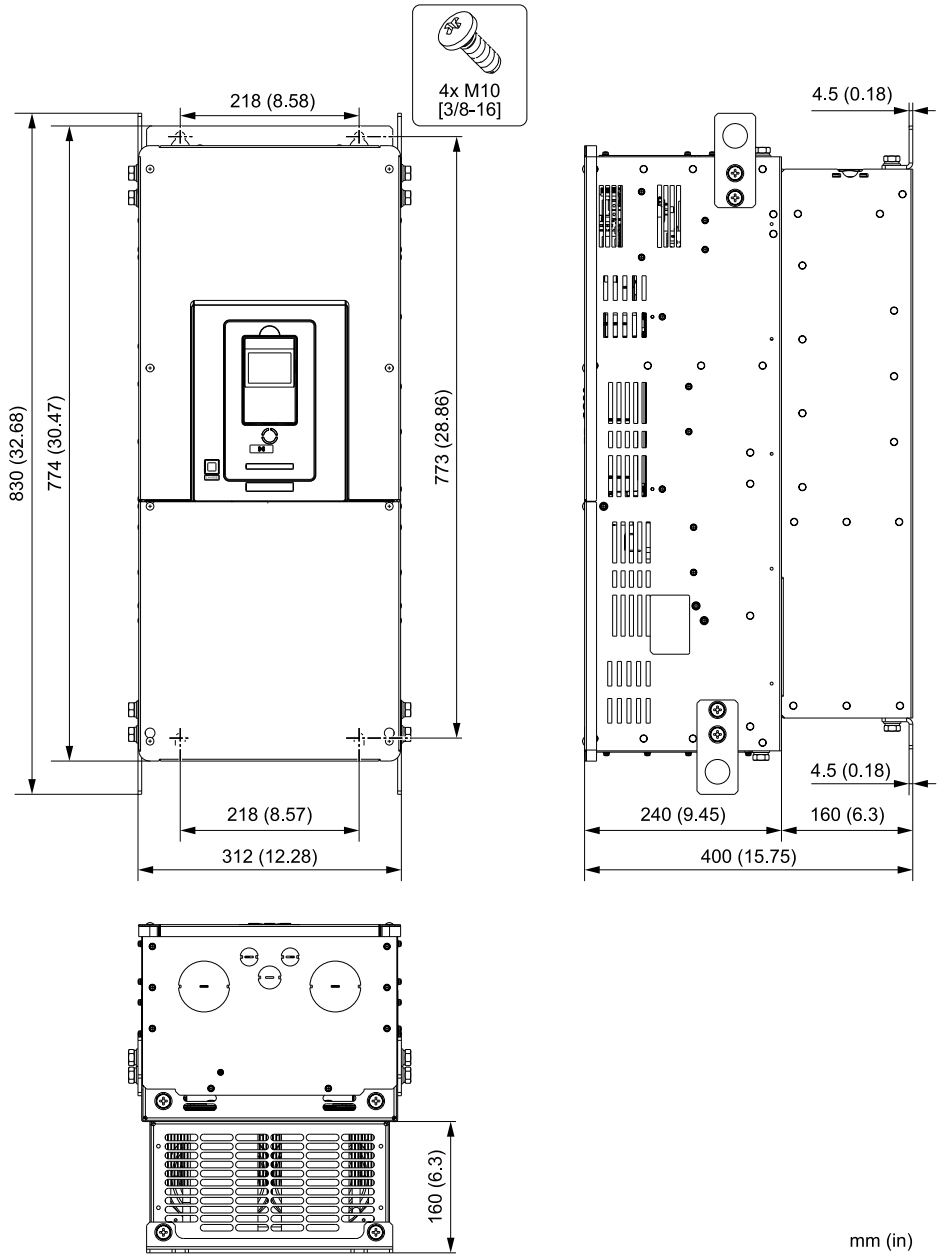


Figure 6.12 Exterior and Mounting Dimensions Diagram 6

Estimated Weight kg (lb)		
2143	**2169**	**4156**
74 (163.1)	76 (167.6)	78 (172.0)

◆ IP55/UL Type 12

■ Drive Models: 4005, 4008

Note:

When you use non-metric hardware to install the drive, use Type B narrow washers or equivalent and make sure that the size of the screw head and washer are applicable for your drive before installation.

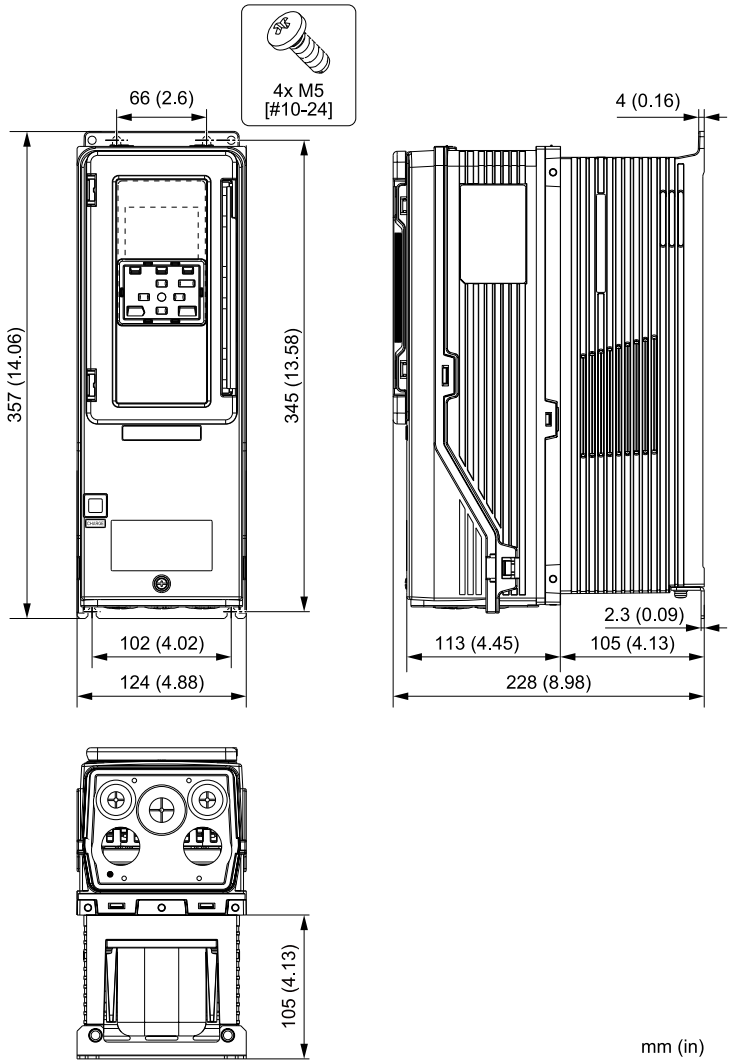


Figure 6.13 Exterior and Mounting Dimensions Diagram 1

Estimated Weight kg (lb)	
4005	**4008**
7.0 (15.4)	7.5 (16.5)

■ Drive Models: 2011, 2017, 4011, 4014

Note:

When you use non-metric hardware to install the drive, use Type B narrow washers or equivalent and make sure that the size of the screw head and washer are applicable for your drive before installation.

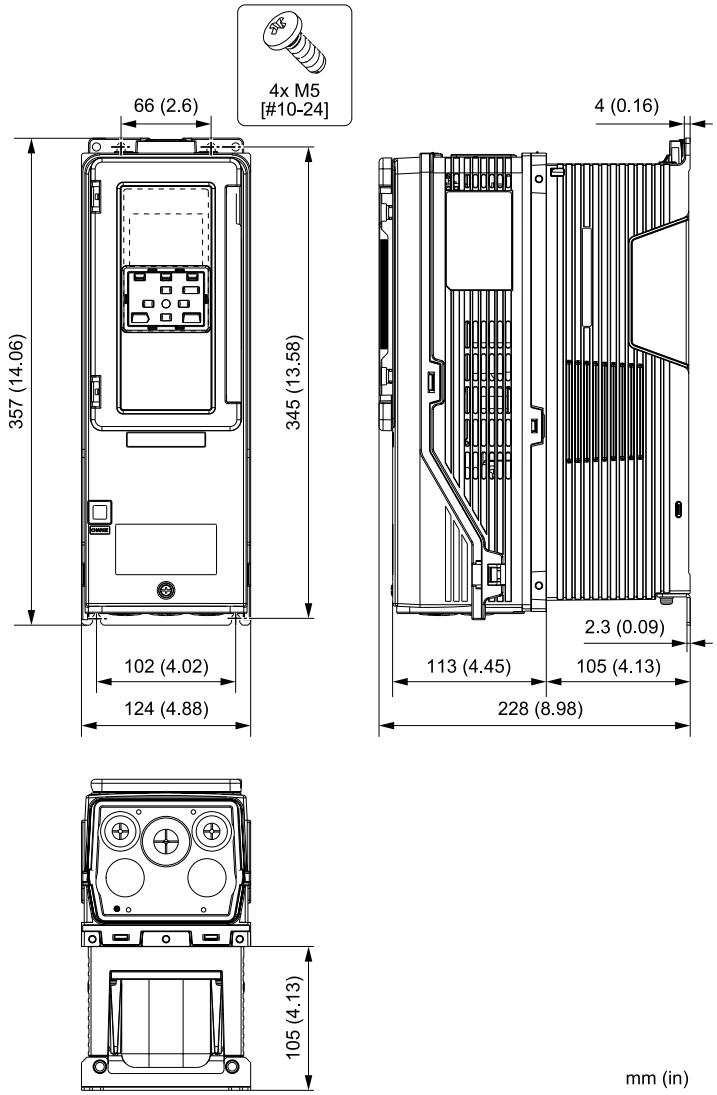


Figure 6.14 Exterior and Mounting Dimensions Diagram 2

Estimated Weight kg (lb)			
2011	**2017**	**4011**	**4014**
6.5 (14.3)	6.5 (14.3)	7.0 (15.4)	7.0 (15.4)

■ Drive Models: 2024, 2031, 4021 to 4034

Note:

When you use non-metric hardware to install the drive, use Type B narrow washers or equivalent and make sure that the size of the screw head and washer are applicable for your drive before installation.

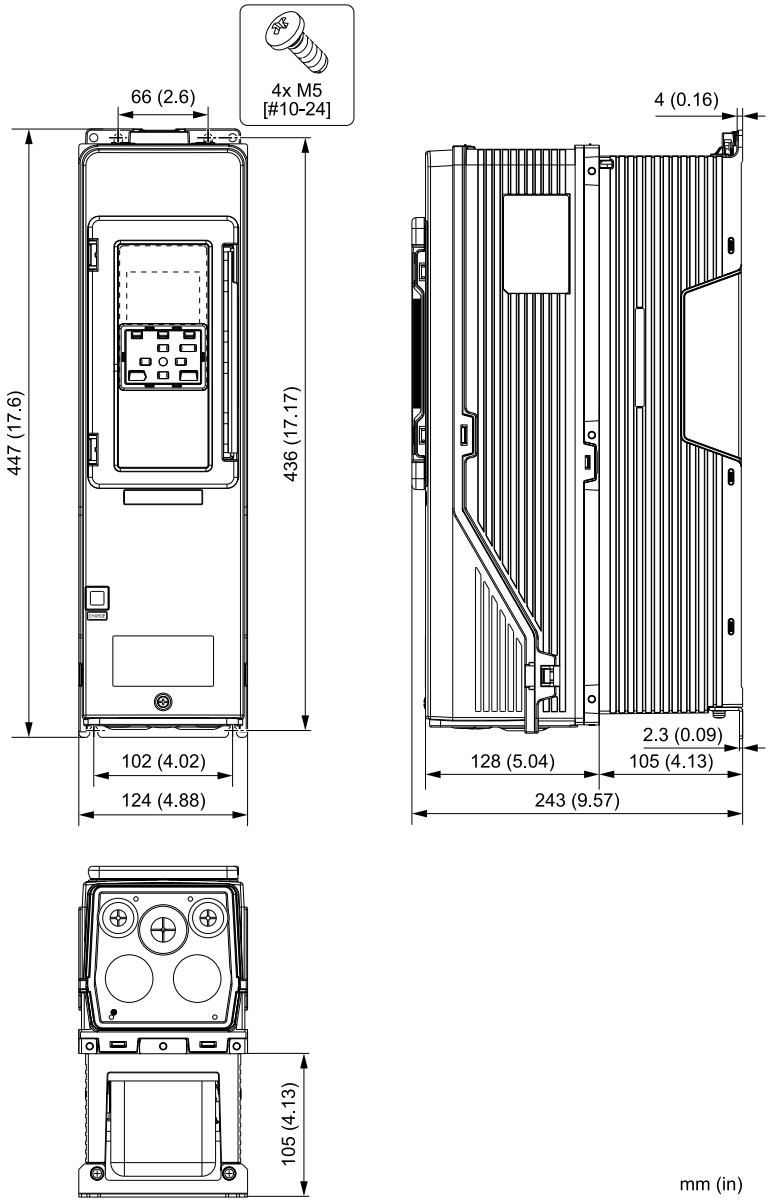


Figure 6.15 Exterior and Mounting Dimensions Diagram 3

Estimated Weight kg (lb)				
2024	**2031**	**4021**	**4027**	**4034**
8.5 (18.7)	9.0 (19.8)	9.0 (19.8)	10 (22.0)	11 (24.3)

■ Drive Models: 2046, 2059, 4040 to 4065

Note:

When you use non-metric hardware to install the drive, use Type B narrow washers or equivalent and make sure that the size of the screw head and washer are applicable for your drive before installation.

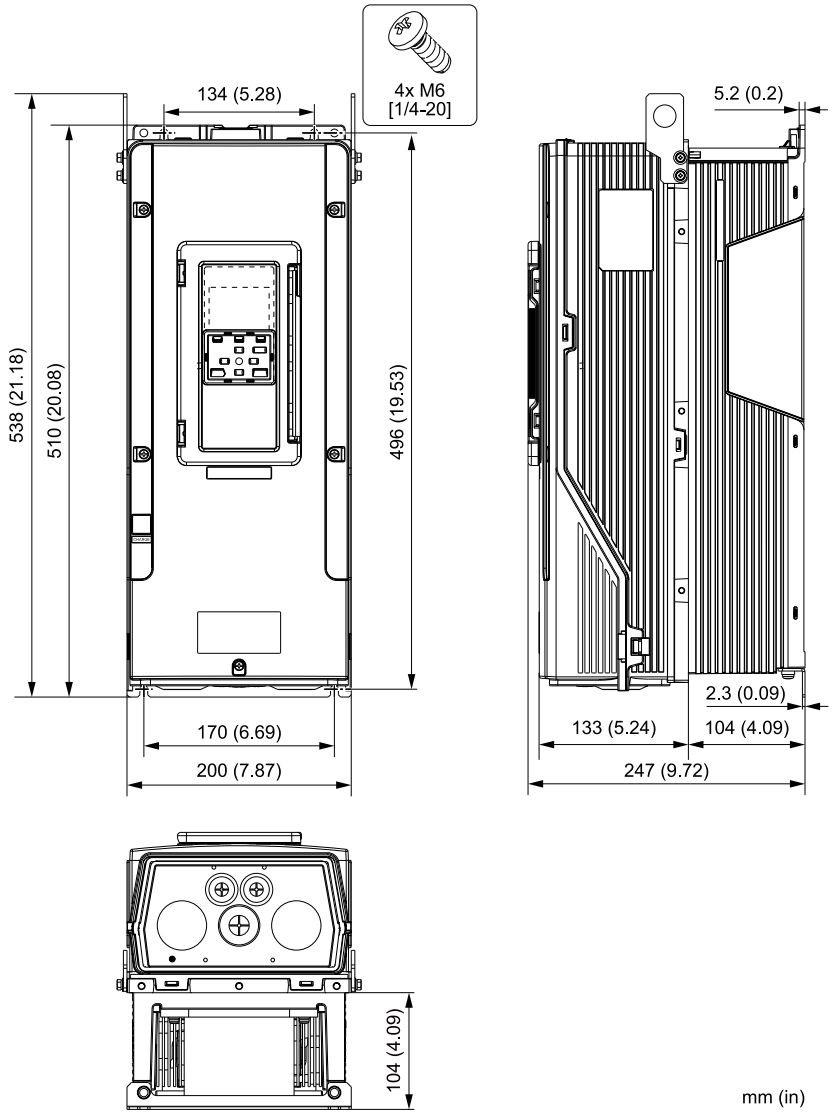


Figure 6.16 Exterior and Mounting Dimensions Diagram 4

Estimated Weight kg (lb)				
2046	**2059**	**4040**	**4052**	**4065**
15 (33.1)	16 (35.3)	16 (35.3)	18 (39.7)	20 (44.1)

■ Drive Models: 2075 to 2114, 4077 to 4124

Note:

When you use non-metric hardware to install the drive, use Type B narrow washers or equivalent and make sure that the size of the screw head and washer are applicable for your drive before installation.

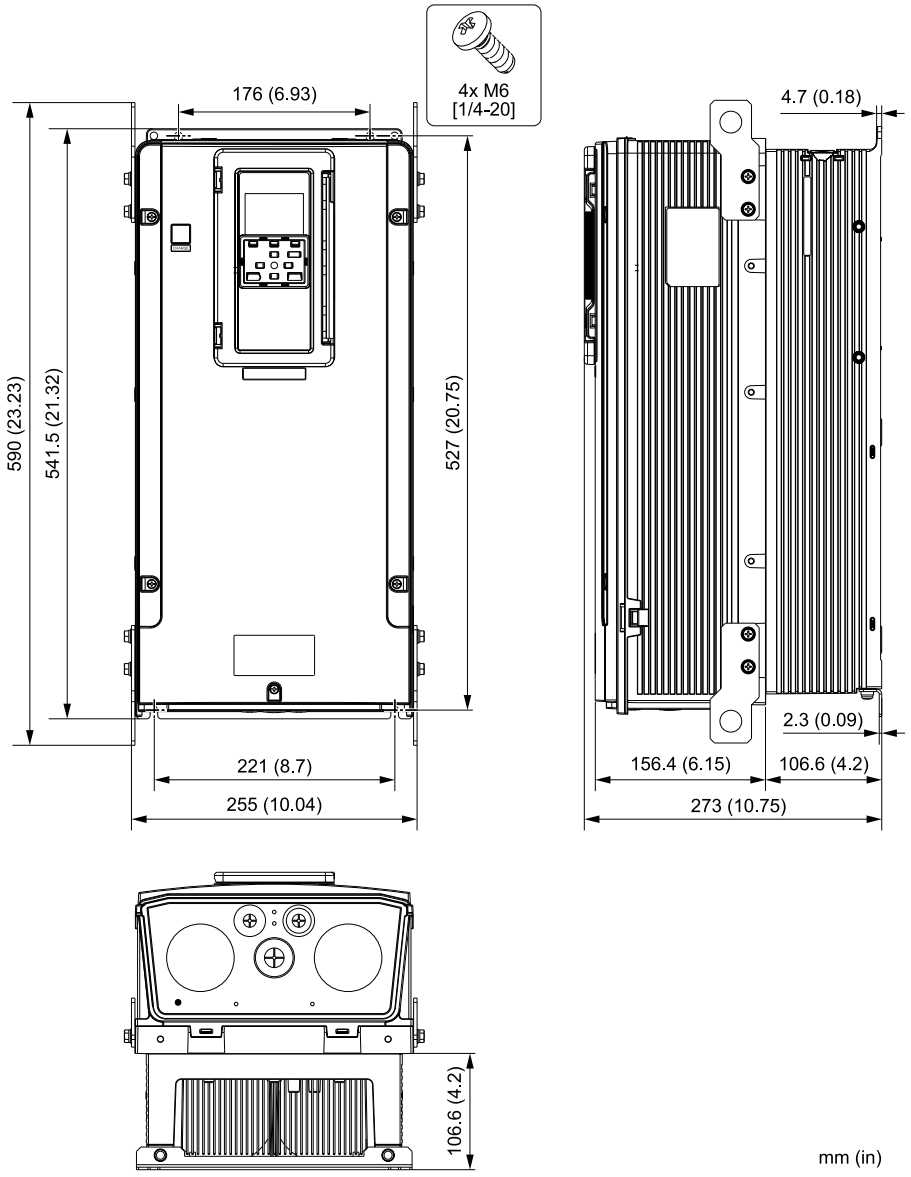


Figure 6.17 Exterior and Mounting Dimensions Diagram 5

Estimated Weight kg (lb)					
2075	**2088**	**2114**	**4077**	**4096**	**4124**
25 (55.1)	25 (55.1)	28 (61.7)	28 (61.7)	30 (66.1)	33 (72.8)

6.8 Knock-Out Hole Dimensions

◆ Drive Models and Knock-Out Hole Dimensions

Model	Reference Pages	
	IP20/UL Type 1	IP55/UL Type 12
4005, 4008	370	373
2011, 2017 4011, 4014	371	374
2024, 2031 4021 - 4034	371	374
2046, 2059 4040 - 4065	372	375
2143, 2169 4077 - 4124	372	375
2211, 2273 4156	373	-
4180, 4240	-	-
2257, 2313 4302	-	-

◆ IP20/UL Type1

■ Drive Models: 4005, 4008

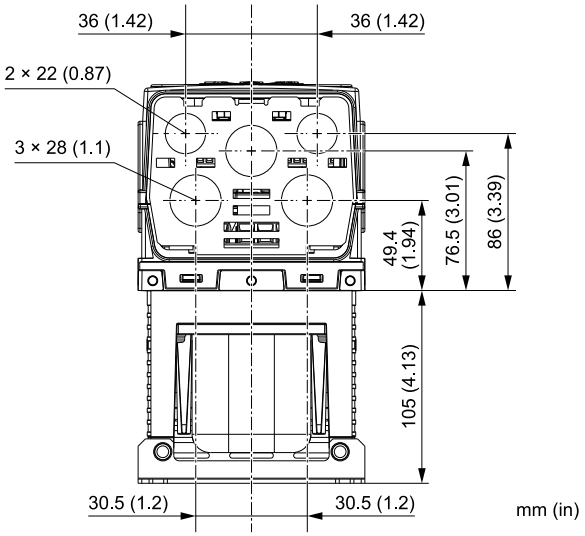


Figure 6.18 Knock-Out Dimensions Diagram 1

■ Drive Models: 2011, 2017, 4011, 4014

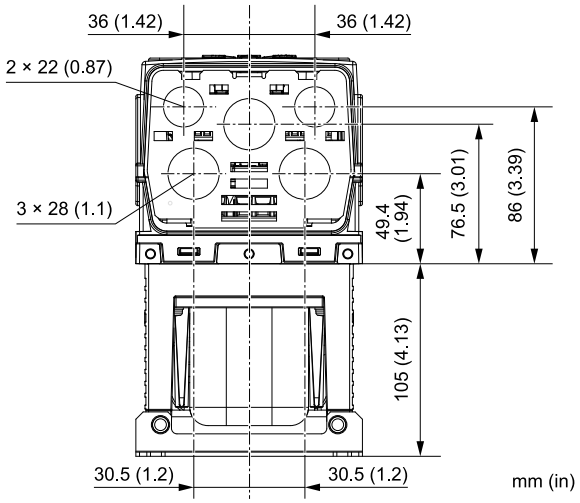


Figure 6.19 Knock-Out Dimensions Diagram 2

■ Drive Models: 2024, 2031, 4021 to 4034

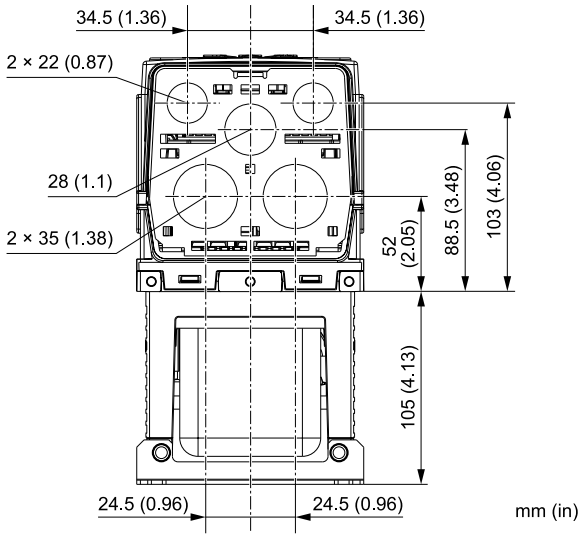


Figure 6.20 Knock-Out Dimensions Diagram 3

■ Drive Models: 2046, 2059, 4040 to 4065

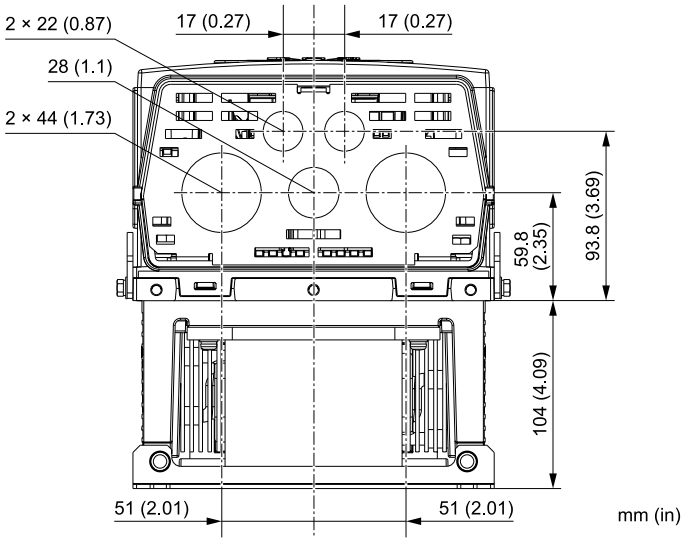


Figure 6.21 Knock-Out Dimensions Diagram 4

■ Drive Models: 2075 to 2114, 4077 to 4124

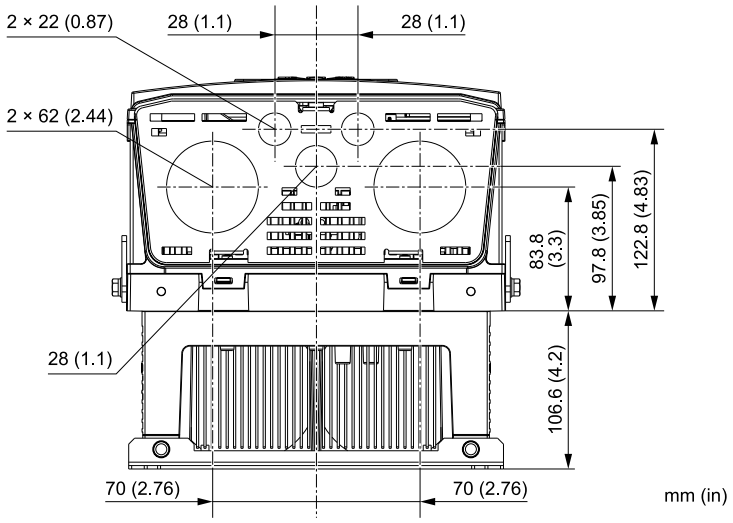


Figure 6.22 Knock-Out Dimensions Diagram 5

■ Drive Models: 2143, 2169, 4156

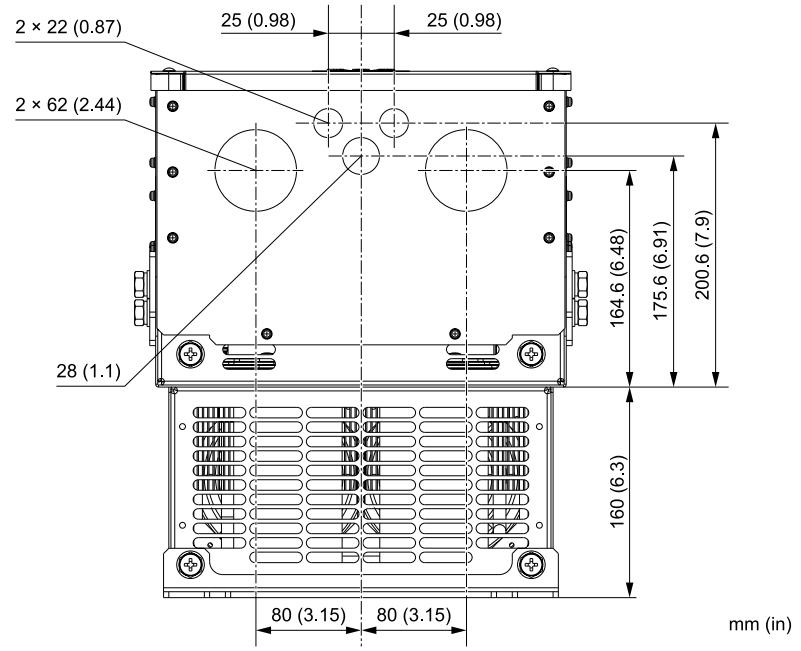


Figure 6.23 Knock-Out Dimensions Diagram 6

◆ IP55/UL Type 12

■ Drive Models: 4005, 4008

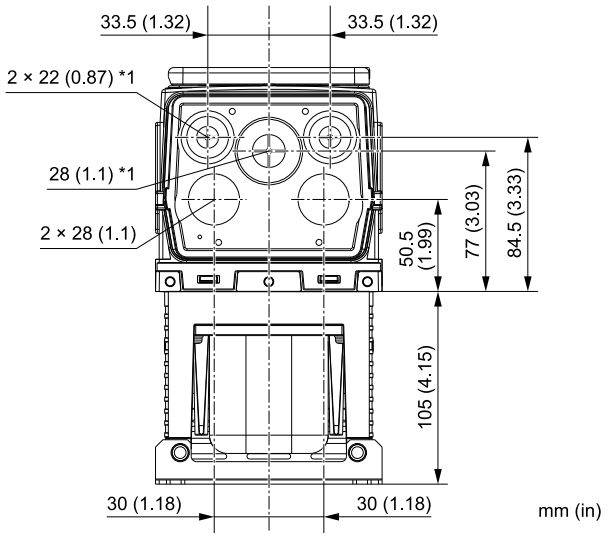


Figure 6.24 Knock-Out Dimensions Diagram 1

*1 You must install the included rubber waterproofing grommets for knock-out holes that you do not use for control circuit wiring.

■ Drive Models: 2011, 2017, 4011, 4014

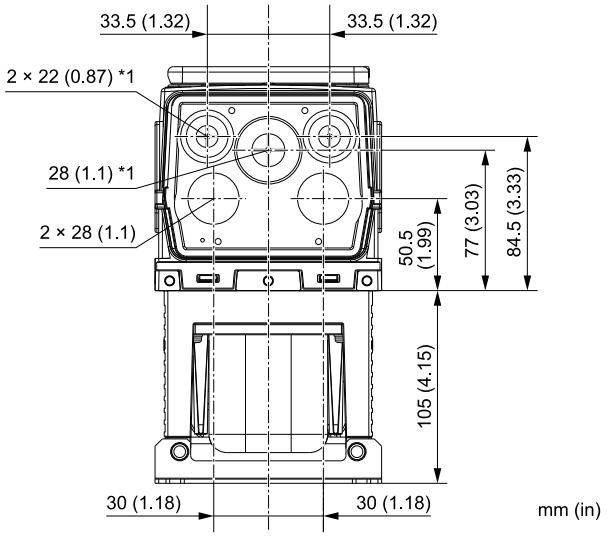


Figure 6.25 Knock-Out Dimensions Diagram 2

*1 You must install the included rubber waterproofing grommets for knock-out holes that you do not use for control circuit wiring.

■ Drive Models: 2024, 2031, 4021 to 4034

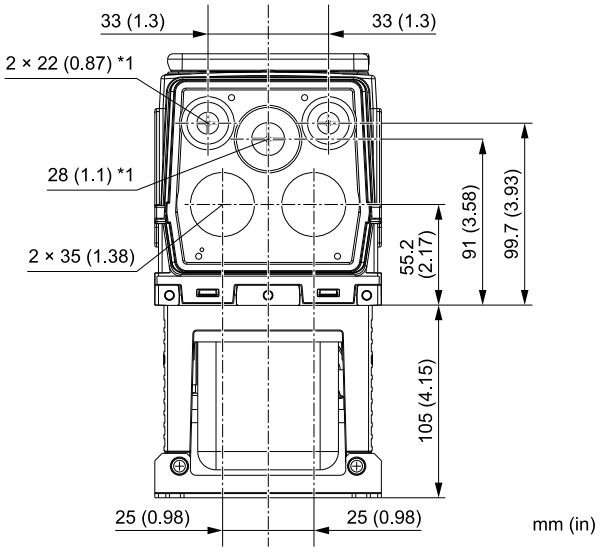


Figure 6.26 Knock-Out Dimensions Diagram 3

*1 You must install the included rubber waterproofing grommets for knock-out holes that you do not use for control circuit wiring.

■ Drive Models: 2046, 2059, 4040 to 4065

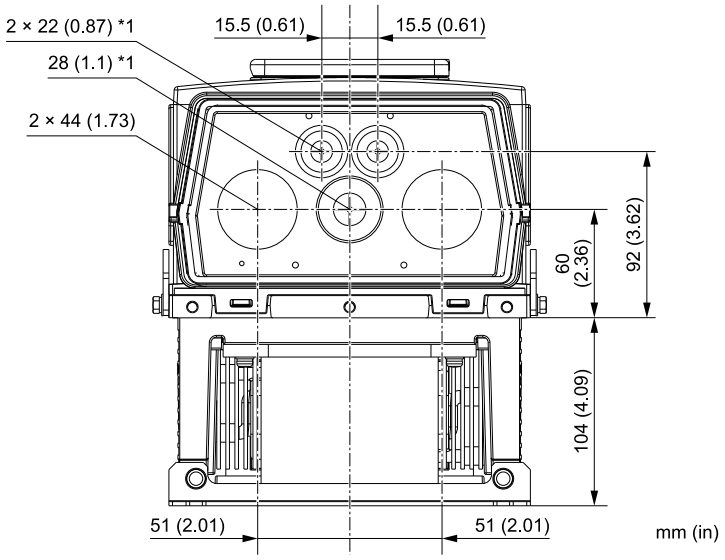


Figure 6.27 Knock-Out Dimensions Diagram 4

*1 You must install the included rubber waterproofing grommets for knock-out holes that you do not use for control circuit wiring.

■ Drive Models: 2075 to 2114, 4077 to 4124

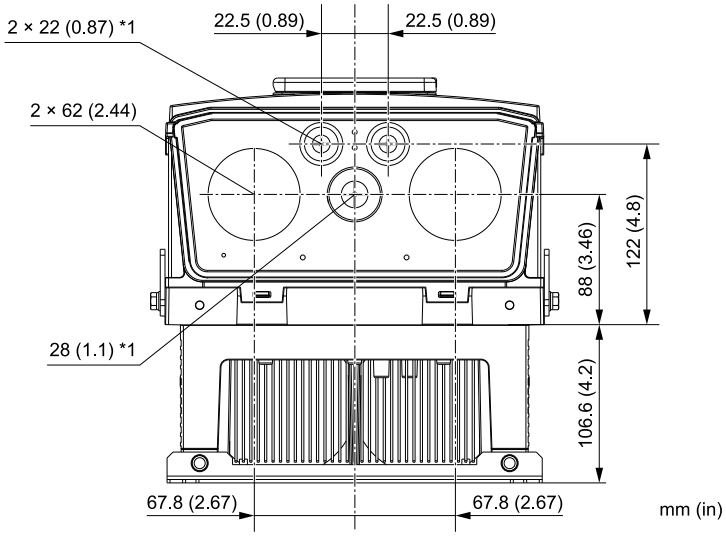


Figure 6.28 Knock-Out Dimensions Diagram 5

*1 You must install the included rubber waterproofing grommets for knock-out holes that you do not use for control circuit wiring.

6.9 Peripheral Devices and Options

There are many available peripheral devices and options for the drive.

Refer to the the HV600 Selection Guide (SL.HV600.01) for information about available options, including:

- Main circuit options
- Frequency settings and monitor options
- Keypad options
- Attachment options
- Engineering tools

Contact Yaskawa or your nearest sales representative to make an order.

Refer to the instruction manual for each option for information about option installation and wiring.

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Specifications are subject to change without notice for ongoing product modifications and improvements.

Original instructions.

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