

ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Visit our website - *Click HERE*

YASKAWA

GA800 Drive

AC Drive for Industrial Applications

Maintenance & Troubleshooting

Catalog Code: GA80Uxxxxxxxx
240 V: 1 to 150 HP
480 V: 1 to 600 HP

PDF



Get the **DriveWizard® Mobile** Commissioning App

https://www.yaskawa.com/dwm

This Page Intentionally Blank

Table of Contents

i. Preface and General Precautions 9
- i.1 Document Use 10
- i.2 Using the Product Safely 11
  - Explanation of Signal Words 11
  - General Safety 11
  - Warning Label Content and Location 13

1. Periodic Inspection and Maintenance 15
- 1.1 Section Safety 16
- 1.2 Inspection 18
  - Recommended Daily Inspection 18
  - Recommended Periodic Inspection 18
- 1.3 Maintenance 21
- 1.4 Replace a Cooling Fan and Circulation Fan 23
  - Cooling Fans and Circulation Fans by Drive Model 23
  - Replace a Fan (Procedure A) 23
  - Replace a Fan (Procedure B) 26
  - Replace a Fan (Procedure C) 28
  - Replace a Fan (Procedure D) 31
  - Replace a Fan (Procedure E) 33
  - Replace Fans (Procedure F) 36
  - Replace Fans (Procedure G) 43
  - Replace Fans (Procedure H) 52
- 1.5 Replace the Drive 60
  - About the Control Circuit Terminal Block 60
- 1.6 Replace the Keypad Battery 61

2. Troubleshooting 63
- 2.1 Section Safety 64
- 2.2 Types of Faults, Minor Faults, Alarms, and Errors 66
- 2.3 List of Fault, Minor Fault, Alarm, and Error Codes 67
- 2.4 Faults 73
- 2.5 Minor Faults/Alarms 93
- 2.6 Parameter Setting Errors 103
- 2.7 Auto-Tuning Errors 109
- 2.8 Backup Function Operating Mode Display and Errors 114
- 2.9 Diagnosing and Resetting Faults 116
  - Fault Occurs Without Power Loss 116

Fault Occurs Without Power Loss . . . 116
Fault Reset . . . 116
2.10 Troubleshooting Without Fault Display . . . 118
The Parameter Settings Will Not Change . . . 118
The Motor Does Not Rotate After Entering Run Command . . . 118
The Motor Rotates in the Opposite Direction from the Run Command . . . 119
The Motor Rotates in Only One Direction . . . 119
The Motor Is Too Hot . . . 120
The Correct Auto-Tuning Mode Is Not Available . . . 120
The Motor Stalls during Acceleration or Accel/Decel Time Is Too Long . . . 120
The Drive Frequency Reference Is Different than the Controller Frequency Reference Command . . . 121
The Motor Speed Is Not Stable When Using a PM Motor . . . 121
There Is Too Much Motor Oscillation and the Rotation Is Irregular . . . 122
Deceleration Takes Longer Than Expected When Dynamic Braking Is Enabled . . . 122
There Is Audible Noise from the Drive or Motor Cables When the Drive Is Energized . . . 122
The Ground Fault Circuit Interrupter (GFCI) Trips During Run . . . 123
Motor Rotation Causes Unexpected Audible Noise from Connected Machinery . . . 123
Motor Rotation Causes Oscillation or Hunting . . . 123
PID Output Fault . . . 123
The Starting Torque Is Not Sufficient . . . 123
The Motor Rotates after the Drive Output Is Shut Off . . . 124
The Output Frequency Is Lower Than the Frequency Reference . . . 124
The Motor Is Making an Audible Noise . . . 124
The Motor Will Not Restart after a Loss of Power . . . 124
3. Parameter List . . . 125
3.1 Section Safety . . . 126
3.2 How to Read the Parameter List . . . 127
Icons and Terms that Identify Parameters and Control Modes . . . 127
3.3 Parameter Groups . . . 128
3.4 A: Initialization Parameters . . . 130
A1: Initialization . . . 130
A2: User Parameters . . . 131
3.5 b: Application . . . 132
b1: Operation Mode Selection . . . 132
b2: DC Injection Braking and Short Circuit Braking . . . 133
b3: Speed Search . . . 133
b4: Timer Function . . . 135
b5: PID Control . . . 136
b6: Dwell Function . . . 139
b7: Droop Control . . . 139
b8: Energy Saving . . . 140
b9: Zero Servo . . . 141
3.6 C: Tuning . . . 142
C1: Accel & Decel Time . . . 142
C2: S-Curve Characteristics . . . 142
C3: Slip Compensation . . . 143
C4: Torque Compensation . . . 144
C5: Auto Speed Regulator (ASR) . . . 144
C6: Duty & Carrier Frequency . . . 146
3.7 d: Reference Settings . . . 147
d1: Frequency Reference . . . 147

d2: Reference Limits . . . 148
d3: Jump Frequency . . . 148
d4: Frequency Ref Up/Down & Hold . . . 149
d5: Torque Control . . . 149
d6: Field Weakening /Forcing . . . 150
d7: Offset Frequency . . . 150
3.8 E: Motor Parameters . . . 151
E1: V/f Pattern for Motor 1 . . . 151
E2: Motor Parameters . . . 152
E3: V/f Pattern for Motor 2 . . . 152
E4: Motor 2 Parameters . . . 153
E5: PM Motor Settings . . . 154
E9: Motor Setting . . . 154
3.9 F: Options . . . 156
F1: Encoder Option Setup . . . 156
F2: Analog Input Option . . . 158
F3: Digital Input Option . . . 158
F4: Analog Output Option . . . 159
F5: Digital Output Option . . . 160
F6: Communication Options . . . 160
F7: Ethernet Options . . . 164
3.10 H: Terminal Functions . . . 167
H1: Digital Inputs . . . 167
H2: Digital Outputs . . . 171
H3: Analog Inputs . . . 177
H4: Analog Outputs . . . 179
H5: Modbus Communication . . . 180
H6: Pulse Train Input/Output . . . 181
H7: Virtual MFIO selection . . . 182
3.11 L: Protection Functions . . . 184
L1: Motor Protection . . . 184
L2: Power Loss Ride Through . . . 184
L3: Stall Prevention . . . 185
L4: Speed Detection . . . 187
L5: Fault Restart . . . 187
L6: Torque Detection . . . 188
L7: Torque Limit . . . 189
L8: Drive Protection . . . 190
L9: Drive Protection 2 . . . 192
3.12 n: Special Adjustment . . . 193
n1: Hunting Prevention . . . 193
n2: Auto Freq Regulator (AFR) . . . 193
n3: High Slip/Overexcite Braking . . . 194
n4: Adv Open Loop Vector Tune . . . 194
n5: Feed Forward Control . . . 195
n6: Online Tuning . . . 195
n7: EZ Drive . . . 196
n8: PM Motor Control Tuning . . . 196
3.13 o: Keypad-Related Settings . . . 200
o1: Keypad Display . . . 200
o2: Keypad Operation . . . 202
o3: Copy Keypad Function . . . 203
o4: Maintenance Monitors . . . 203
o5: Log Function . . . 204

3.14 q: DriveWorksEZ Parameters . . . 205
q1-01 to q8-40: Reserved for DriveWorksEZ . . . 205
3.15 r: DWEZ Connection 1-20 . . . 206
r1-01 to r1-40: DriveWorksEZ Connection Parameters 1 to 20 (Upper / Lower) . . . 206
3.16 T: Motor Tuning . . . 207
T0: Tuning Mode Selection . . . 207
T1: Induction Motor Auto-Tuning . . . 207
T2: PM Motor Auto-Tuning . . . 208
T3: ASR and Inertia Tuning . . . 209
T4: EZ Tuning . . . 209
3.17 U: Monitors . . . 211
U1: Operation Status Monitors . . . 211
U2: Fault Trace . . . 213
U3: Fault History . . . 214
U4: Maintenance Monitors . . . 215
U5: PID Monitors . . . 218
U6: Operation Status Monitors . . . 219
U8: DriveWorksEZ Monitors . . . 221
3.18 Parameters that Change from the Default Settings with A1-02 [Control Method Selection] . . . 222
3.19 Parameters that Change from the Default Settings with E3-01 [Motor 2 Control Mode Selection] . . . 227
3.20 Parameters Changed by E1-03 [V/f Pattern Selection] . . . 228
3.21 Defaults by Drive Model and Duty Rating ND/HD . . . 230
200 V class . . . 230
400 V Class . . . 237
3.22 Parameters Changed by PM Motor Code Selection . . . 248
Yaskawa SMRA Series SPM Motors . . . 248
Yaskawa SSR1 Series IPM Motors (Derated Torque) . . . 249
Yaskawa SST4 Series IPM Motors (Constant Torque) . . . 259
4. Mechanical and Electrical . . . 269
4.1 Section Safety . . . 270
4.2 Installation Environment . . . 272
4.3 Removing/Reattaching Covers . . . 273
Removing/Reattaching the Cover Using Procedure A . . . 273
Removing/Reattaching the Cover Using Procedure B . . . 274
4.4 Electrical Installation . . . 278
Standard Connection Diagram . . . 278
4.5 Main Circuit Wiring . . . 282
Main Circuit Terminal and Motor Wiring . . . 282
Motor and Main Circuit Connections . . . 283
Main Circuit Terminal Functions . . . 284
Main Circuit Terminal and Motor Wiring . . . 285
4.6 Control Circuit Wiring . . . 289
Control Circuit Connection Diagram . . . 289
Control Circuit Terminal Block Functions . . . 290
Control Circuit Terminal Configuration . . . 292
Wiring the Control Circuit Terminal . . . 294
Switches and Jumpers on the Terminal Board . . . 297

4.7 Control I/O Connections . . . 298
Pulse Train Output . . . 298
Set Sinking Mode/Sourcing Mode . . . 299
Set Input Signals for MFAI Terminals A1 to A3 . . . 299
Set MFAI Terminal A3 to PTC Input . . . 300
Set Output Signals for MFAO Terminals FM, AM . . . 300
Switch ON Termination Resistor for MEMOBUS/Modbus Communications . . . 301
4.8 Connect the Drive to a PC . . . 302
4.9 Protect the Drive during Failures . . . 303
Factory-Recommended Branch Circuit Protection for UL Listing . . . 303
5. Keypad Use and Test Run . . . 307
5.1 Section Safety . . . 308
5.2 LED Status Ring . . . 309
5.3 Keypad Operation . . . 311
Home Screen Display Selection . . . 311
Displaying the Monitor . . . 312
Set Custom Monitors . . . 313
Show Custom Monitors . . . 314
Set the Monitors to Show as a Bar Graph . . . 315
Show Monitors as Bar Graphs . . . 316
Set the Monitors to Show as Analog Gauges . . . 317
Display Monitors as an Analog Gauge . . . 318
Set Monitoring Items to be Shown as a Trend Plot . . . 318
Show Monitor Items as a Trend Plot . . . 322
Change Parameter Settings . . . 323
Examine User Custom Parameters . . . 324
Save a Backup of Parameters . . . 326
Write Backed-up Parameters to the Drive . . . 327
Verify Keypad Parameters and Drive Parameters . . . 328
Delete Parameters Backed Up to the Keypad . . . 329
Check Modified Parameters . . . 330
Restore Modified Parameters to Defaults . . . 332
Show Fault History . . . 333
Auto-Tuning the Drive . . . 334
Set the Keypad Language Display . . . 336
Set the Date and Time . . . 337
Set Parameters Using the Setup Wizard . . . 339
Disable the Initial Setup Screen . . . 341
Start Data Logging . . . 342
Configuring the Data Log Content . . . 343
Set Backlight to Automatically Turn OFF . . . 345
Show Information about the Drive . . . 346
Write Automatically Backed-up Parameters to the Drive . . . 347
5.4 Automatic Parameter Settings Optimized for Specific Applications (Application Presets) . . . 349
5.5 Auto-Tuning . . . 351
Auto-Tuning for Induction Motors . . . 351
Auto-Tuning for Motor Parameters for PM Motor . . . 352
Auto-Tuning in EZ Open Loop Vector Control Method . . . 354
Control Tuning . . . 355
Precautions before Auto-Tuning . . . 357
5.6 Test Run . . . 360

No-Load Test Run 360
Do a No-Load Test Run 360
Actual-Load Test Run. 360
Do an Actual-Load Test Run 361
5.7 Fine Tuning during Test Runs (Adjust the Control Function) 362
V/f Control and Closed Loop V/f Control. 362
Open Loop Vector Control Method 363
Closed Loop Vector Control Method. 364
Advanced Open Loop Vector Control Method 365
Fine-Tuning Open Loop Vector Control for PM Motors 366
Advanced Open Loop Vector Control Method for PM 367
Closed Loop Vector Control Method for PM. 367
EZ Open Loop Vector Control Method 368
5.8 Test Run Checklist 369
6. Specifications 371
6.1 Drive Derating 372
Carrier Frequency Settings and Rated Current Values 372
Derating Depending on Ambient Temperature. 376
Altitude Derating. 377
Index 378
Revision History 383

i

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 Document Use 10
i.2 Using the Product Safely 11

i.1 Document Use

This document is for maintenance and troubleshooting of installed Yaskawa GA800 drives. It is intended for use by those familiar with maintenance and troubleshooting of variable frequency drives. This document does not contain information to support repairs beyond fan and control board replacement components for Yaskawa GA800 drives. For more information about the GA800 drive, refer to the GA800 Technical Manual (SIEPC*********).

Yaskawa Technical Support

- repair@yaskawa.com
- Toll Free - 1.800.927.5292
- Direct - 1.847.887.7457
- Option 2 for Technical Support, then option 1 for Drive Support

Before You Call....

Please have the following information available:

- Model and spec number of the unit
- Serial Number
- Failure Information (fault and alarm codes, descriptions)
- Application which the product is used on
- Length of time in service

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. The drive has internal capacitors that stay charged after you de-energize the drive.

⚠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.

Fire Hazard

Do not use the main circuit power supply (Overvoltage Category III) at incorrect voltages. Operate the drive in the specification range of the input voltage on the drive nameplate.

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

Install sufficient branch circuit short circuit protection as specified by applicable codes and this manual. The drive is suited for circuits that supply not more than 100,000 RMS symmetrical amperes, 240 Vac maximum (200 V Class), 480 Vac maximum (400 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.

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 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.

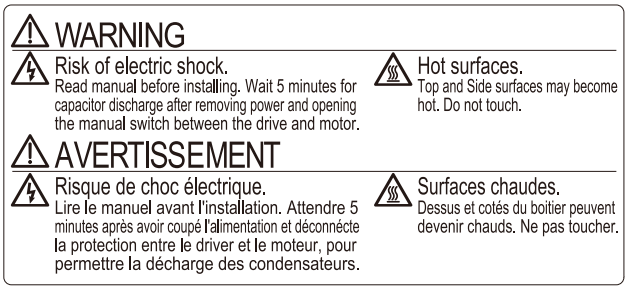
You can cause damage to the drive and connected equipment.

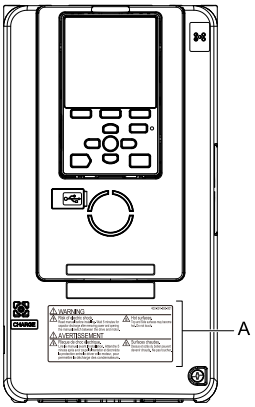
Do not use steam or other disinfectants to fumigate wood for packaging the drive. Use alternative methods, for example heat treatment, before you package the components.

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

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 16
1.2 Inspection 18
1.3 Maintenance 21
1.4 Replace a Cooling Fan and Circulation Fan 23
1.5 Replace the Drive 60
1.6 Replace the Keypad Battery 61

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. The drive has internal capacitors that stay charged after you de-energize the drive.

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 serous 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.

Do not use the main circuit power supply (Overvoltage Category III) at incorrect voltages. Operate the drive in the specification range of the input voltage on the drive nameplate.

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

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

Obey correct electrostatic discharge (ESD) procedures when you touch the drive.

Incorrect ESD procedures can cause 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.

The drive can fail if users frequently turn the drive ON and OFF with the MC on the power source side to Run and Stop the drive. Incorrect operation can decrease the service life of the relay contacts and electrolytic capacitors.

If you frequently use the magnetic contactor on the power source side to Run and Stop 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. The drive has internal capacitors that stay charged after you de-energize the drive.*

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. **Note:** On drive models, 2056, 2070, 4031, and 4038, you cannot replace the hex screws.	
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.	
Dynamic Braking Option	Examine the insulation for discoloration from too much heat.	If there is discoloration in the option, check to make sure that the wiring is not damaged. A small quantity of discoloration is not a problem.	
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.	• If you have problems with the display or the keys, contact Yaskawa or your nearest sales representative. • Clean the keypad.	

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

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. The drive has internal capacitors that stay charged after you de-energize the drive.*

◆ 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 of 40 °C (IP00/Open Type enclosure) Load factor: 80% maximum Operation time: 24 hours a day

◆ Monitors that Display 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 increase 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 these parameters are not reset after the corresponding parts have been replaced, the Maintenance Monitor function will continue to count down the performance life from the value that was reached with the old part. If the Maintenance Monitor is not reset, the drive will not have the correct value of the performance life for the new component.

Note:

The maintenance period changes 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 a Cooling Fan and Circulation Fan

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 (Three-Phase 200 V)

Model	Cooling Fan	Circulation Fan	Replacement Procedure	Reference
2004 - 2012	-	-	-	-
2018, 2021	1	-	Procedure A	23
2030, 2042	2	-	Procedure B	26
2056 - 2082	2	-	Procedure C	28
2110 - 2211	2	-	Procedure D	31
2257 - 2313	2	-	Procedure E	33
2360, 2415	3	1	Procedure F	36

Table 1.12 Cooling Fans and Circulation Fans (Three-Phase 400 V)

Model	Cooling Fan	Circulation Fan	Circuit Board Cooling Fan	Replacement Procedure	Reference
4002 - 4005	-	-	-	-	-
4007 - 4012	1	-	-	Procedure A	23
4018, 4023	2	-	-	Procedure B	26
4031 - 4060	2	-	-	Procedure C	28
4075 - 4168	2	-	-	Procedure D	31
4208 - 4302	2	-	-	Procedure E	33
4371	2	1	-	Procedure F	36
4414	3	1	-	Procedure F	36
4477 - 4605	2	1	2	Procedure G	43
4720	3	1	2	Procedure H	52

◆ Replace a Fan (Procedure A)

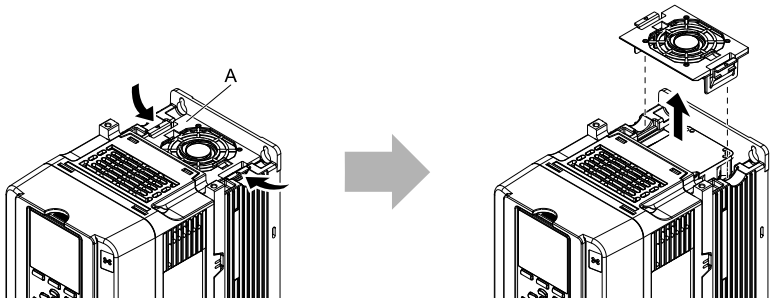
DANGER! *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge 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. The drive has internal capacitors that stay charged after you de-energize the drive.*

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 Fan

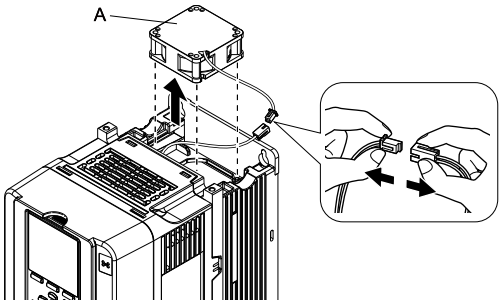
1. To remove the fan finger guard from the drive, push the hooks on the left and right sides of it and pull up.



A - Fan finger guard

Figure 1.1 Remove the Fan Finger Guard

2. Pull the cooling fan straight up from the drive. Disconnect the power supply connector and remove the fan from the drive.



A - Cooling fan

Figure 1.2 Remove the Cooling Fans

■ Install the Cooling Fans

Reverse the removal procedure to install a cooling fan.

1. Connect the drive and the fan connectors.

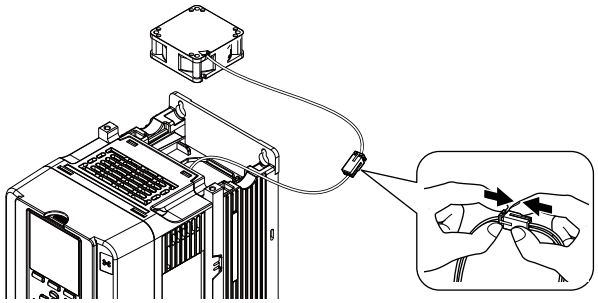
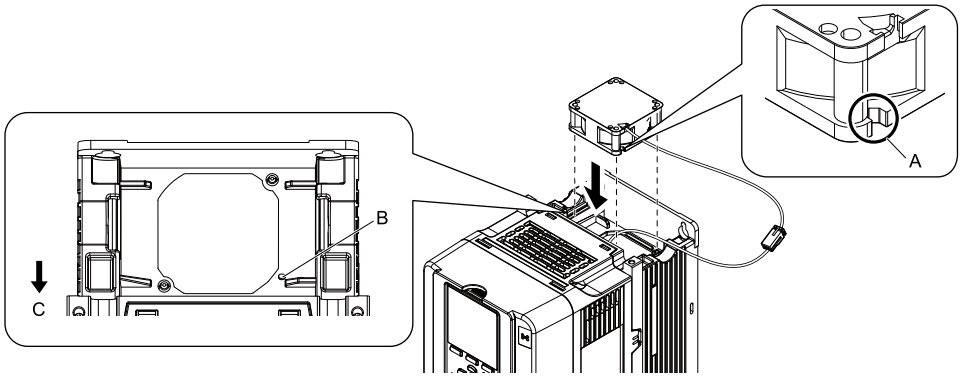


Figure 1.3 Connect the Power Supply Connector

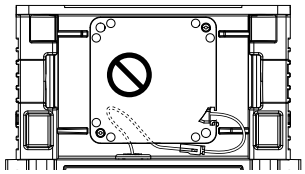
2. Align the notches on the fan with the pins on the drive and install the cooling fan in the drive.



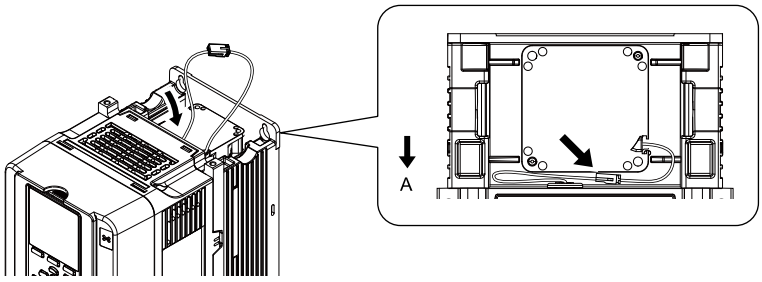
A - Notch on fan
B - Alignment pins on drive
C - Front of drive

Figure 1.4 Install the Cooling Fans

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



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



A - Front of drive

Figure 1.5 Put the Cable in the Drive Recess

4. Insert the fan finger guard straight until the hook clicks into place.

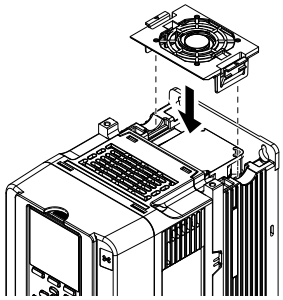


Figure 1.6 Reattach the Fan Finger Guard

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

◆ Replace a Fan (Procedure B)

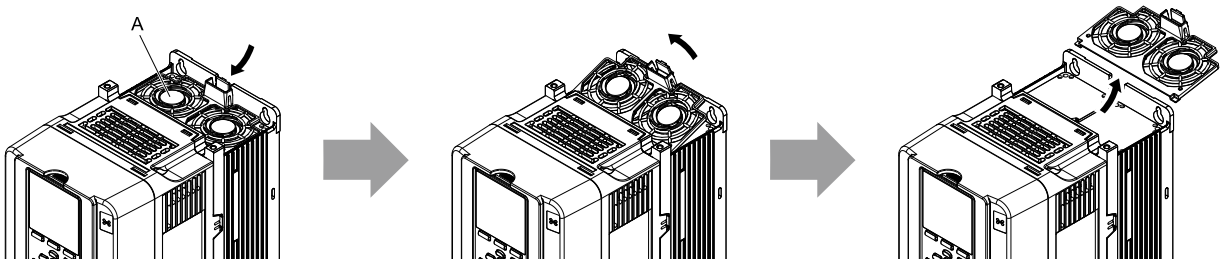
DANGER! *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge 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. The drive has internal capacitors that stay charged after you de-energize the drive.*

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 Fan

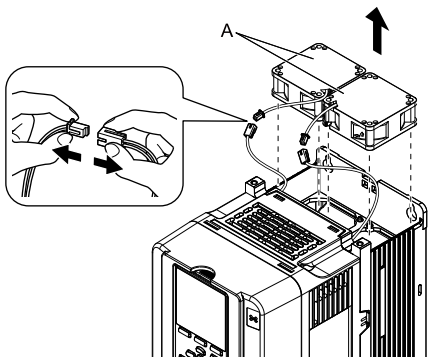
1. To remove the fan finger guard from the drive, push the hook on the back side of the fan finger guard and pull up.



A - Fan finger guard

Figure 1.7 Remove the Fan Finger Guard

2. Pull the cooling fan straight up from the drive. Disconnect the power supply connector and remove the fan from the drive.



A - Cooling fan

Figure 1.8 Remove the Cooling Fans

■ Install Fans

Reverse the removal procedure to install a cooling fan.

1. Connect the power supply connector.

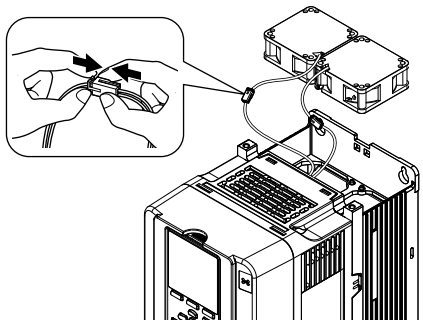
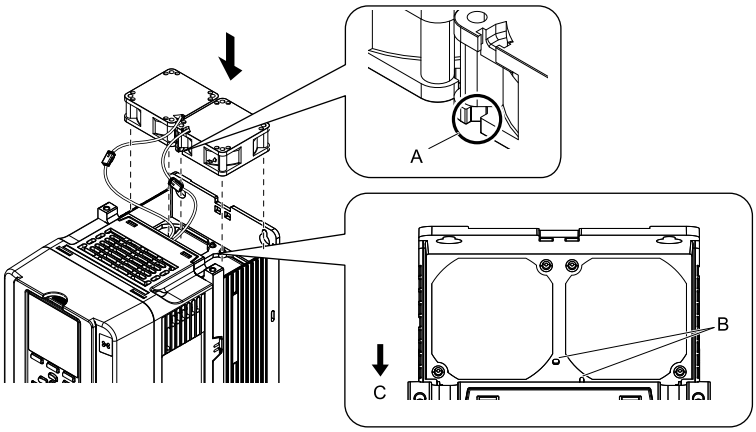


Figure 1.9 Connect the Power Supply Connector

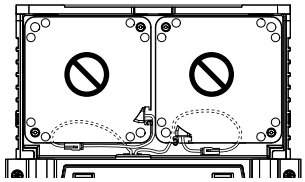
2. Align the notches on the fan with the pins on the drive and install the cooling fan in the drive.



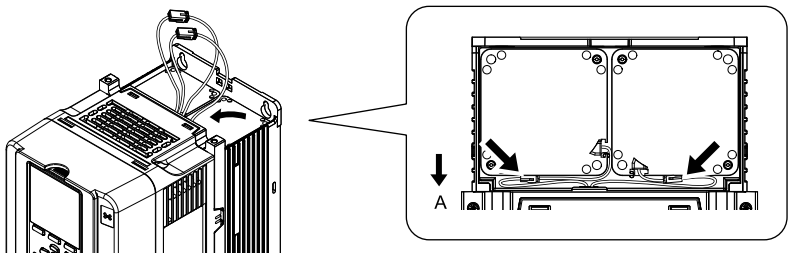
A - Notch on fan
B - Alignment pins on drive
C - Front of drive

Figure 1.10 Install the Cooling Fans

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



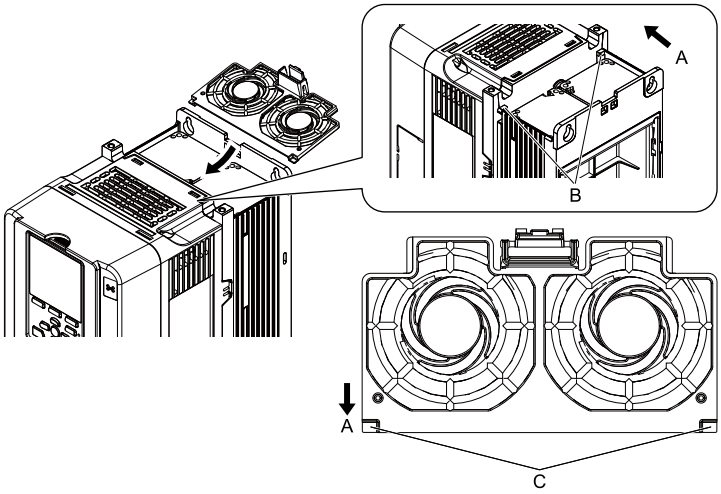
3. Put the cable in the recess of the drive.



A - Front of drive

Figure 1.11 Put the Cable in the Drive Recess

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 - Tab

Figure 1.12 Reattach the Fan Finger Guard

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

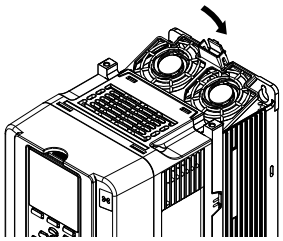


Figure 1.13 Reattach the Fan Finger Guard

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 C)

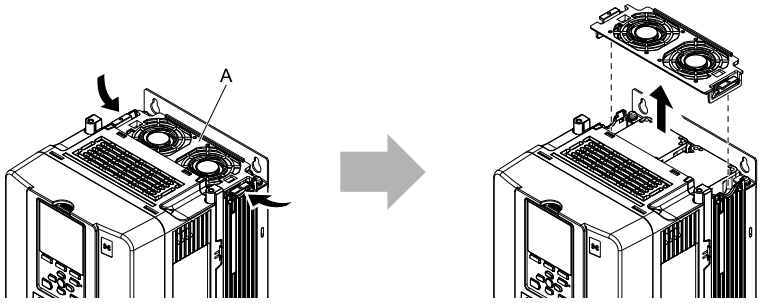
DANGER! *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge 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. The drive has internal capacitors that stay charged after you de-energize the drive.*

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 Fan

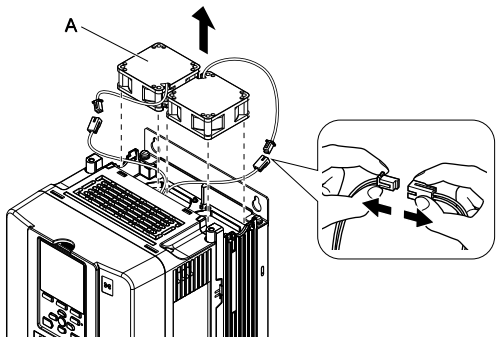
1. To remove the fan finger guard from the drive, push the hooks on the left and right sides of it and pull up.



A - Fan finger guard

Figure 1.14 Remove the Fan Finger Guard

2. Pull the cooling fan straight up from the drive. Disconnect the power supply connector and remove the fan from the drive.



A - Cooling fan

Figure 1.15 Remove the Cooling Fans

■ Install Fans

Reverse the removal procedure to install a cooling fan.

1. Connect the drive and the fan connectors.

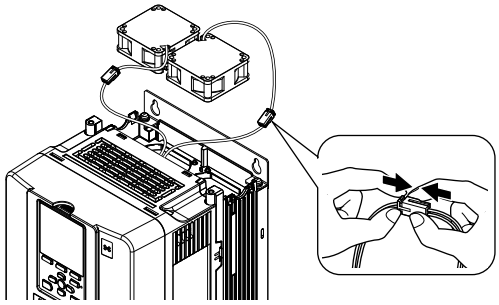
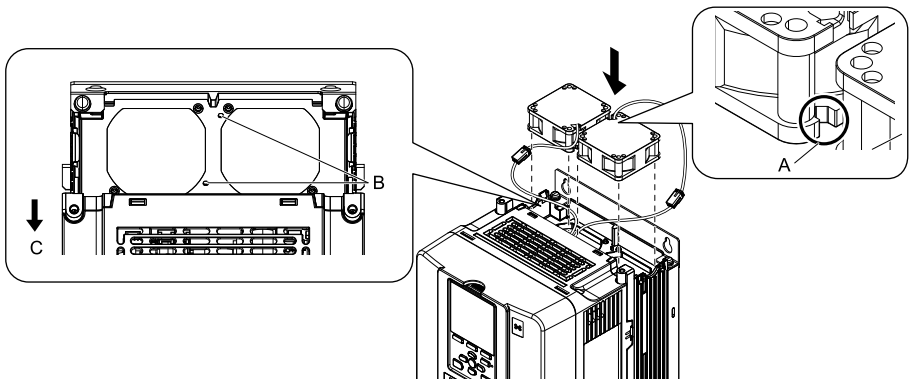


Figure 1.16 Connect the Power Supply Connector

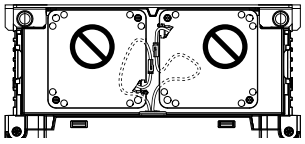
2. Align the notches on the fan with the pins on the drive and install the cooling fan in the drive.



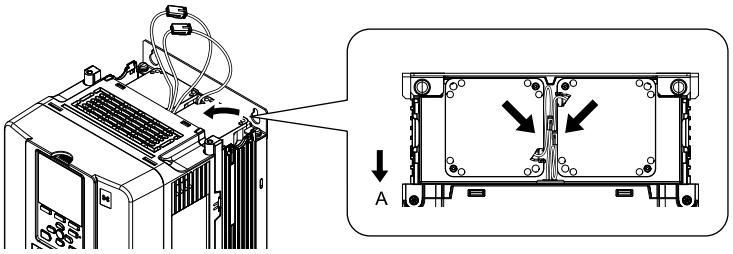
A - Notch on fan
B - Alignment pins on drive
C - Front of drive

Figure 1.17 Install the Cooling Fans

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



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



A - Front of drive

Figure 1.18 Put the Cable in the Drive Recess

4. Insert the fan finger guard straight until the hook clicks into place.

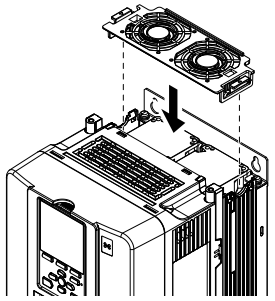


Figure 1.19 Reattach the Fan Finger Guard

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

◆ Replace a Fan (Procedure D)

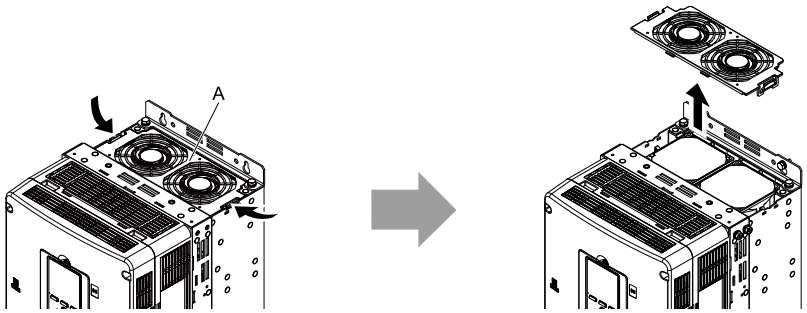
DANGER! *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge 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. The drive has internal capacitors that stay charged after you de-energize the drive.*

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 Fan

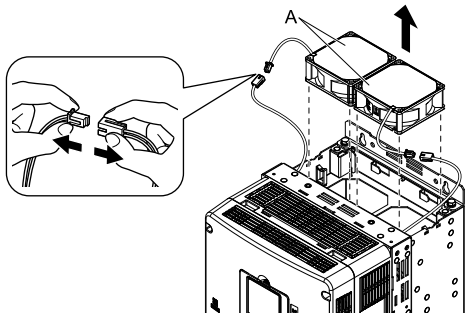
1. To remove the fan finger guard from the drive, push the hooks on the left and right sides of it and pull up.



A - Fan finger guard

Figure 1.20 Remove the Fan Finger Guard

2. Pull the cooling fan straight up from the drive. Disconnect the power supply connector and remove the fan from the drive.



A - Cooling fan

Figure 1.21 Remove the Cooling Fan

■ Install the Cooling Fans

Reverse the removal procedure to install a cooling fan.

1. Connect the power supply connector.

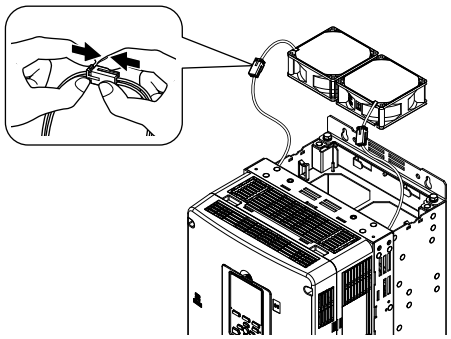
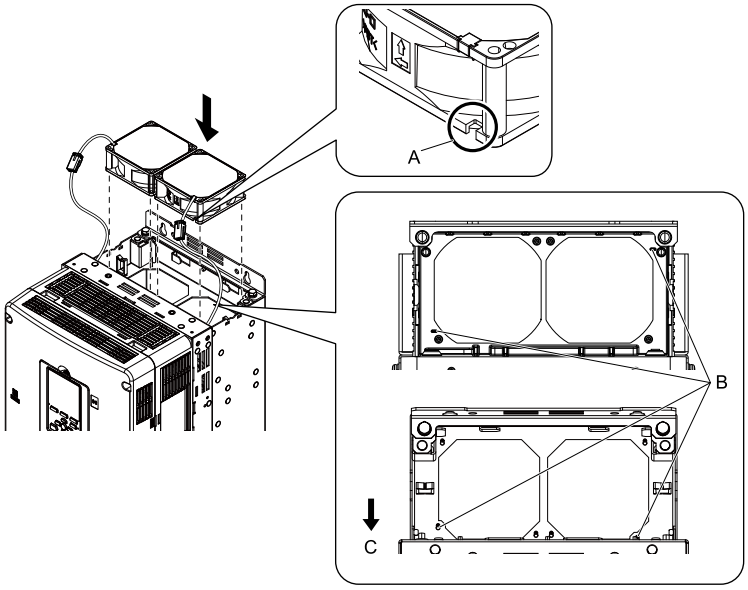


Figure 1.22 Connect the Power Supply Connector

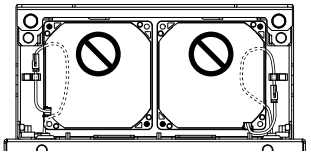
2. Align the notches on the fan with the pins on the drive and install the cooling fan in the drive.



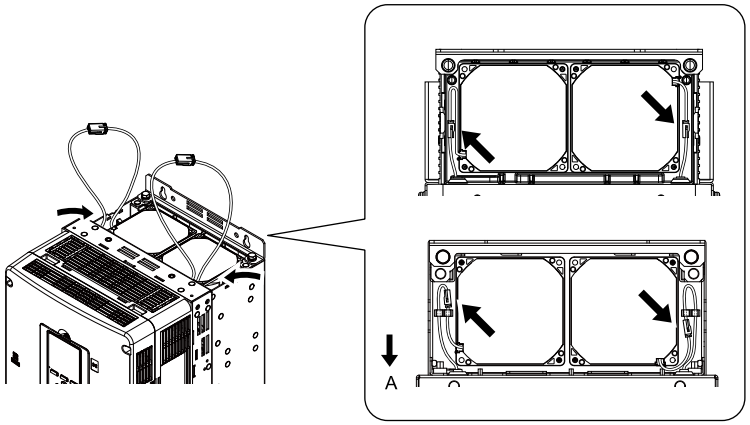
A - Notch on fan
B - Alignment pins on drive
C - Front of drive

Figure 1.23 Install the Cooling Fans

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



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



A - Front of drive

Figure 1.24 Put the Cable in the Drive Recess

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

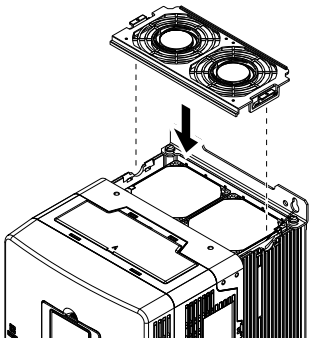


Figure 1.25 Reattach the Fan Finger Guard

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

◆ Replace a Fan (Procedure E)

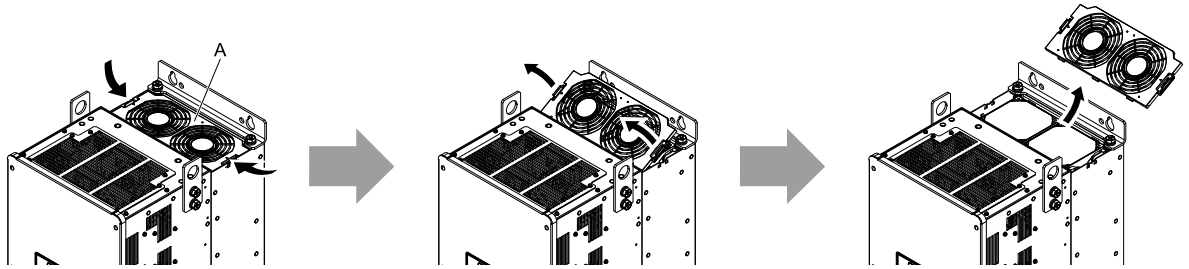
DANGER! *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge 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. The drive has internal capacitors that stay charged after you de-energize the drive.*

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 Fan

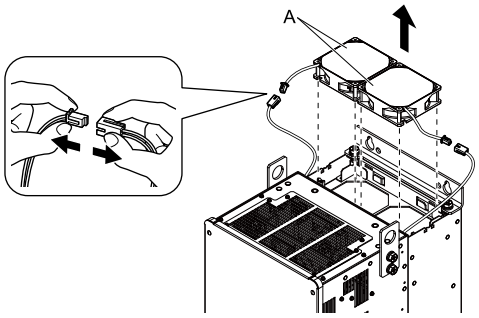
1. To remove the fan finger guard from the drive, push the tabs on the left and right sides of it and pull up the back side of the guard.



A - Fan finger guard

Figure 1.26 Remove the Fan Finger Guard

2. Pull the cooling fan straight up from the drive. Disconnect the power supply connector and remove the fan from the drive.



A - Cooling fan

Figure 1.27 Remove the Cooling Fans

■ Install the Cooling Fans

Reverse the removal procedure to install a cooling fan.

1. Connect the power supply connector.

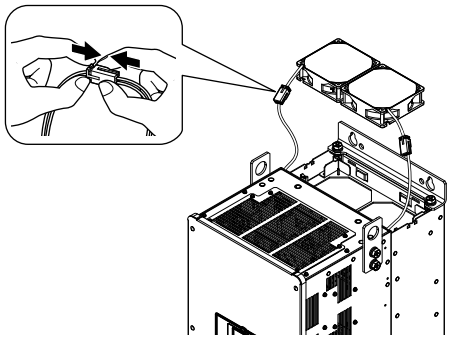
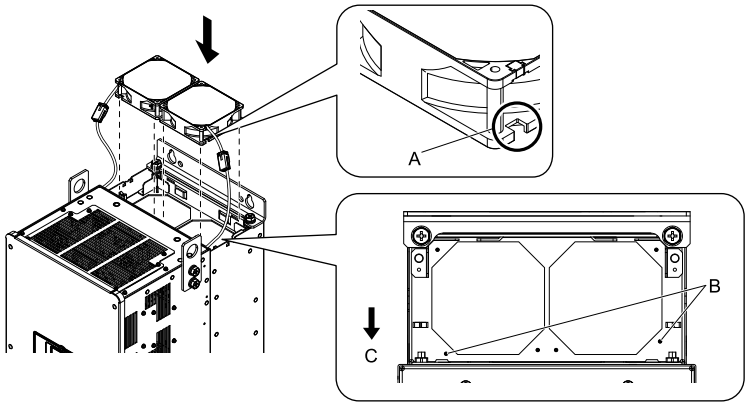


Figure 1.28 Connect the Power Supply Connector

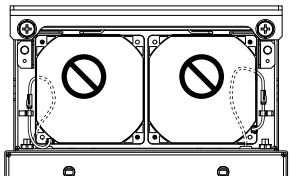
2. Align the notches on the fan with the pins on the drive and install the cooling fan in the drive.



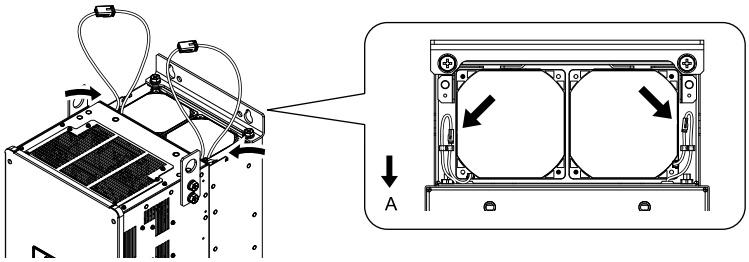
A - Notch on fan
B - Alignment pins on drive
C - Front of drive

Figure 1.29 Install the Cooling Fans

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



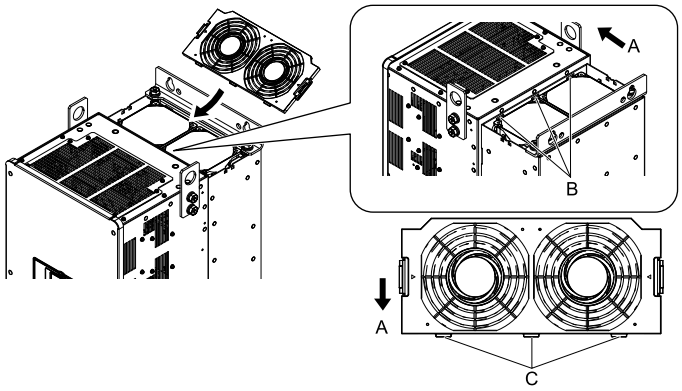
3. Put the cable in the recess of the drive.



A - Front of drive

Figure 1.30 Put the Cable in the Drive Recess

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 - Tab

Figure 1.31 Reattach the Fan Finger Guard

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

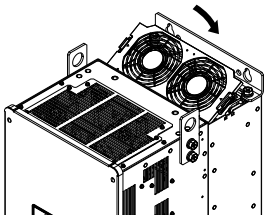


Figure 1.32 Reattach the Fan Finger Guard

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

◆ Replace Fans (Procedure F)

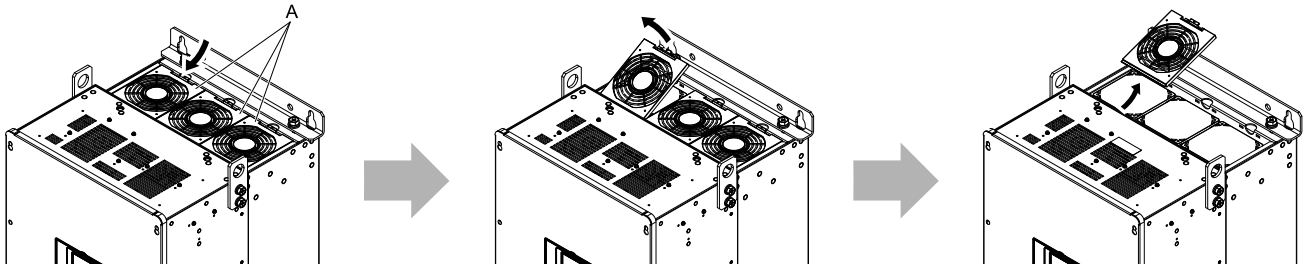
DANGER! *Electrical Shock Hazard. Do not examine, connect, or disconnect wiring on an energized drive. Before servicing, disconnect all power to the equipment and wait for the time specified on the warning label at a minimum. The internal capacitor stays charged after the drive is de-energized. The charge 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. The drive has internal capacitors that stay charged after you de-energize the drive.*

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 Fan

1. To remove the fan finger guards from the drive, push the hook on the back side of each guard and pull up.

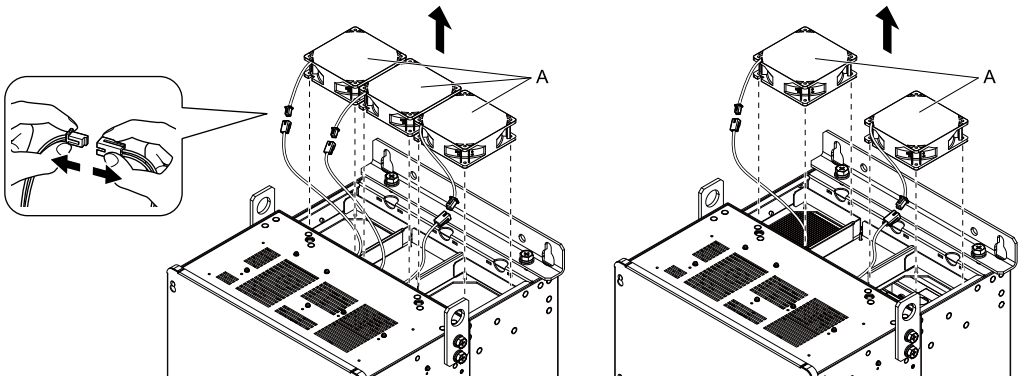


A - Fan finger guard

Figure 1.33 Remove the Fan Finger Guard

2. Pull the cooling fan straight up from the drive. Disconnect the power supply connector and remove the fan from the drive.

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



A - Cooling fan

Figure 1.34 Remove the Cooling Fans

■ Install the Cooling Fans

Reverse the removal procedure to install a fan unit.

1. Connect the power supply connector.

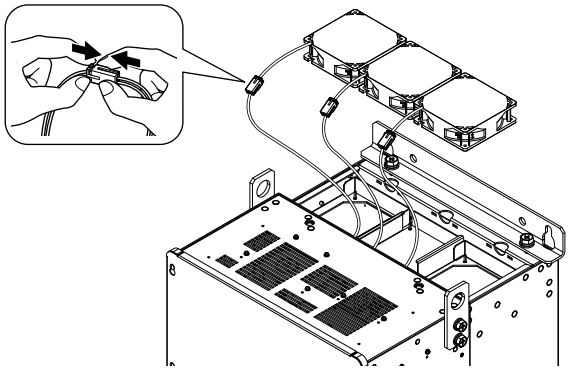
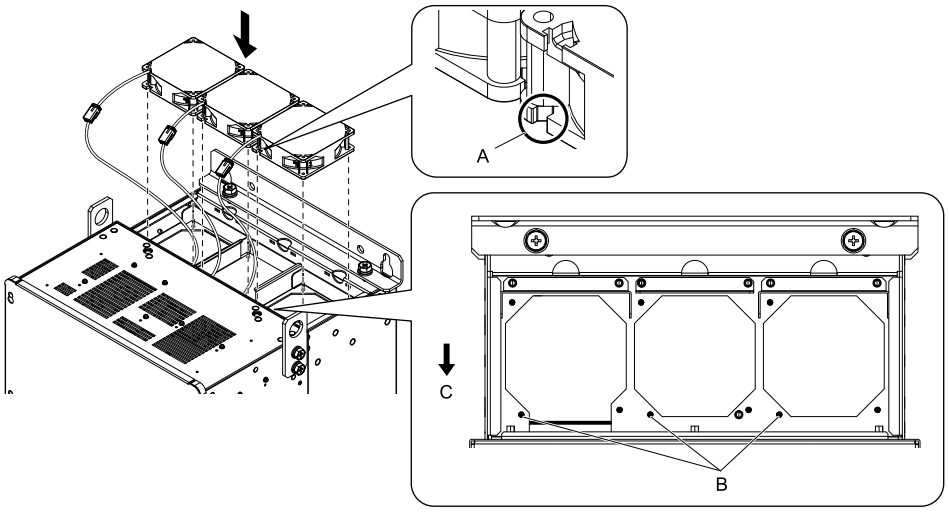


Figure 1.35 Connect the Power Supply Connector

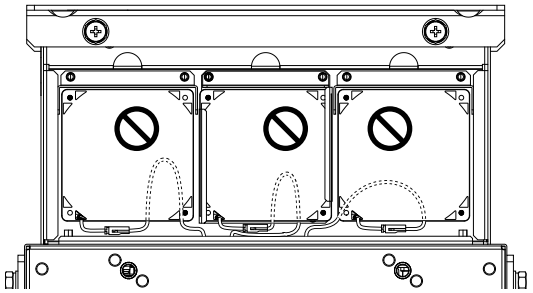
2. Align the notches on the fan with the pins on the drive and install the cooling fan in the drive.



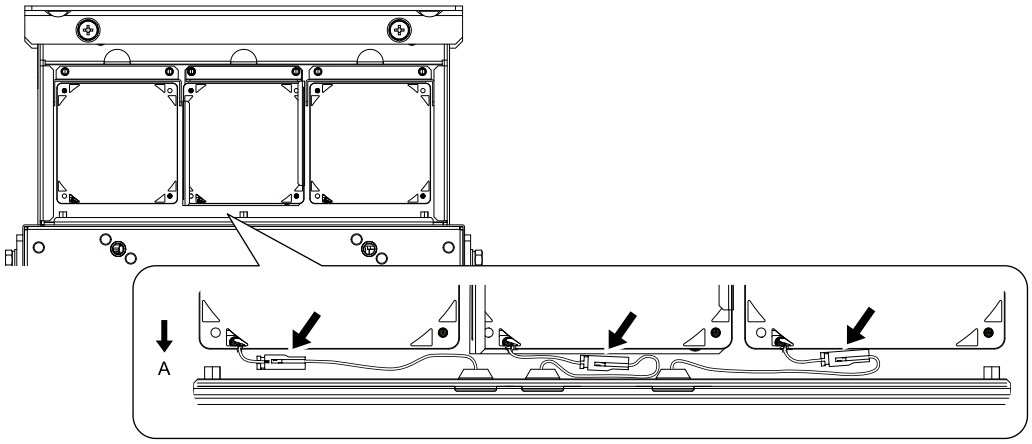
A - Notch on fan
B - Alignment pins on drive
C - Front of drive

Figure 1.36 Install the Cooling Fans

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



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

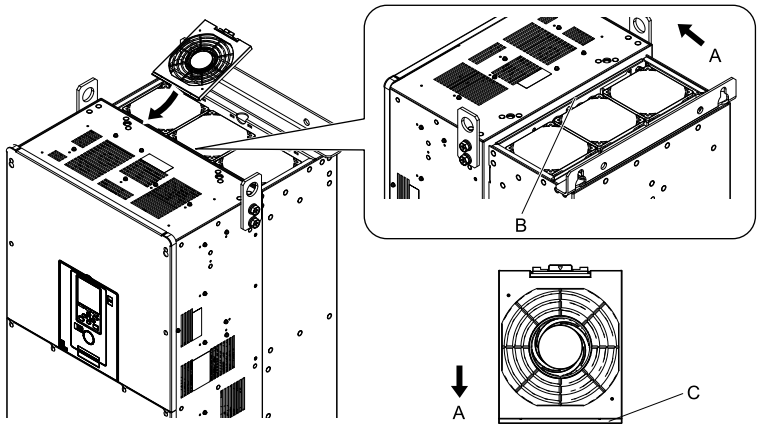


A - Front of drive

Figure 1.37 Put the Cable in the Drive Recess

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.

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 - Insertion area
C - Tab

Figure 1.38 Reattach the Fan Finger Guard

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

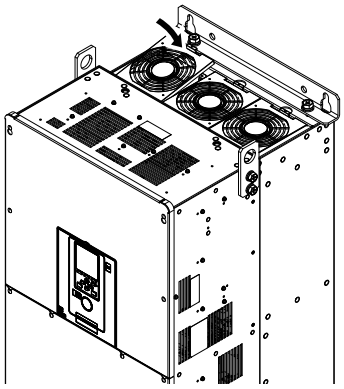


Figure 1.39 Reattach the Fan Finger Guard

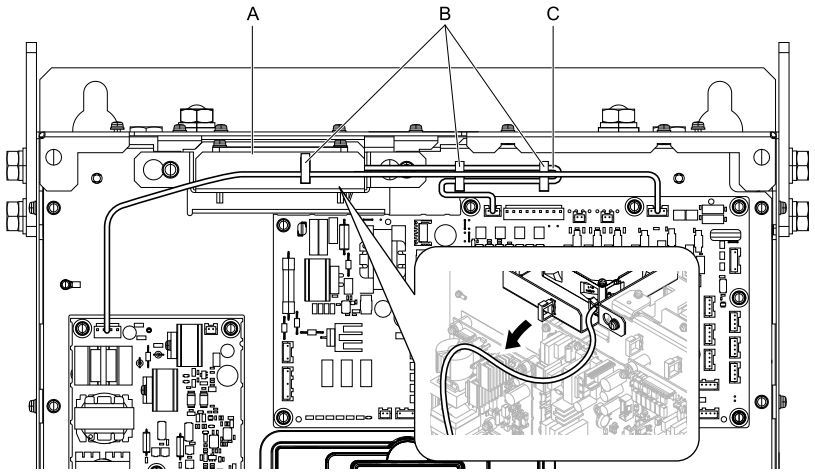
6. Energize the drive and set *o4-03 = 0 [Fan Operation Time Setting = 0 h]* to reset the cooling fan operation time.

■ Remove 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. Disconnect the cable from the hook.

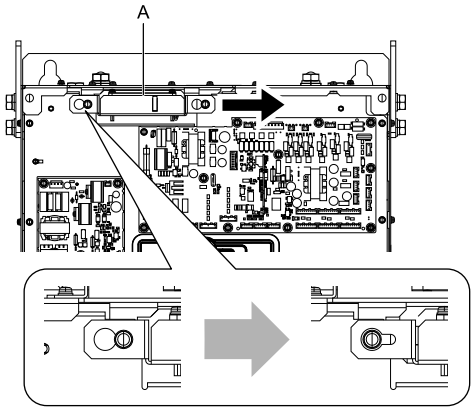


A - Fan unit
B - Hook
C - Fan cable

Figure 1.40 Components

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

Figure 1.41 Slide the Fan Unit

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

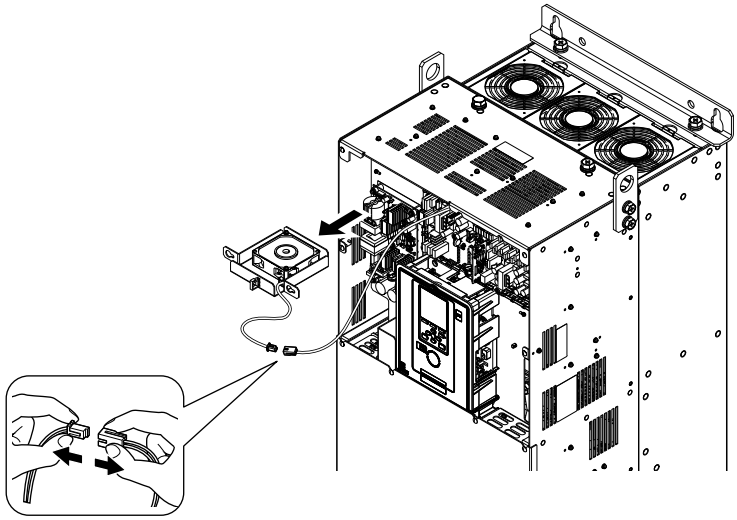
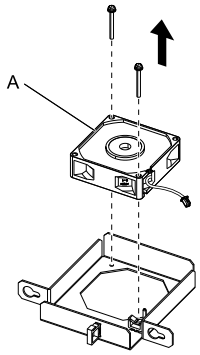


Figure 1.42 Remove the Fan Unit

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



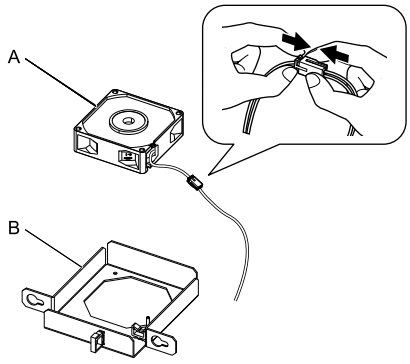
A - Cooling fan

Figure 1.43 Remove the Cooling Fan

■ Install Circulation Fan

Reverse the removal procedure to install a circulation fan.

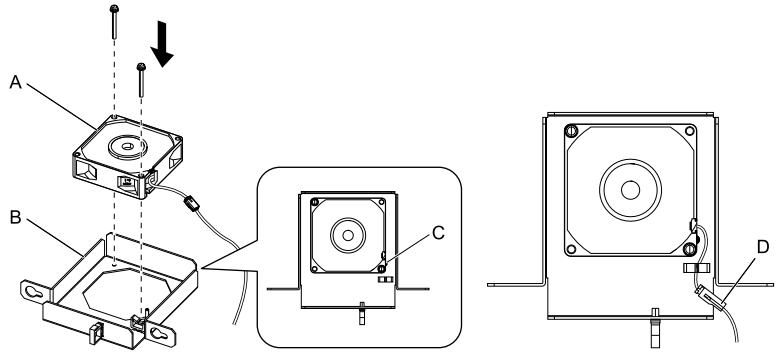
1. Connect the power supply connector.



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

Figure 1.44 Connect the Power Supply Connector

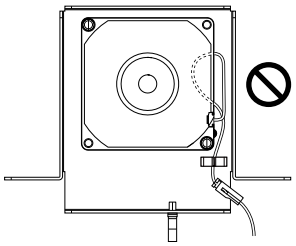
2. Align the pins on the fan unit base with the notches on the fan and put the fan unit base in the fan unit, then use the screws to safety it.
   Tighten the M4 screws to a tightening torque of 0.98 N·m to 1.33 N·m (8.67 lb.·in to 11.77 lb.·in).



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

Figure 1.45 Install the Cooling Fans

Note:
When you install the cooling fan, make sure that you do not pinch cables between the cooling fan and the fan unit base.



3. 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 tightening torque of 0.98 N·m to 1.33 N·m (8.67 lb.·in to 11.77 lb.·in).

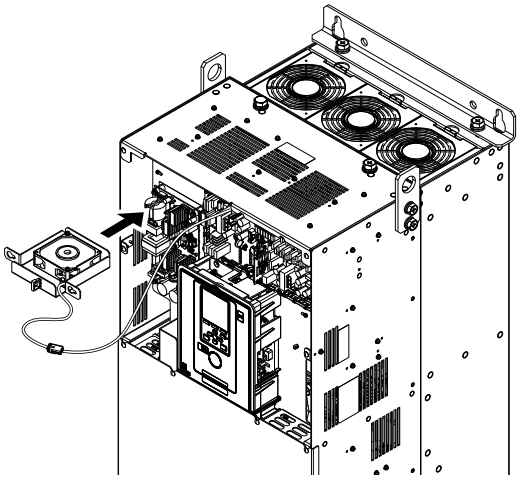
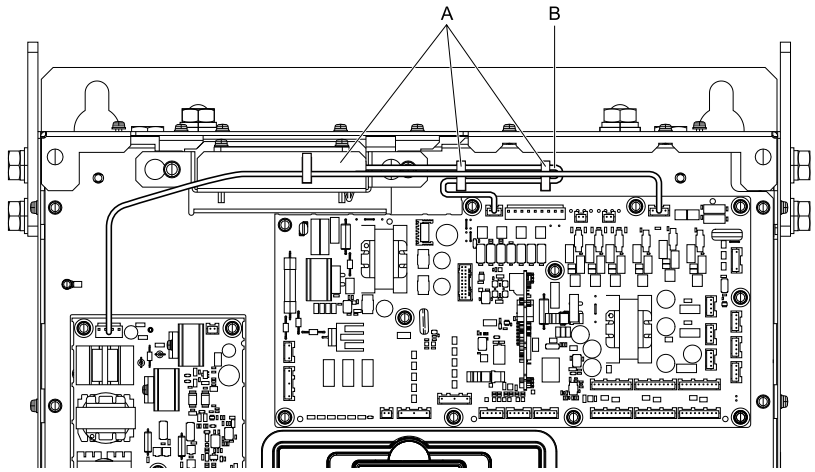


Figure 1.46 Install the Fan Unit

4. Hook the fan cable to the hook.



A - Hook **B - Fan cable**

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

◆ Replace Fans (Procedure G)

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. The drive has internal capacitors that stay charged after you de-energize the drive.*

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.*

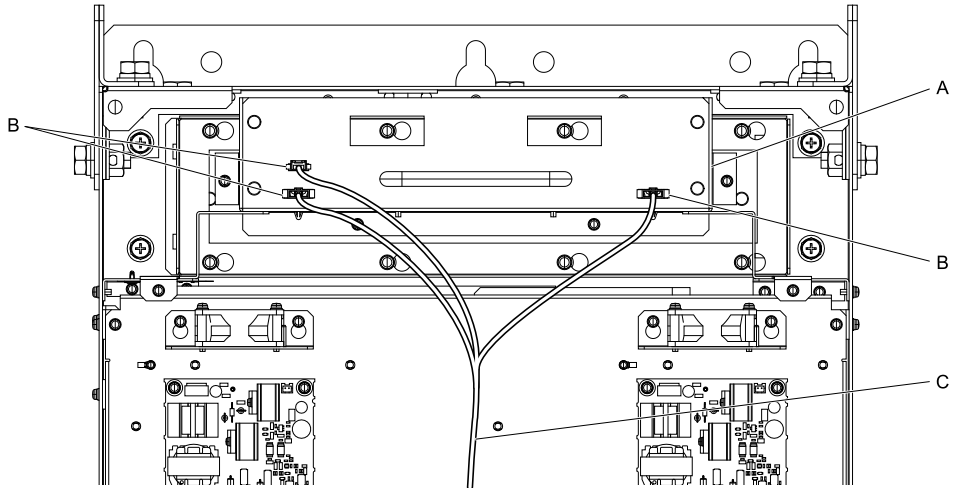
NOTICE: *Use the instructions in this manual to replace the cooling fans. When you do maintenance on the fans, replace all the fans to increase product life. If you install the fans incorrectly, it can cause damage to the drive.*

■ Remove a Fan

1. Remove the drive 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.*

2. Unplug the fan cables from the fan connectors.

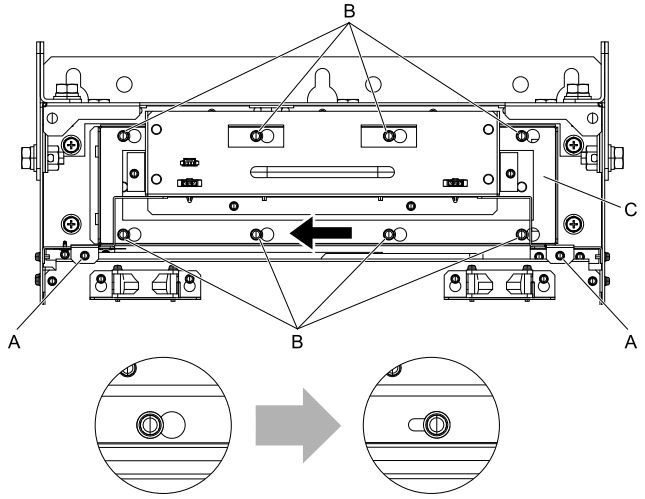


A - Fan unit
B - Fan connector
C - Fan cable

Figure 1.47 Components

3. Loosen the fan unit screws and slide the slide panel to the left.

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



A - Screws A
B - Screws B
C - Slide panel

Figure 1.48 Slide the Slide Panel

4. Remove the fan unit and the slide panel at the same time.

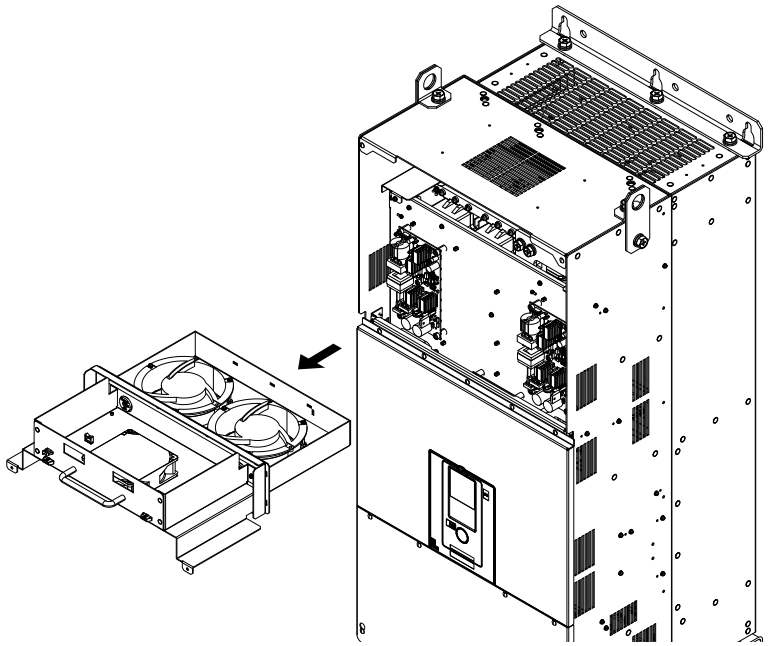
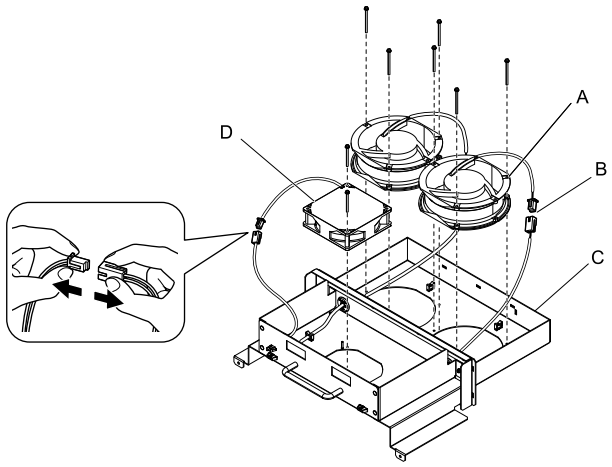


Figure 1.49 Remove the Fan Unit

5. Unplug the power supply connector, remove the screws that safety the cooling fan and circulation fan, and then remove the fans.



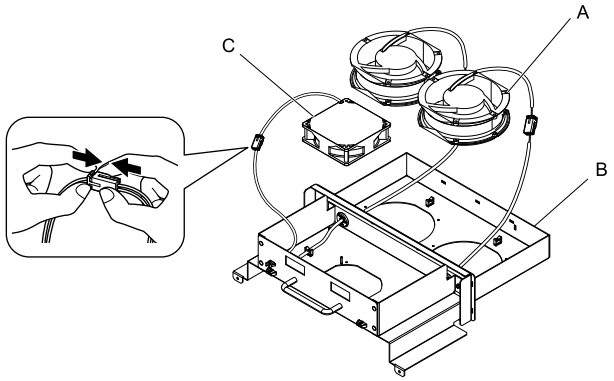
A - Cooling fan
B - Relay connector
C - Fan unit base
D - Circulation fan

Figure 1.50 Remove the Cooling Fans

■ Install the Cooling Fans

Reverse the removal procedure to install a cooling fan.

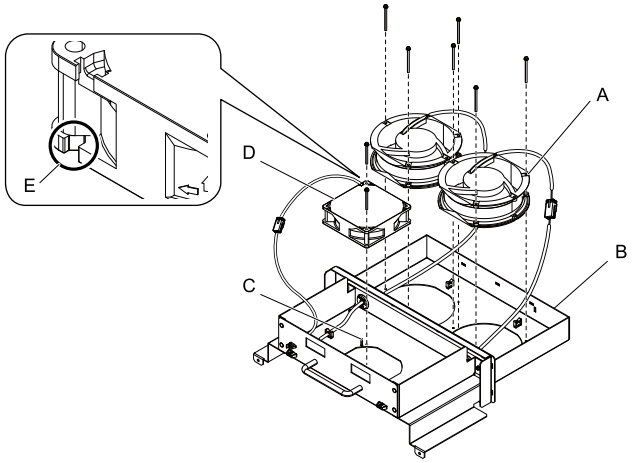
1. Connect the power supply connector.



A - Cooling fan
B - Fan unit base
C - Circulation fan

Figure 1.51 Connect the Power Supply Connector

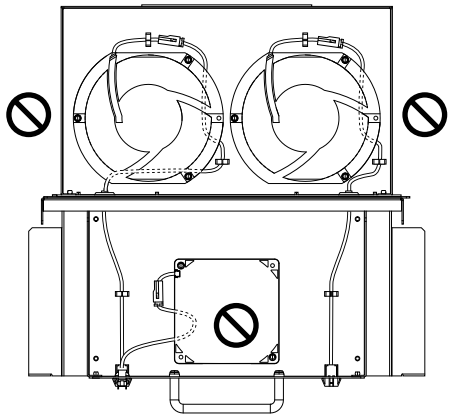
2. Align the pins on the fan unit base with the notches on the fan and put the fan unit base in the fan unit, then use the screws to safety it.
   Tighten the M4 screws to a tightening torque of 0.98 N·m to 1.33 N·m (8.67 lb.·in to 11.77 lb.·in).



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

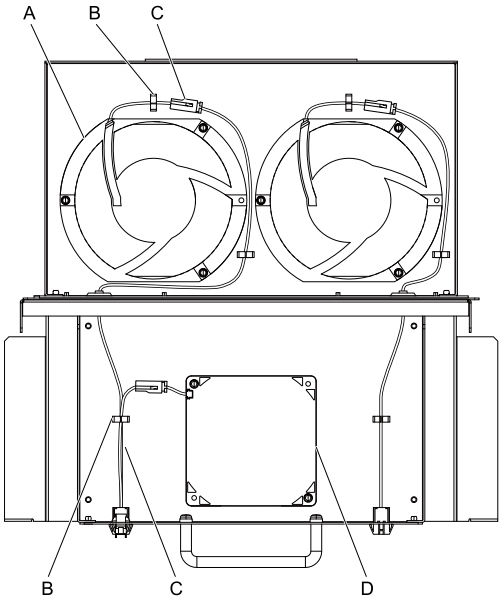
Figure 1.52 Install the Cooling Fans

Note:
When you install the cooling fan, make sure that you do not pinch cables between the cooling fan and the fan unit base.



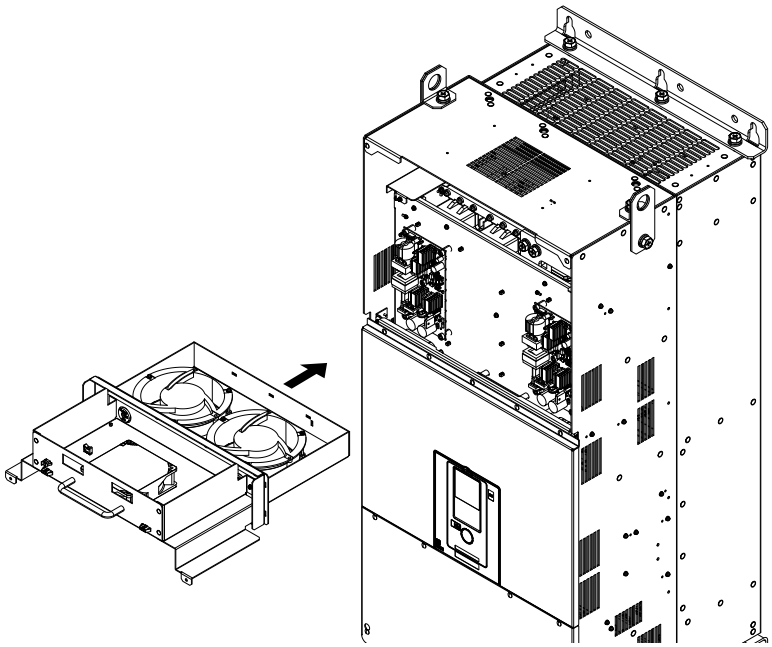
3. Put the cables in their initial locations.

Note:
Safety the relay cable to the hook.

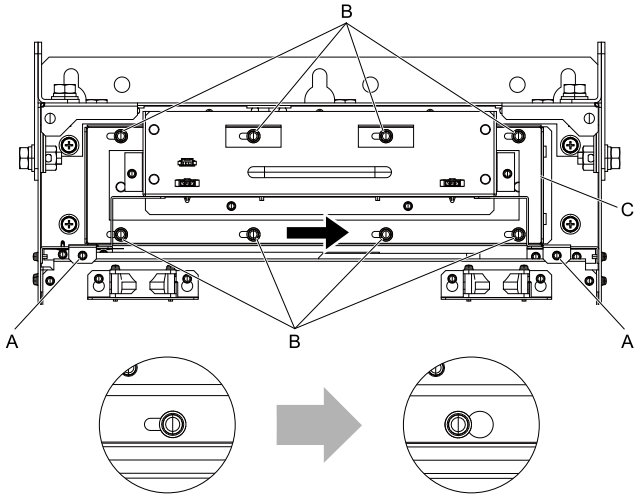


A - Cooling fan
B - Cable hook
C - Relay connector
D - Circulation fan

4. Put the fan unit back into its initial position.



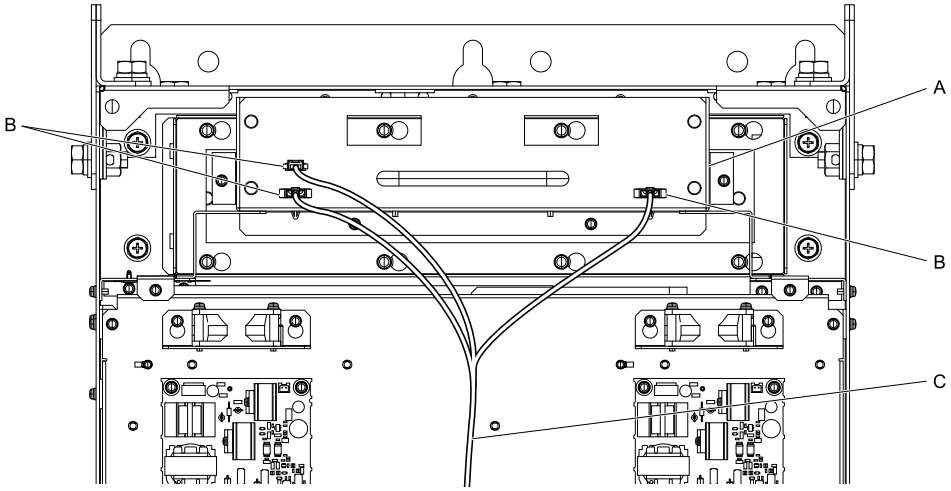
5. Slide the fan unit to the right and safety it with mounting screws.
   Tighten the screws to a tightening torque of 1.96 N·m to 2.53 N·m (17.35 lb.·in to 22.39 lb.·in).



A - Screws A
B - Screws B
C - Fan unit

Figure 1.53 Slide the Fan Unit

6. Connect the fan cable to the fan connector.



A - Fan unit
B - Fan connector
C - Fan cable

Figure 1.54 Connect Cooling Fan Connectors

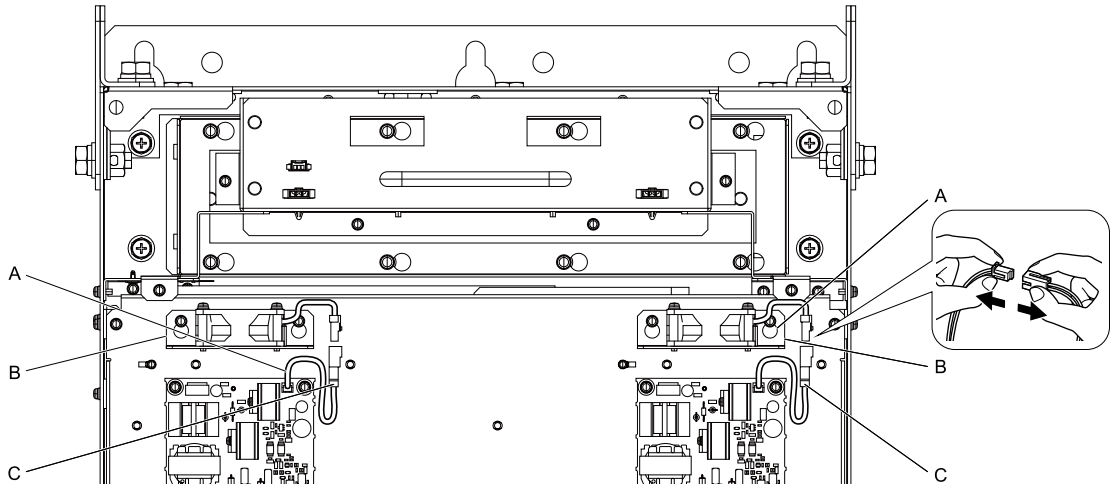
7. Reattach the drive cover.
8. Energize the drive and set *o4-03 = 0 [Fan Operation Time Setting = 0 h]* to reset the cooling fan operation time.

■ Remove the Circuit Board Cooling 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. Unplug the fan cables from the fan connectors.

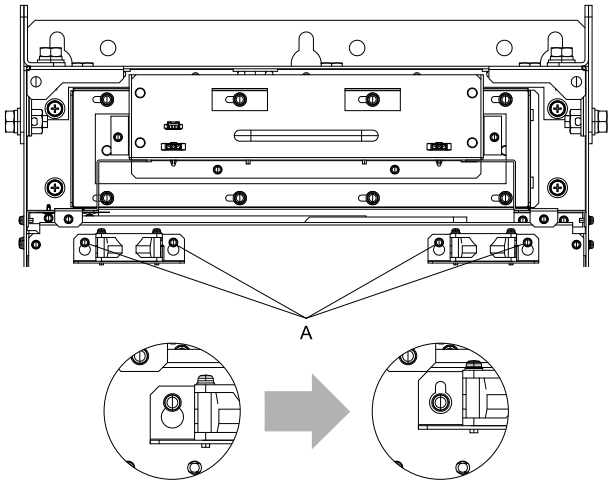


A - Fan cable
B - Circuit board cooling fan unit
C - Relay connector

Figure 1.55 Components

2. Loosen the circuit board cooling fan unit screws and slide the circuit board cooling fan unit up.

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



A - Screws

Figure 1.56 Slide the Circuit Board Cooling Fan Unit

3. Remove the circuit board cooling fan unit.

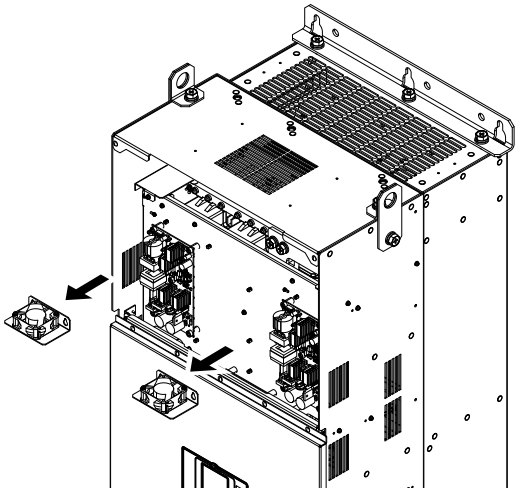
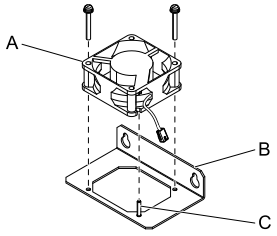


Figure 1.57 Remove the Circuit Board Cooling Fan Unit

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



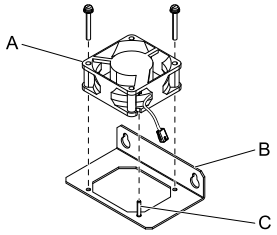
A - Circuit board cooling fan
B - Fan unit base
C - Alignment pin on fan unit base

Figure 1.58 Remove the Circuit Board Cooling Fan

■ Attach the Circuit Board Cooling Fan

Reverse the removal procedure to install a cooling fan.

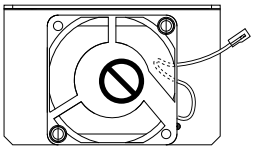
1. Align the pins on the fan unit base with the notches on the fan and put the circuit board cooling fan in the fan unit, then use the screws to safety the circuit board cooling fan to the fan unit base.
   Tighten the M4 screws to a tightening torque of 0.98 N·m to 1.33 N·m (8.67 lb.·in to 11.77 lb.·in).



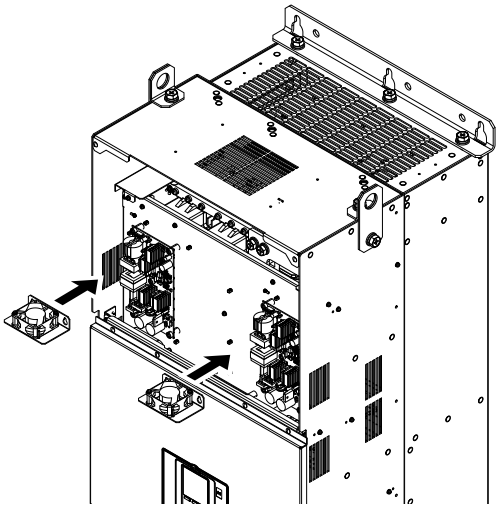
A - Circuit Board Cooling Fan
B - Fan unit base
C - Alignment pin on fan unit base

Figure 1.59 Attach the Circuit Board Cooling Fan

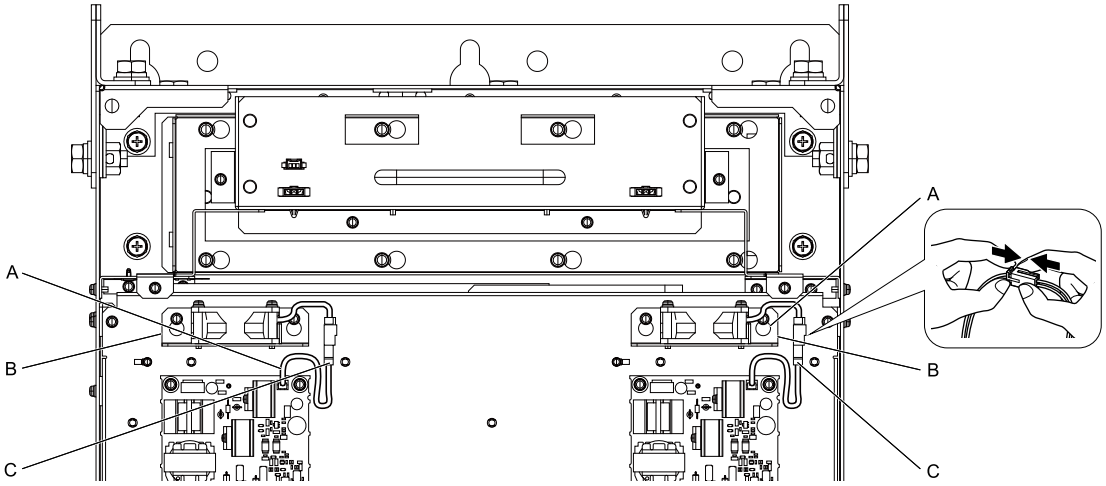
Note:
When you install the circuit board cooling fan, make sure that you do not pinch cables between the circuit board cooling fan and the fan unit base.



2. Install the circuit board cooling fan unit into the specified position, slide it down, and use the screws to safety it to the drive.
   Tighten the screws to a tightening torque of 0.98 N·m to 1.33 N·m (8.67 lb.·in to 11.77 lb.·in).



3. Connect the fan cable to the fan connector.



A - Fan cable
B - Circuit board cooling fan unit
C - Fan connector

Figure 1.60 Connect Cooling Fan Connectors

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

◆ Replace Fans (Procedure H)

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. The drive has internal capacitors that stay charged after you de-energize the drive.*

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.*

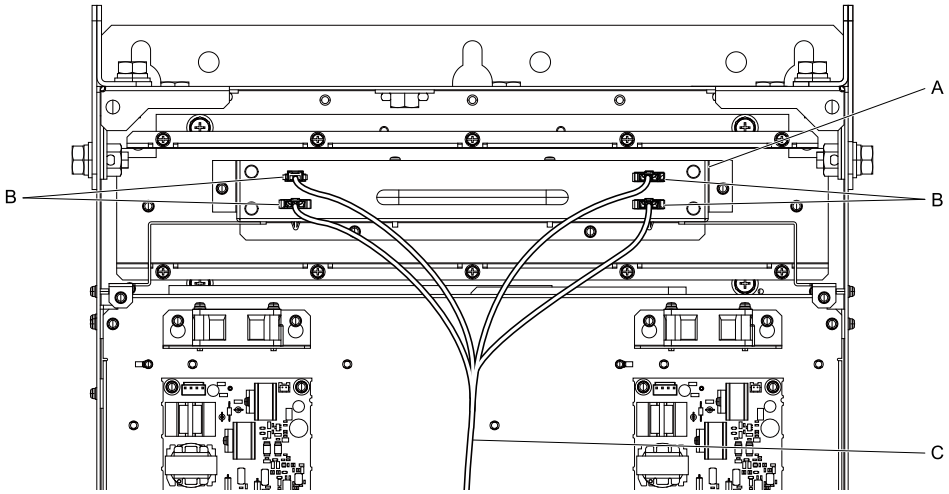
NOTICE: *Use the instructions in this manual to replace the cooling fans. When you do maintenance on the fans, replace all the fans to increase product life. If you install the fans incorrectly, it can cause damage to the drive.*

■ Remove a Fan

1. Remove the drive 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.*

2. Unplug the fan cables from the fan connectors.

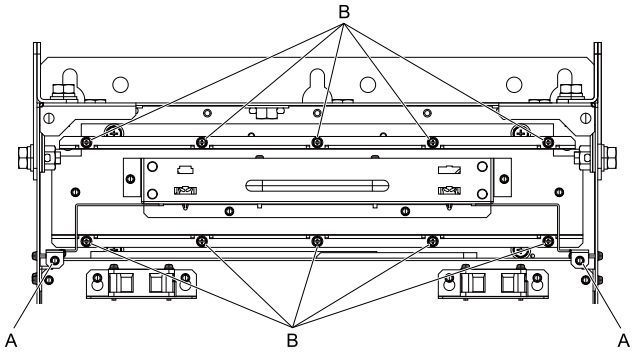


A - Fan unit **C - Fan cable**
B - Fan connector

Figure 1.61 Components

3. Loosen the fan unit screws.

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



A - Screws A **B - Screws B**

Figure 1.62 Loosen the Screws

4. Remove the fan unit.

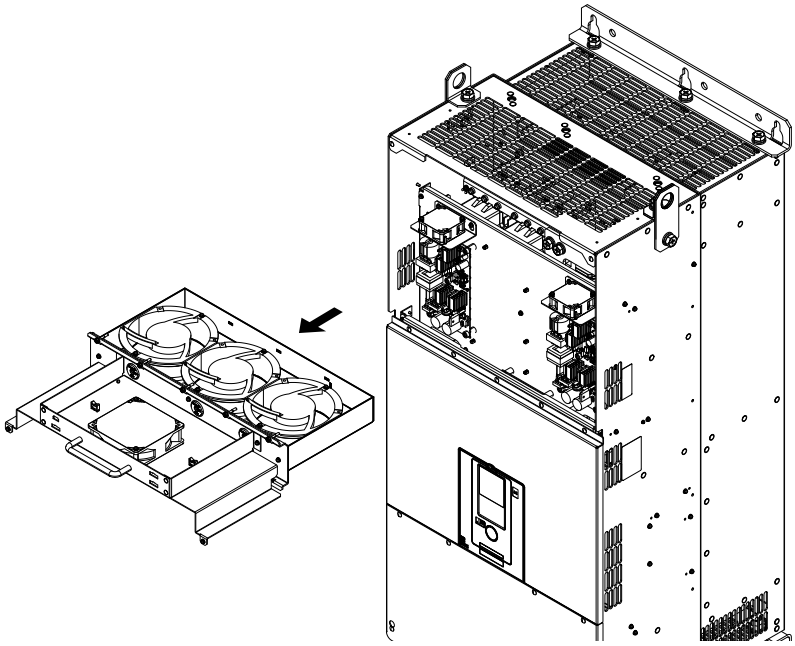
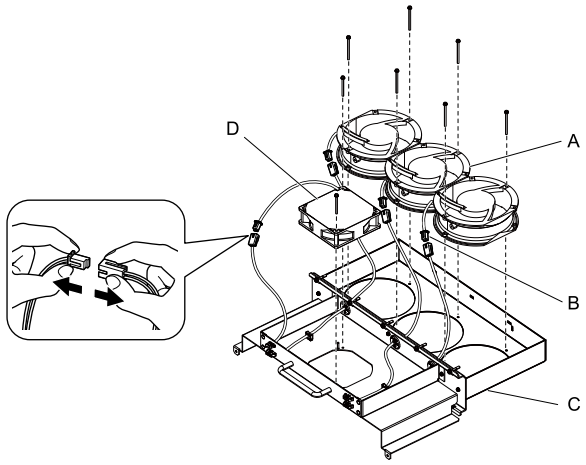


Figure 1.63 Remove the Fan Unit

5. Unplug the power supply connector, remove the screws that safety the cooling fan and circulation fan, and then remove the fans.



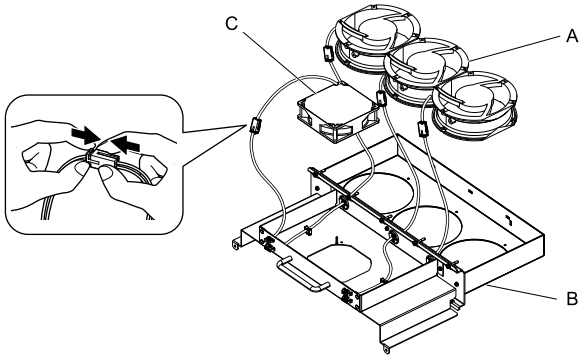
A - Cooling fan
B - Relay connector
C - Fan unit base
D - Circulation fan

Figure 1.64 Remove the Cooling Fans

■ Install the Cooling Fans

Reverse the removal procedure to install a cooling fan.

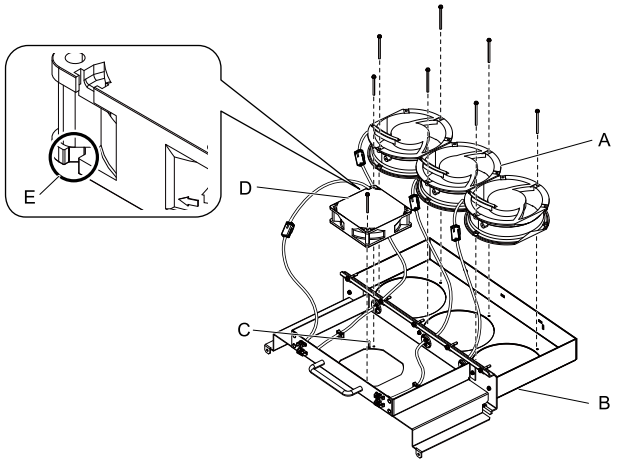
1. Connect the power supply connector.



A - Cooling fan
B - Fan unit base
C - Circulation fan

Figure 1.65 Connect the Power Supply Connector

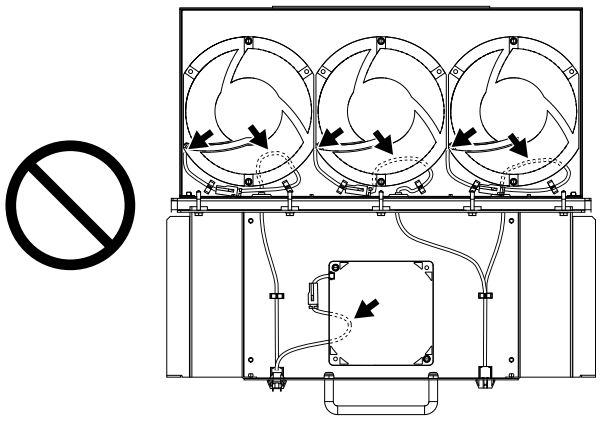
2. Align the pins on the fan unit base with the notches on the fan and put the fan unit base in the fan unit, then use the screws to safety it.
   Tighten the M4 screws to a tightening torque of 0.98 N·m to 1.33 N·m (8.67 lb.·in to 11.77 lb.·in).



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

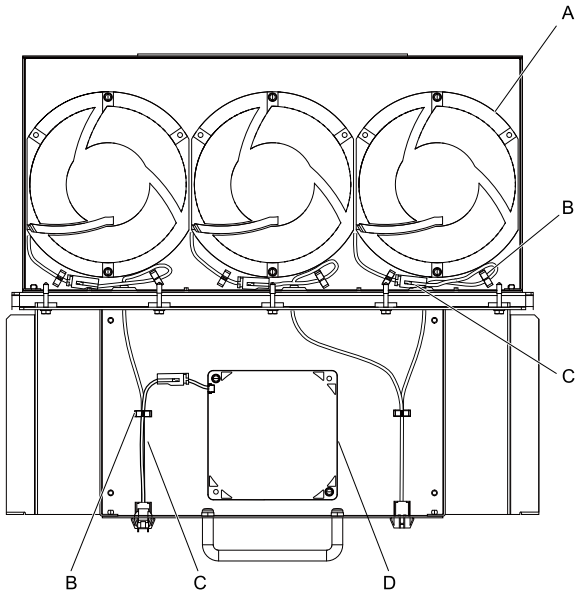
Figure 1.66 Install the Cooling Fans

Note:
When you install the cooling fan, make sure that you do not pinch cables between the cooling fan and the fan unit base or between cooling fans.



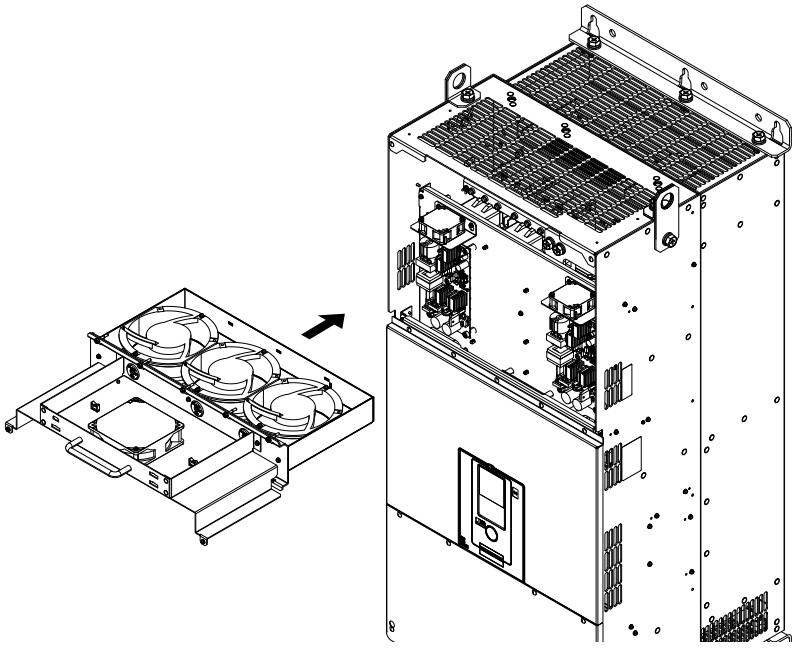
3. Put the cables in their initial locations.

Note:
Safety the relay cable to the hook.

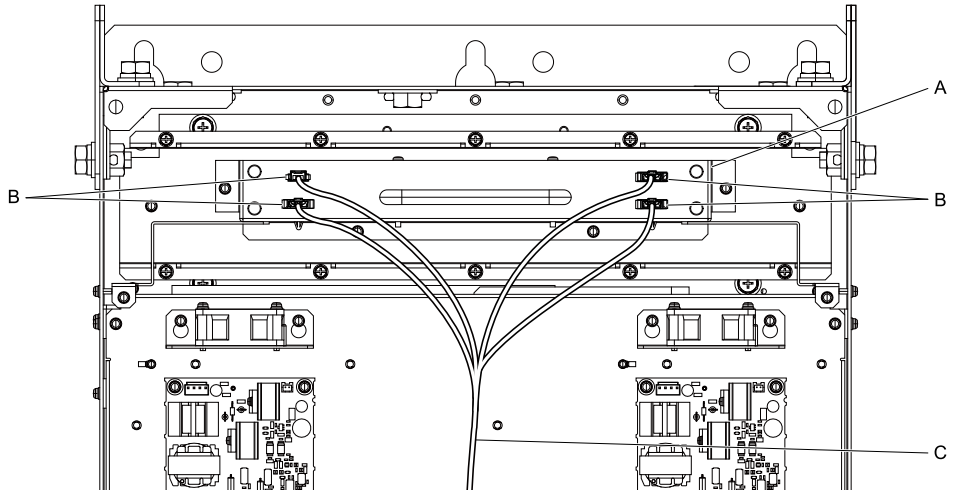


A - Cooling fan
B - Cable hook
C - Relay connector
D - Circulation fan

4. Put the fan unit into the specified location and use screws to safety it to the drive.
Tighten the screws to a tightening torque of 1.96 N·m to 2.53 N·m (17.35 lb.·in to 22.39 lb.·in).



5. Connect the fan cable to the fan connector.



A - Fan unit
B - Fan connector
C - Fan cable

Figure 1.67 Connect Cooling Fan Connectors

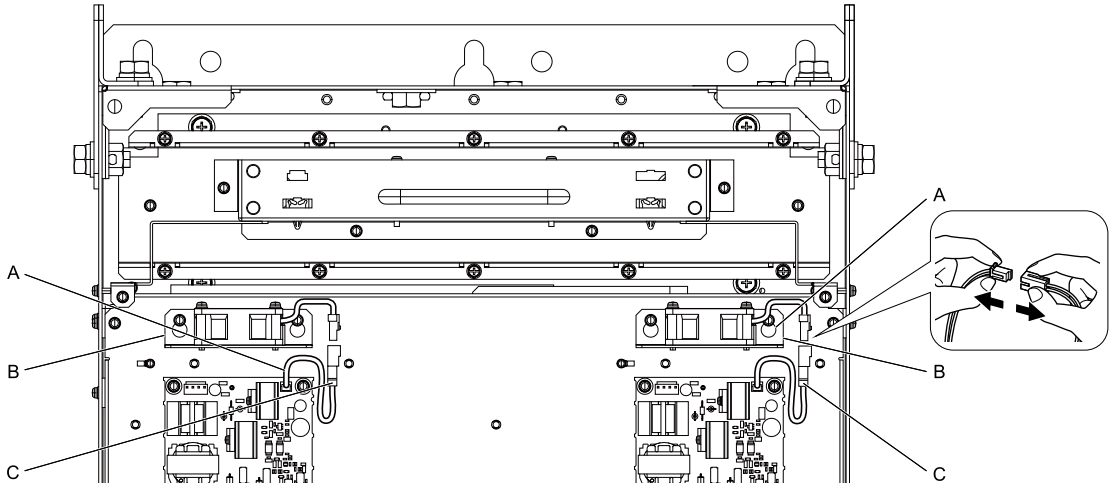
6. Install the drive cover.
7. Energize the drive and set *o4-03 = 0 [Fan Operation Time Setting = 0 h]* to reset the cooling fan operation time.

■ Remove the Circuit Board Cooling 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. Unplug the fan cables from the fan connectors.

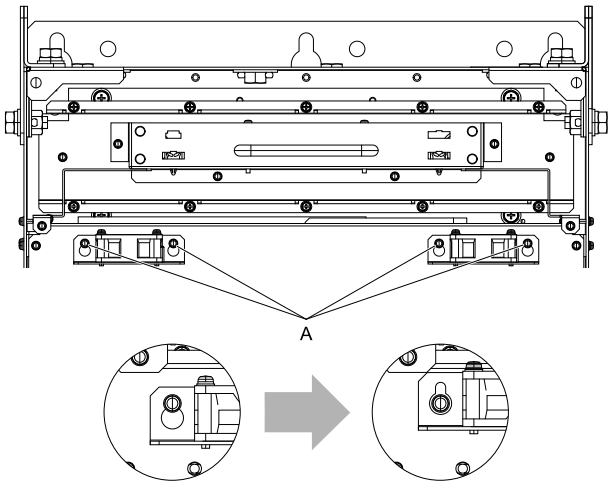


A - Fan cable
B - Circuit board cooling fan unit
C - Relay connector

Figure 1.68 Components

2. Loosen the circuit board cooling fan unit screws and slide the circuit board cooling fan unit up.

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



A - Screws

Figure 1.69 Slide the Circuit Board Cooling Fan Unit

3. Remove the circuit board cooling fan unit.

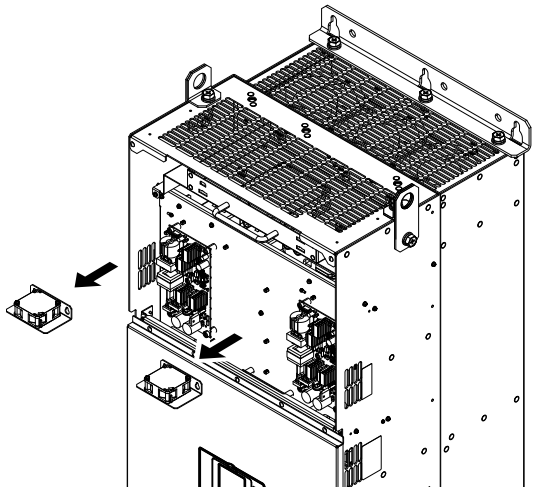
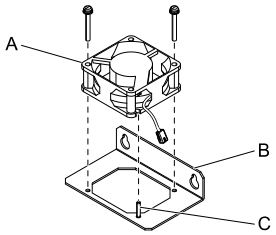


Figure 1.70 Remove the Circuit Board Cooling Fan Unit

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



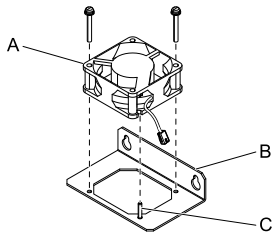
A - Circuit board cooling fan
B - Fan unit base
C - Alignment pin on fan unit base

Figure 1.71 Remove the Circuit Board Cooling Fan

■ Attach the Circuit Board Cooling Fan

Reverse the removal procedure to install a cooling fan.

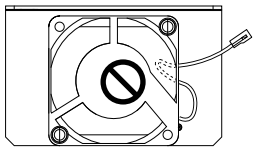
1. Align the pins on the fan unit base with the notches on the fan and put the circuit board cooling fan in the fan unit, then use the screws to safety the circuit board cooling fan to the fan unit base.
   Tighten the M4 screws to a tightening torque of 0.98 N·m to 1.33 N·m (8.67 lb.·in to 11.77 lb.·in).



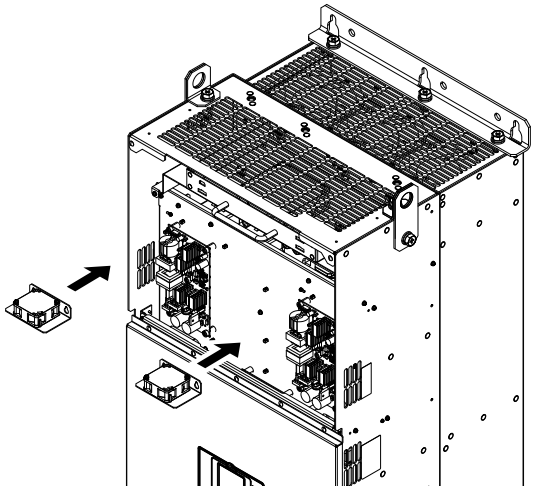
A - Circuit board cooling fan
B - Fan unit base
C - Alignment pin on fan unit base

Figure 1.72 Attach the Circuit Board Cooling Fan

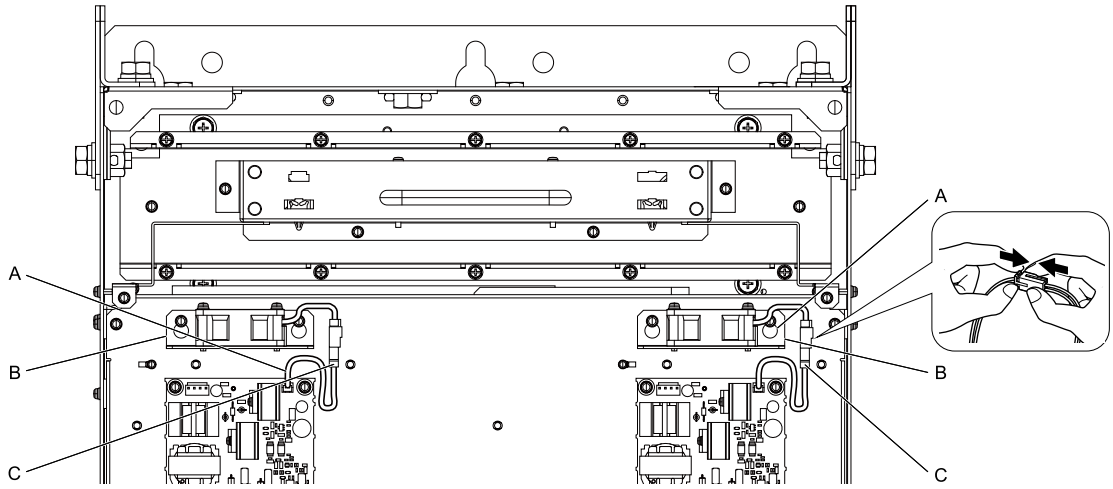
Note:
When you install the circuit board cooling fan, make sure that you do not pinch cables between the circuit board cooling fan and the fan unit base.



2. Put the fan unit into the specified location and use screws to safety it to the drive.
   Tighten the screws to a tightening torque of 0.98 N·m to 1.33 N·m (8.67 lb.·in to 11.77 lb.·in).



3. Connect the fan cable to the fan connector.



A - Fan cable
B - Circuit board cooling fan unit
C - Fan connector

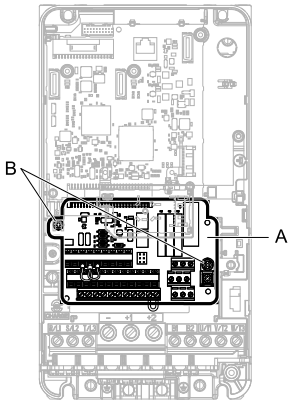
Figure 1.73 Connect Cooling Fan Connectors

4. Install the drive cover.
5. 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 Drive

◆ About the Control Circuit Terminal Block

You can remove the control circuit terminal block of the drive and install a new terminal block. If there is a failure in the drive, you can use this feature to easily replace the control circuit terminal block.



A - Control circuit terminal block

B - Control circuit terminal block fastening screw

Figure 1.74 Control Circuit Terminal Block

1.6 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! *Preventing Fire. Be careful when you touch the keypad battery. 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)

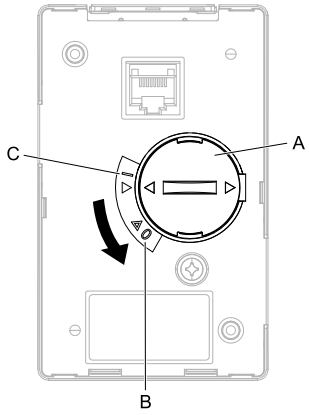
WARNING! *Preventing Fire. Do not disassemble the battery. Do not put the battery near heat or fire. If the battery explodes, it can cause a fire.*

NOTICE: *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 keypad battery stays in use after you de-energize the 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 to turn the battery cover counterclockwise and remove the cover.

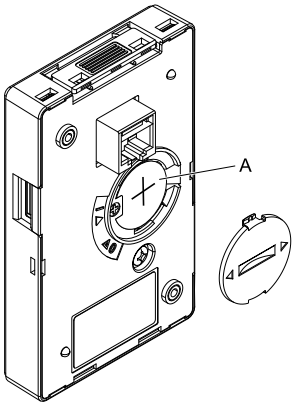


A - Battery cover **C - Closed**
B - Opened

Figure 1.75 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 1.76 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.

2

Troubleshooting

2.1 Section Safety 64
2.2 Types of Faults, Minor Faults, Alarms, and Errors 66
2.3 List of Fault, Minor Fault, Alarm, and Error Codes 67
2.4 Faults 73
2.5 Minor Faults/Alarms 93
2.6 Parameter Setting Errors 103
2.7 Auto-Tuning Errors 109
2.8 Backup Function Operating Mode Display and Errors 114
2.9 Diagnosing and Resetting Faults 116
2.10 Troubleshooting Without Fault Display 118

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. The drive has internal capacitors that stay charged after you de-energize the drive.

⚠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 serous 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.

Do not use the main circuit power supply (Overvoltage Category III) at incorrect voltages. Operate the drive in the specification 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

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

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 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. • 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: AEr (0032)

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

Display (Hex.)	Name	ALM LED	Type	Ref.
AEr (0032)	Station Address Setting Error	Flashing	Alarm	93
bAT (0085)	Keypad Battery Low Voltage	Flashing	Alarm	93
bAT (0402)	Keypad Battery Low Voltage	Illuminated	Faults	73
bb (0008)	Baseblock	Flashing	An alarm	93
bCE (008A)	Bluetooth Communication Error	Flashing	Alarm	93
bCE (0416)	Bluetooth Communication Fault	Illuminated	Faults	73
boL (0045)	Braking Transistor Overload	Flashing	Alarm	93
boL (004F)	BrakingTransistor Overload Fault	Illuminated	Faults	73
bUS (0015)	Option Communication Error	Flashing	Alarm	93
bUS (0022)	Option Communication Error	Illuminated	Faults	73
CALL (001D)	Serial Comm Transmission Error	Flashing	Alarm	94
CE (0014)	Modbus Communication Error	Flashing	Alarm	94
CE (0021)	Modbus Communication Error	Illuminated	Faults	73
CF (0025)	Control Fault	Illuminated	Faults	74
CoF (0046)	Current Offset Fault	Illuminated	Faults	74
CP1 (0087)	Comparator 1 Limit Error	Flashing	Alarm	94
CP1 (0414)	Comparator 1 Limit Error	Illuminated	Faults	74
CP2 (0088)	Comparator 2 Limit Error	Flashing	Alarm	94
CP2 (0415)	Comparator 2 Limit Error	Illuminated	Faults	75
CPEr	Control Mode Mismatch	-	Backup Function Runtime Errors	114
CPF00, CPF01 CPF02, CPF03 (0083, 0084) CPF07, CPF08 (0088, 0089) CPF11 - CPF14 (008C - 008F) CPF16 - CPF24 (0091 - 0099) CPF26 - CPF39 (009B - 00A8)	Control Circuit Error	Illuminated	Faults	75
CPF06 (0087)	EEPROM Memory Data Error	Illuminated	Faults	75
CPF25 (009A)	Terminal Board not Connected	Illuminated	Faults	75
CPyE	Error Writing Data	-	Backup Function Runtime Errors	114
CrST	Remove RUN Command to Reset	Flashing	Not an alarm.	95
CSEr	Control Mode Mismatch	-	Backup Function Runtime Errors	114
CyC (0033)	MECHATROLINK CommCycleSettingErr	Flashing	Alarm	95
CyPo (0029)	Cycle Power to Accept Changes	Flashing	Alarm	95
dEv (0011)	Speed Deviation	Flashing	Alarm	95
dEv (0019)	Speed Deviation	Illuminated	Faults	75
dFPS	Drive Model Mismatch	-	Backup Function Runtime Errors	114

Display (Hex.)	Name	ALM LED	Type	Ref.
dnE (002A)	Drive Disabled	Flashing	Alarm	95
dv1 (0032)	Z Pulse Fault	Illuminated	Faults	75
dv2 (0033)	Z Pulse Noise Fault Detection	Illuminated	Faults	76
dv3 (0034)	Inversion Detection	Illuminated	Faults	76
dv4 (0035)	Inversion Prevention Detection	Illuminated	Faults	76
dv7 (005B)	Polarity Judge Timeout	Illuminated	Faults	77
dWA2 (004A)	DriveWorksEZ Alarm 2	Flashing	Alarm	95
dWA3 (004B)	DriveWorksEZ Alarm 3	Flashing	Alarm	95
dWAL (0049)	DriveWorksEZ Alarm	Flashing	Alarm	95
dWF1 (004A)	EEPROM Memory DWEZ Data Error	Illuminated	Faults	77
dWF2 (004B)	DriveWorksEZ Fault 2	Illuminated	Faults	77
dWF3 (004C)	DriveWorksEZ Fault 3	Illuminated	Faults	77
dWFL (0049)	DriveWorksEZ Fault	Illuminated	Faults	77
E5 (0031)	MECHATROLINK Watchdog Timer Err	Flashing	Alarm	95
E5 (0039)	MECHATROLINK Watchdog Timer Err	Illuminated	Faults	77
EF (0007)	FWD/REV Run Command Input Error	Flashing	Alarm	96
EF0 (001A)	Option Card External Fault	Flashing	Alarm	96
EF0 (0027)	Option Card External Fault	Illuminated	Faults	77
EF1 (0042)	External Fault (Terminal S1)	Illuminated	Faults	78
EF1 (0039)	External Fault (Terminal S1)	Flashing	Alarm	96
EF2 (003A)	External Fault (Terminal S2)	Flashing	Alarm	96
EF2 (0043)	External Fault (Terminal S2)	Illuminated	Faults	78
EF3 (0009)	External Fault (Terminal S3)	Flashing	Alarm	96
EF3 (0011)	External Fault (Terminal S3)	Illuminated	Faults	78
EF4 (000A)	External Fault (Terminal S4)	Flashing	Alarm	96
EF4 (0012)	External Fault (Terminal S4)	Illuminated	Faults	78
EF5 (000B)	External Fault (Terminal S5)	Flashing	Alarm	96
EF5 (0013)	External Fault (Terminal S5)	Illuminated	Faults	78
EF6 (000C)	External Fault (Terminal S6)	Flashing	Alarm	97
EF6 (0014)	External Fault (Terminal S6)	Illuminated	Faults	78
EF7 (000D)	External Fault (Terminal S7)	Flashing	Alarm	97
EF7 (0015)	External Fault (Terminal S7)	Illuminated	Faults	79
EF8 (000E)	External Fault (Terminal S8)	Flashing	Alarm	97
EF8 (0016)	External Fault (Terminal S8)	Illuminated	Faults	79
End1	Excessive Rated Voltage Setting	Flashing	An Auto-Tuning Error	109
End2	Iron Core Saturation Coefficient	Flashing	An Auto-Tuning Error	109
End3	Rated Current Setting Alarm	Flashing	An Auto-Tuning Error	109
End4	Adjusted Slip Calculation Error	Flashing	An Auto-Tuning Error	109
End5	Resistance Tuning Error	Flashing	An Auto-Tuning Error	109
End6	Leakage Inductance Alarm	Flashing	An Auto-Tuning Error	109
End7	No-Load Current Alarm	Flashing	An Auto-Tuning Error	109
End8	HFI Alarm	Flashing	An Auto-Tuning Error	110
End9	Initial Pole Detection Alarm	Flashing	An Auto-Tuning Error	111

Display (Hex.)	Name	ALM LED	Type	Ref.
EP24v (0081)	External Power 24V Supply	Flashing	An alarm	97
Er-01	Motor Data Error	Flashing	An Auto-Tuning Error	109
Er-02	Drive in an Alarm State	Flashing	An Auto-Tuning Error	110
Er-03	STOP Button was Pressed	Flashing	An Auto-Tuning Error	110
Er-04	Line-to-Line Resistance Error	Flashing	An Auto-Tuning Error	110
Er-05	No-Load Current Error	Flashing	An Auto-Tuning Error	110
Er-08	Rated Slip Error	Flashing	An Auto-Tuning Error	111
Er-09	Acceleration Error	Flashing	An Auto-Tuning Error	111
Er-10	Motor Direction Error	Flashing	An Auto-Tuning Error	111
Er-11	Motor Speed Error	Flashing	An Auto-Tuning Error	111
Er-12	Current Detection Error	Flashing	An Auto-Tuning Error	111
Er-13	Leakage Inductance Error	Flashing	An Auto-Tuning Error	112
Er-14	Motor Speed Error 2	Flashing	An Auto-Tuning Error	112
Er-15	Torque Saturation Error	Flashing	An Auto-Tuning Error	112
Er-16	Inertia ID Error	Flashing	An Auto-Tuning Error	112
Er-17	Reverse Prohibited Error	Flashing	An Auto-Tuning Error	112
Er-18	Back EMF Error	Flashing	An Auto-Tuning Error	112
Er-19	PM Inductance Error	Flashing	An Auto-Tuning Error	112
Er-20	Stator Resistance Error	Flashing	An Auto-Tuning Error	112
Er-21	Z Pulse Correction Error	Flashing	An Auto-Tuning Error	112
Er-25	HighFreq Inject Param Tuning Err	Flashing	An Auto-Tuning Error	113
Err (001F)	EEPROM Write Error	Illuminated	Faults	79
FAn1 (0413)	Drive Cooling Fan Fault	Illuminated	Faults	79
FbH (0028)	Excessive PID Feedback	Flashing	Alarm	97
FbH (0041)	Excessive PID Feedback	Illuminated	Faults	79
FbL (0027)	PID Feedback Loss	Flashing	Alarm	97
FbL (0028)	PID Feedback Loss	Illuminated	Faults	79
GF (0006)	Ground Fault	Illuminated	Faults	80
HCA (0034)	High Current Alarm	Flashing	Alarm	98
HLCE	High Level Communication Errors	Illuminated	Faults	80
iFEr	Communication Err	-	Backup Function Runtime Errors	114
L24v (0021)	Loss of External Power 24 Supply	Flashing	An alarm	98
LF (001C)	Output Phase Loss	Illuminated	Faults	80
LF2 (0036)	Output Current Imbalance	Illuminated	Faults	80
LoG	Log Com Error	Flashing	An alarm	98
LSo (0051)	Low Speed Motor Step-Out	Illuminated	Faults	81
LT-1 (0035)	Cooling Fan Maintenance Time	Flashing	An alarm	98
LT-2 (0036)	Capacitor Maintenance Time	Flashing	An alarm	98
LT-3 (0043)	SoftChargeBypassRelay MainteTime	Flashing	An alarm	98
LT-4 (0044)	IGBT Maintenance Time (50%)	Flashing	An alarm	98
ndAT	Model,VolClass,Capacity Mismatch	-	Backup Function Runtime Errors	114
nSE (0052)	Node Setup Error	Illuminated	Faults	81
oC (0007)	Overcurrent	Illuminated	Faults	81

Display (Hex.)	Name	ALM LED	Type	Ref.
oFA00 (0101)	Option Not Compatible with Port	Illuminated	Faults	82
oFA01 (0102)	Option Fault/Connection Error	Illuminated	Faults	82
oFA02 (0103)	Duplicate Options	Illuminated	Faults	82
oFA03 - oFA06 (0104 - 0107)	Option Card Error Occurred at Option Port CN5-A	Illuminated	Faults	82
oFA10, oFA11 (0111, 0112)	Option Card Error Occurred at Option Port CN5-A	Illuminated	Faults	83
oFA12 - oFA17 (0113 - 0118)	Option Card Connection Error (CN5-A)	Illuminated	Faults	83
oFA30 - oFA43 (0131 - 013E)	Communication Option Card Connection Error (CN5-A)	Illuminated	Faults	83
oFb00 (0201)	Option Not Compatible with Port	Illuminated	Faults	83
oFb01 (0202)	Option Fault/Connection Error	Illuminated	Faults	83
oFb02 (0203)	Duplicate Options	Illuminated	Faults	83
oFb03 - oFb11 (0204 - 0212)	Option Card Error Occurred at Option Port CN5-B	Illuminated	Faults	83
oFb12 - oFb17 (0213 - 0218)	Option Card Connection Error (CN5-B)	Illuminated	Faults	83
oFC00 (0301)	Option Not Compatible with Port	Illuminated	Faults	84
oFC01 (0302)	Option Fault/Connection Error	Illuminated	Faults	84
oFC02 (0303)	Duplicate Options	Illuminated	Faults	84
oFC03 - oFC11 (0304 - 0312)	Option Card Error Occurred at Option Port CN5-C	Illuminated	Faults	84
oFC12 - oFC17 (0313 - 0318)	Option Card Connection Error (CN5-C)	Illuminated	Faults	84
oFC50 - oFC55 (0351 - 0356)	Option Card Error Occurred at Option Port CN5-C	Illuminated	Faults	84
oH (0003)	Heatsink Overheat	Flashing	Alarm	99
oH (0009)	Heatsink Overheat	Illuminated	Faults	84
oH1 (000A)	Heatsink Overheat	Illuminated	Faults	85
oH2 (0004)	External Overheat (H1-XX=B)	Flashing	Alarm	99
oH3 (001D)	Motor Overheat (PTC Input)	Illuminated	Faults	85
oH3 (0022)	Motor Overheat (PTC Input)	Flashing	Alarm	99
oH4 (0020)	Motor Overheat Fault (PTC Input)	Illuminated	Faults	85
oL1 (000B)	Motor Overload	Illuminated	Faults	85
oL2 (000C)	Drive Overload	Illuminated	Faults	86
oL3 (0005)	Overtorque 1	Flashing	Alarm	99
oL3 (000D)	Overtorque Detection 1	Illuminated	Faults	87
oL4 (0006)	Overtorque 2	Flashing	Alarm	100
oL4 (000E)	Overtorque Detection 2	Illuminated	Faults	87
oL5 (003D)	Mechanical Weakening Detection 1	Flashing	Alarm	100
oL5 (0044)	Mechanical Weakening Detection 1	Illuminated	Faults	87
oL7 (002B)	High Slip Braking Overload	Illuminated	Faults	87
oPE01	Drive Capacity Setting Fault	Flashing	Parameter Setting Errors	103
oPE02	Parameter Range Setting Error	Flashing	Parameter Setting Errors	103
oPE03	Multi-Function Input Setting Err	Flashing	Parameter Setting Errors	103
oPE05	Run Cmd/Freq Ref Source Sel Err	Flashing	Parameter Setting Errors	104
oPE06	Control Method Selection Error	Flashing	Parameter Setting Errors	105
oPE07	Analog Input Selection Error	Flashing	Parameter Setting Errors	105
oPE08	Parameter Selection Error	Flashing	Parameter Setting Errors	105
oPE09	PID Control Selection Fault	Flashing	Parameter Setting Errors	106
oPE10	V/f Data Setting Error	Flashing	Parameter Setting Errors	106

Display (Hex.)	Name	ALM LED	Type	Ref.
oPE11	Carrier Frequency Setting Error	Flashing	Parameter Setting Errors	106
oPE13	Pulse Monitor Selection Error	Flashing	Parameter Setting Errors	107
oPE15	Torque Control Setting Error	Flashing	Parameter Setting Errors	107
oPE16	Energy Saving Constants Error	Flashing	Parameter Setting Errors	107
oPE18	Online Tuning Param Setting Err	Flashing	Parameter Setting Errors	107
oPE20	PG-F3 Setting Error	Flashing	Parameter Setting Errors	107
oPE33	Digital Output Selection Error	Flashing	Parameter Setting Errors	108
oPr (001E)	Keypad Connection Fault	Illuminated	Faults	88
oS (0010)	Overspeed	Flashing	Alarm	100
oS (0018)	Overspeed	Illuminated	Faults	88
ov (0002)	DC Bus Overvoltage	Flashing	Alarm	100
ov (0008)	Overvoltage	Illuminated	Faults	88
PASS	Modbus Communication Test	Flashing	Not an alarm.	100
PE1 (0047) PE2 (0048)	PLC Faults	Illuminated	Faults	89
PF (0047)	Input Phase Loss	Flashing	Alarm	100
PF (001B)	Input Phase Loss	Illuminated	Faults	89
PGo (0012)	Encoder (PG) Feedback Loss	Flashing	Alarm	101
PGo (001A)	Encoder (PG) Feedback Loss	Illuminated	Faults	89
PGoH (002B)	Encoder (PG) Hardware Fault	Flashing	Alarm	101
PGoH (0038)	Encoder (PG) Hardware Fault	Illuminated	Faults	90
PWEr	DWEZ Password Mismatch	-	Backup Function Runtime Errors	114
rdEr	Error Reading Data	-	Backup Function Runtime Errors	115
rF (004E)	Braking Resistor Fault	Illuminated	Faults	90
rH (0010)	Braking Resistor Overheat	Illuminated	Faults	90
rr (000F)	Dynamic Braking Transistor Fault	Illuminated	Faults	90
rUn (001B)	Motor Switch during Run	Flashing	Alarm	101
SC (0005)	Short Circuit/IGBT Failure	Illuminated	Faults	90
SCF (040F)	Safety Circuit Fault	Illuminated	Faults	91
SE (0020)	Modbus Test Mode Error	Flashing	Alarm	101
SEr (003B)	Speed Search Retries Exceeded	Illuminated	Faults	91
STo (003C)	Safe Torque OFF	-	An alarm	101
SToF (003B)	Safe Torque OFF	Flashing	Alarm	101
STPo (0037)	Motor Step-Out Detected	Illuminated	Faults	91
SvE (0026)	Zero Servo Fault	Illuminated	Faults	91
TiM (0089)	Keypad Time Not Set	Flashing	Alarm	102
TiM (0401)	Keypad Time Not Set	Illuminated	Faults	91
TrPC (0042)	IGBT Maintenance Time (90%)	Flashing	Alarm	102
UL3 (001E)	Undertorque Detection 1	Flashing	Alarm	102
UL3 (0029)	Undertorque Detection 1	Illuminated	Faults	91
UL4 (001F)	Undertorque Detection 2	Flashing	Alarm	102
UL4 (002A)	Undertorque Detection 2	Illuminated	Faults	92
UL5 (003E)	Mechanical Weakening Detection 2	Flashing	Alarm	102

Display (Hex.)	Name	ALM LED	Type	Ref.
UL5 (0045)	Mechanical Weakening Detection 2	Illuminated	Faults	92
Uv (0001)	DC Bus Undervoltage	Flashing	Alarm	102
Uv1 (0002)	DC Bus Undervoltage	Illuminated	Faults	92
Uv2 (0003)	Control Power Undervoltage	Illuminated	Faults	92
Uv3 (0004)	Soft Charge Answerback Fault	Illuminated	Faults	92
vAEr	Voltage Class, Capacity Mismatch	-	Backup Function Runtime Errors	115
vFyE	Parameters do not Match	-	Backup Function Runtime Errors	115

2.4 Faults

This section gives information about 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
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 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 operating the drive with a smartphone or tablet using the Bluetooth LCD keypad. • 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**
boL	BrakingTransistor Overload Fault	The duty cycle of the braking transistor is high (the regeneration power or repetition frequency is high).	• Install a braking unit (CDBR-series). • Install a regenerative converter. • Increase the deceleration time.
		You enabled the protective function for the braking transistor when you have a regenerative converter.	Set *L8-55 = 0 [Internal DB TransistorProtection = Disable]*.
		The braking transistor in the drive is broken.	Replace the entire drive.
Note: Do a Fault Reset to clear the fault.			
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
CF	Control Fault	Motor parameters are set incorrectly	Correctly set the motor parameters and do Auto-Tuning again.
		When *A1-02 = 4 [Control Method Selection = Advanced Open Loop Vector]*, the drive takes long to ramp to stop because of these settings: • The torque limit setting is too low. • *L3-11 = 1 [Overvoltage Suppression Select = Enabled]*. • *d5-01 = 1 [Torque Control Selection = Torque Control]*.	When Rotational Auto-Tuning changes or the installation environment changes, make sure that you do Line-to-Line Resistance Tuning and set *L8-20 = 0 [Control Fault & Step Out Detect = Disabled]*. **Note:** After you set *L8-20 = 0*, do test runs and examine the drive to make sure that it starts and stops correctly.
		The torque limit setting is too low.	Adjust *L7-01 to L7-04 [Torque Limit]*.
		The load inertia is too large.	• Adjust *C1-02, C1-04, C1-06, and C1-08 [Deceleration Times]*. • Set the frequency reference to the minimum output frequency, and stop the Run command when the drive stops deceleration.
		The drive is trying to ramp to stop a machine that cannot do ramp to stop or on a machine for which deceleration is not necessary.	Correctly set *b1-03 [Stopping Method Selection]*.
		The motor and drive are connected incorrectly.	Correct wiring errors.
		Line-to-line Resistance Tuning is not done.	Do Stationary Auto-Tuning for Line-to-Line Resistance.
		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]*.

Note:
• The drive detects this error if the torque reference is more than the torque limit for 3 seconds or longer while the drive ramps to stop.
• Do a Fault Reset to clear the fault.

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
CP1	Comparator 1 Limit Fault	The monitor value set in *H2-20 [Comparator 1 Monitor Selection]* was in the range of *H2-21 [Comparator 1 Lower Limit]* and *H2-22 [Comparator 1 Upper Limit]*.	Examine the monitor value and remove the cause of the fault.

Note:
• The drive detects this error when the terminal is set to *H2-01 to H2-03 = 66 [MFDO Function Selection = Comparator1]*.
• Do a Fault Reset to clear the fault.
• Set the stopping method for this fault in *H2-33 [Comparator1 Protection Selection]*.

Code	Name	Causes	Possible Solutions
CP2	Comparator 2 Limit Fault	The monitor value set in *H2-26 [Comparator 2 Monitor Selection]* was outside the range of *H2-27 [Comparator 2 Lower Limit]* and *H2-28 [Comparator 2 Upper Limit]*.	Examine the monitor value and remove the cause of the fault.

Note:
• The drive detects this error when the terminal is set to *H2-01 to H2-03 = 67 [MFDO Function Selection = Comparator2]*.
• Do a Fault Reset to clear the fault.
• Set the stopping method for this fault in *H2-35 [Comparator2 Protection Selection]*.

Code	Name	Causes	Possible Solutions
CPF00 to CPF03, CPF07 to CPF08, CPF11 to CPF14, CPF16 to CPF24, and CPF26 to CPF39	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
CPF06	EEPROM Memory Data Error	The drive power supply was de-energized while a communication option card 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 replacing 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 EEPROM of the drive.
• Do a Fault Reset to clear the fault.
• Fault trace is not available for this fault.

Code	Name	Causes	Possible Solutions
CPF25	Terminal Board not Connected	The terminal board is not correctly connected to the drive.	1. De-energize the drive. 2. Correctly connect the terminal board to the drive. 3. Re-energize the drive.

Note:
Do a Fault Reset to clear the fault.

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 C1-08 [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*.
• 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
dv1	Z Pulse Fault	The encoder option card or the encoder on the motor side is damaged.	1. Repair wiring errors and connect disconnected wires. Correctly ground the shielded wire of the encoder cable. 2. Re-energize the drive 3. 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.
		The encoder cable is disconnected or wired incorrectly.	

Note:
• The drive detects this error if it does not detect a Z pulse during one motor rotation.
• Do a Fault Reset to clear the fault.

Code	Name	Causes	Possible Solutions
dv2	Z Pulse Noise Fault Detection	Noise interference along the encoder cable.	Isolate the encoder cable from the drive output line or a different source of electrical interference.
		The encoder cable is disconnected or wired incorrectly.	Examine for wiring errors or disconnected wires in the encoder cable, and repair problems. Correctly ground the shielded wire of the encoder cable.
		The drive operates the motor with 24 or more pole at zero speed.	• Set *F1-46 = 1 [dv2 Detection Method Selection = MechanicalAngle Detection Method]*. • Increase the value set in *F1-17 [Deviation 2 Detection Selection]*. • Increase the value set in *F1-47 [Deviation 2 Detection Level]*. **Note:** If you change the setting of *F1-47*, the sensibility of detection for *dv2* can decrease.
		The PG option or the encoder on the motor side is damaged.	Repair the wiring and re-energize the drive, then replace the PG option or the encoder if the problem continues.

Note:
• The drive detects this error if it detects an unusual Z pulse more than the number of times set in *F1-17 [Deviation 2 Detection Selection]*.
• Do a Fault Reset to clear the fault.

Code	Name	Causes	Possible Solutions
dv3	Inversion Detection	*E5-11 [Encoder Z-Pulse Offset]* is set incorrectly.	Correctly set the value for Δθ to *E5-11* as specified by the values on the motor nameplate.
		There is a new encoder or the motor rotation direction changed.	Do Z Pulse Offset Tuning.
		An external force on the load side rotated the motor.	• Make sure that the motor is rotating in the correct direction. • Find and repair problems on the load side that cause the motor to rotate from the load side.
		Noise interference along the encoder cable.	Correctly ground the shielded wire of the encoder cable.
		The encoder cable is disconnected or wired incorrectly.	Examine for wiring errors or disconnected wires in the encoder cable, and repair problems.
		The setting for *F1-05 [Encoder 1 Rotation Selection]* is the opposite of the direction of motor rotation.	Correctly connect the motor wiring for each phase (U, V, W).
		The drive incorrectly detected the motor magnetic pole position.	If the value for *U6-57 [PolePolarityDeterVal]* is lower than 819, increase the value set in *n8-84 [Polarity Detection Current]*. Contact the motor manufacturer to confirm the maximum setting values.
		The setting value of *n8-84 [Polarity Detection Current]* is too low.	Increase the value set in *n8-84* from the default setting. Contact the motor manufacturer to confirm the maximum setting values.
		The drive did not make a correct estimate of the initial pole count.	When you use an IPM motor, do High Frequency Injection Auto-Tuning.
		The PG option card or the encoder on the motor side is damaged.	Repair the wiring and re-energize the drive, then replace the PG option card or the encoder if the problem continues.

Note:
• The drive detects this error if:
– the torque reference and acceleration are in opposite directions.
– the speed reference and actual motor speed are more than 30% different for the number of times set to *F1-18 [Deviation 3 Detection Selection]*.
• Do a Fault Reset to clear the fault.

Code	Name	Causes	Possible Solutions
dv4	Inversion Prevention Detection	An external force on the load side rotated the motor.	• Make sure that the motor is rotating in the correct direction. • Find and repair problems on the load side that cause the motor to rotate from the load side. • Disable detection of this fault for applications that rotate the motor from the load side in the opposite direction of the speed reference. The drive will not detect this fault if *F1-19 = 0 [Deviation 4 Detection Selection = Disabled]*.
		E5-11 [Encoder Z-Pulse Offset] is set incorrectly.	Correctly set the value for Δθ to *E5-11* as specified by the values on the motor nameplate.
		There is a new encoder or the motor rotation direction changed.	Do Z Pulse Offset Tuning.
		Noise interference along the encoder cable.	Correctly ground the shielded wire of the encoder cable.
		The encoder cable is disconnected or wired incorrectly.	Examine for wiring errors or disconnected wires in the encoder cable, and repair problems.
		The drive incorrectly detected the motor magnetic pole position.	If the value for *U6-57 [PolePolarityDeterVal]* is lower than 819, increase the value set in *n8-84 [Polarity Detection Current]*. Consult the motor manufacturer for information about maximum setting values.

Code	Name	Causes	Possible Solutions
		The setting of *n8-84 [Polarity Detection Current]* is too low.	Increase the *n8-84* setting from the default. Consult the motor manufacturer for information about maximum setting values.
		Pole Position Detection failed.	If you are using an IPM motor, do High Frequency Injection Auto-Tuning.
		The PG option card or the encoder on the motor side is damaged.	Repair the wiring and re-energize the drive, then replace the PG option card or the PG if the problem continues.

Note:
• The drive detects this error if the pulses in the opposite direction of the speed reference are more than the value set in *F1-19*.
• 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
E5	MECHATROLINK Watchdog Timer Err	The drive detected a watchdog circuit exception while it received data from the controller.	Examine the MECHATROLINK cable connection. If this error occurs frequently, examine the wiring and decrease the effects of electrical interference as specified by these manuals: • MECHATROLINK-II Installation Guide (MECHATROLINK Members Association, manual number MMATDEP011) • MECHATROLINK-III Installation Manual (MECHATROLINK Members Association, publication number MMATDEP018)

Note:
• 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 *F6-25 [MECHATROLINK Watchdog Error Sel]*.

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.
		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
EF8	External Fault (Terminal S8)	MFDI terminal S8 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 S8.
		External Fault [H1-08 = 20 to 2B] is set to MFDI terminal S8, 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
FbH	Excessive PID Feedback	The *FbH* detection level is set incorrectly.	Adjust *b5-36 [PID High Feedback Detection Lvl]* and *b5-37 [PID High Feedback Detection Time]*.
		There is a problem with the PID feedback wiring.	Correct errors with the PID control wiring.
		The feedback sensor is not operating correctly.	Examine the sensors on the control device side.
		A fault occurred in the feedback input circuit of the drive.	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 the PID feedback input is more than the level set in *b5-36* for longer than *b5-37*.
• 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 *b5-12 [Feedback Loss Detection Select]*.

Code	Name	Causes	Possible Solutions
FbL	PID Feedback Loss	The *FbL* detection level is set incorrectly.	Adjust *b5-13 [PID Feedback Loss Detection Lvl]* and *b5-14 [PID Feedback Loss Detection Time]*.
		There is a problem with the PID feedback wiring.	Correct errors with the PID control wiring.
		The feedback sensor is not operating correctly.	Examine the sensors on the control device side.

Code	Name	Causes	Possible Solutions
		A fault occurred in the feedback input circuit of the drive.	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 the PID feedback input is more than the level set in *b5-13* for longer than *b5-14*.
• 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 *b5-12 [Feedback Loss Detection Select]*.

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
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
LSo	Low Speed Motor Step-Out	The motor code set incorrectly.	• 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.	• Decrease the load. • Replace the drive and motor with larger capacity models.
		An external force on the load side caused the motor to move at start.	Find and repair problems on the load side that cause the motor to rotate from the load side.
		The drive incorrectly detected the motor magnetic pole position.	• Set *b3-01 = 1 [Speed Search at Start Selection = Enabled]*. • If the value for *U6-57 [PolePolarityDeterVal]* is lower than 819, increase the value set in *n8-84 [Polarity Detection Current]*. Consult the motor manufacturer for information about maximum setting values.
		The setting of *n8-84 [Polarity Detection Current]* is too low.	Increase the n8-84 setting from the default. Consult the motor manufacturer for information about maximum setting values.
		Incorrect values set in *L8-93 [Low Speed Pull-out DetectionTime]*, *L8-94 [Low Speed Pull-out Detect Level]*, and *L8-95 [Low Speed Pull-out Amount]*.	Increase the values set in *L8-93 to L8-95*.
		The drive incorrectly detected the motor magnetic pole position.	If you are using an IPM motor, do High Frequency Injection Auto-Tuning.

Note:
• The drive detects this fault if it detects step-out while running at low speed.
• Do a Fault Reset to clear the fault.
• *LSo* is a protective function that stops the motor and stops the reverse run if a motor without a motor code incorrectly detects the initial polarity. To quickly detect motor reversal, decrease the values set in *L8-93* to *L8-95* to a range in which the drive does not malfunction.

Code	Name	Causes	Possible Solutions
nSE	Node Setup Error	The *H1-xx = 47 [Node Setup (CANopen)]* terminal was activated during run.	Stop the drive when the Node Setup function is in use.
		The drive received a Run command while the Node Setup function was active.	

Note:
Do a Fault Reset to clear the fault.

Code	Name	Causes	Possible Solutions
oC	Overcurrent	The load is too heavy.	• 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 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.
		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, C1-03, C1-05, or C1-07 [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.
		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*.

Code	Name	Causes	Possible Solutions
		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.
		In PM Control Methods, the setting of the motor code is incorrect.	• 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.
		If the drive detects the fault at start or in the low speed range (10% or less) and *n8-57 = 1 [HFI Overlap Selection = Enabled]* for PM Control methods, the high frequency injection gain is too high.	• Set *E5-xx [PM Motor Parameters]* correctly or do Rotational Auto-Tuning. • Decrease the value of *n8-41 [HFI P Gain]* in 0.5 unit increments. **Note:** Set *n8-41 > 0.0* for an ordinary IPM motor.
		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 you set *A1-02 = 8 [EZ Vector Control]* and 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]*.
		An overcurrent 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
oFA00	Option Not Compatible with Port	The option card connected to connector CN5-A is not compatible.	Connect the option card to the correct connector. **Note:** Encoder option cards are not compatible with connector CN5-A.

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-A 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
oFA02	Duplicate Options	The same option cards or the same type of option cards are connected to connectors CN5-A, B, and C.	Connect the option card to the correct connector. **Note:** Use connectors CN5-C and CN5-B to connect two encoder option cards.

Note:
Do a Fault Reset to clear the fault.

Code	Name	Causes	Possible Solutions
oFA03 to oFA06	Option Card Error Occurred at Option Port CN5-A	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, oFA11	Option Card Error Occurred at Option Port CN5-A	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 to oFA17	Option Card Connection Error (CN5-A)	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 to oFA43	Communication Option Card Connection Error (CN5-A)	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**
oFb00	Option Not Compatible with Port	The option card connected to connector CN5-B is not compatible.	Connect the option card to the correct connector. **Note:** DO-A3, AO-A3, PG-B3, and PG-X3 options can connect to connector CN5-B. Use connector CN5-C when connecting only one encoder option card.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for this fault.			
Code	**Name**	**Causes**	**Possible Solutions**
oFb01	Option Fault/Connection Error	The option card connected to connector CN5-B was changed during operation.	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**
oFb02	Duplicate Options	The same option cards or the same type of option cards are connected to connectors CN5-A, B, and C.	Connect the option card to the correct connector.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
oFb03 to oFb11	Option Card Error Occurred at Option Port CN5-B	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**
oFb12 to oFb17	Option Card Error Occurred at Option Port CN5-B	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
oFC00	Option Not Compatible with Port	The option card connected to connector CN5-C is not compatible.	Connect the option card to the correct connector. **Note:** AI-A3, DI-A3, and communication option cards cannot be connected to the CN5-C connector.
Note: • Do a Fault Reset to clear the fault. • Fault trace is not available for this fault.			
Code	**Name**	**Causes**	**Possible Solutions**
oFC01	Option Fault/Connection Error	The option card connected to connector CN5-C was changed during operation.	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**
oFC02	Duplicate Options	The same option cards or the same type of option cards are connected to connectors CN5-A, B, and C.	Connect the option card to the correct connector.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
oFC03 to oFC11	Option Card Error Occurred at Option Port CN5-C	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**
oFC12 to oFC17	Option Card Error Occurred at Option Port CN5-C	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**
oFC50 to oFC55	Option Card Error Occurred at Option Port CN5-C	A fault occurred in the option card.	Refer to the manual for the PG-RT3 or PG-F3 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 C1-08 [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, H3-10, or H3-06 = E [MFAI Function Select = Motor Temperature (PTC Input)]*, the drive detects this fault if the motor overheat signal entered to analog input terminals A1 to A3 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 C1-08 [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 A1, A2, or A3 is more than the alarm detection level. (If *H3-02, H3-10, or H3-06 = 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 C1-08 [Acceleration/ Deceleration Times]*.

Code	Name	Causes	Possible Solutions
		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.
		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 C1-08 [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]*.

Code	Name	Causes	Possible Solutions
		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
oL5	Mechanical Weakening Detection 1	The drive detected overtorque as specified by the conditions for mechanical weakening detection set in *L6-08 [Mechanical Fatigue Detect Select]*.	Do a deterioration diagnostic test on the machine side.

Note:
• 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 *L6-08*.

Code	Name	Causes	Possible Solutions
oL7	High Slip Braking Overload	The load inertia is too large.	• Decrease deceleration times in *C1-02, C1-04, C1-06, and C1-08 [Deceleration Times]* for applications that do not use High Slip Braking. • Use a braking resistor to decrease the deceleration time.
		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 LOCAL 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]*. • Adjust the pulse train gain with *H6-02 to H6-05 [Pulse Train Input Setting Parameters]*.
		There is an incorrect number of PG pulses set in the drive.	Set *H6-02 [Terminal RP Frequency Scaling]* to the pulse train frequency during 100% reference (maximum motor rotation speed).
		The *oS* detection level is set incorrectly.	Adjust *F1-08 [Overspeed Detection Level]* and *F1-09 [Overspeed Detection Delay Time]*.
		If the drive detects the fault at start or in the low speed range (10% or less) and *n8-57 = 1 [HFI Overlap Selection = Enabled]* for PM Control methods, the high frequency injection gain is too high.	• Set *E5-xx [PM Motor Parameters]* correctly or do Rotational Auto-Tuning. • Decrease the value of *n8-41 [HFI P Gain]* in 0.5 unit increments. **Note:** Set *n8-41 > 0.0* for IPM motors.

Note:
• The drive detects this fault if the motor speed is more than the value set in *F1-08* for longer than *F1-09*.
• 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 *F1-03 [Overspeed Detection Selection]*.

Code	Name	Causes	Possible Solutions
ov	Overvoltage	The deceleration time is too short and too much regenerative energy is flowing back into the drive.	• Set *L3-04 = 1 [Stall Prevention during Decel = General Purpose]*. • Increase the values set in *C1-02, C1-04, C1-06, or C1-08 [Deceleration Times]*. • Connect a dynamic braking option to the drive. • Perform Deceleration Rate 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, C1-03, C1-05, or C1-07 [Acceleration Times]*. • Increase the value set in *C2-02 [S-Curve Time @ End of Accel]*. • Set *L3-11 = 1 [Overvoltage Suppression Select = Enabled]*.
		The braking load is too large.	Connect a dynamic braking option to the drive.
		There are surge voltages in the input power supply.	Connect a DC link choke to the drive. **Note:** If you turn the phase advancing capacitors ON and OFF and use thyristor converters in the same power supply system, there can be surge voltages that irregularly increase the input voltage.
		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 speed search-related parameters are set incorrectly (this fault also occurs during recovery from momentary power loss and after Auto Restarts).	• 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]*. • Do Stationary Auto-Tuning for Line-to-Line Resistance and set *b3-24 = 1 [Speed Search Method Selection = Speed Estimation]*.
		The power supply voltage is too high.	Decrease the power supply voltage to match the drive rated voltage.
		The braking resistor or braking resistor unit wiring is incorrect.	Correct wiring errors in the connection to the braking resistor or braking resistor unit.
		The encoder cable is disconnected or wired incorrectly.	Examine for wiring errors or disconnected wires in the encoder cable, and repair problems.
		Noise interference along the encoder cable.	Isolate the encoder cable from the drive output line or a different source of electrical interference.

Code	Name	Causes	Possible Solutions
		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 match the qualities of the machine.
		The Short Circuit Braking function used in OLV/PM control method.	Connect a braking resistor to the drive.
		There is motor hunting.	• Adjust *n1-02 [Hunting Prevention Gain Setting]*. • Adjust *n2-02 [Automatic Freq Regulator Time 1]* and *n2-03 [Automatic Freq Regulator Time 2]*. • Adjust *n8-45 [Speed Feedback Detection Gain]* and *n8-47 [Pull-in Current Comp Filter Time]*.
		Speed Search at Start does not complete correctly when: • A1-02 = 8 [Control Method Selection = EZOLV] • 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.
• Do a Fault Reset to clear the fault.
• For 200 V class drives, the detection level of *ov* is approximately 410 V. For 400 V class drives, the detection level is approximately 820 V.
• *L5-08 [Fault Reset Enable Select Grp2]* disables the Auto Restart function.

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
PGo	Encoder (PG) Feedback Loss	The encoder cable is disconnected or wired incorrectly.	Examine for wiring errors or disconnected wires in the encoder cable, and repair problems.
		The encoder is not receiving power.	Examine the encoder power supply.
		The holding brake is stopping the motor.	Release the holding brake.

Note:
• The drive detects this error if it does not receive the speed detection pulse signal from the encoder in the detection time set in *F1-14 [Encoder Open-Circuit Detect Time]*.
• 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 *F1-02 [PG Open Circuit Detection Select]*.

Code	Name	Causes	Possible Solutions
PGoH	Encoder (PG) Hardware Fault	The encoder cable is disconnected.	Connect any disconnected wires in the encoder cable.
Note: • Do a Fault Reset to clear the fault. • Parameter *F1-20 [Encoder 1 PCB Disconnect Detect]* or *F1-36 [Encoder 2 PCB Disconnect Detect]* enables and disables *PGoH* detection. • If the drive detects this error, it will operate the motor as specified by the Stopping Method set in *F1-02 [PG Open Circuit Detection Select]*.			
Code	**Name**	**Causes**	**Possible Solutions**
rF	Braking Resistor Fault	The resistance of the dynamic braking option that is connected to the drive is too low.	Use a dynamic braking option that fits the model and duty rating of the drive.
		A regenerative converter, regenerative unit, or braking unit is connected to the drive.	Set *L8-55 = 0 [Internal DB TransistorProtection = Disable]*.
Note: Do a Fault Reset to clear the fault.			
Code	**Name**	**Causes**	**Possible Solutions**
rH	Braking Resistor Overheat	The deceleration time is too short and excessive regenerative energy is flowing back into the drive.	• Check the load level, deceleration time, and speed. • Decrease the load. • Increase the values set in *C1-02, C1-04, C1-06, or C1-08 [Deceleration Times]*. • Use a dynamic braking option that lets you use more power.
		The duty cycle is too high.	Examine the duty cycle. **Note:** When *L8-01 = 1 [3% ERF DB Resistor Protection = Enabled]*, the maximum braking duty cycle is 3%.
		The braking load is too heavy.	• Calculate the braking load and braking power again, and decrease the braking load. • Use a braking resistor that improves braking power.
		The braking resistor is not sufficient.	Use the braking resistor specifications to select a sufficient braking resistor.
Note: • The drive detects this error if the braking resistor overheat protective function is active. • The magnitude of the braking load causes the braking resistor overheat alarm, NOT the surface temperature. If the duty cycle is higher than the braking resistor rating, the drive will show the alarm. • Do a Fault Reset to clear the fault. • Parameter *L8-01* enables and disables *rH* detection.			
Code	**Name**	**Causes**	**Possible Solutions**
rr	Dynamic Braking Transistor Fault	The drive control circuit 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.
		There is a malfunction in the internal braking transistor of the drive.	
Note: Do a Fault Reset to clear the fault.			
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, 6, 7 [Control Method Selection = OLV/PM, AOLV/PM, or CLV/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 the value set in *b3-10 [Speed Estimation Detection Gain]*. • Increase the value set in *b3-17 [Speed Est Retry Current Level]*. • Increase the value set in *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 the value set in *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 C1-08 [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**
SvE	Zero Servo Fault	The value set in the torque limit is too small.	Adjust torque limit-related parameters *L7-01 to L7-04*.
		The load torque is too large.	Decrease the load torque.
		Noise interference along the encoder cable	Isolate the encoder cable from the drive output line or a different source of electrical interference.
Note: • The drive detects this error if motor rotation position moves during Zero Servo. • 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
UL5	Mechanical Weakening Detection 2	The drive detected undertorque as specified by the conditions for mechanical weakening detection set in *L6-08 [Mechanical Fatigue Detect Select]*.	Examine the machine for deterioration.

Note:
• 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 *L6-08*.

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 200 V class drives. The detection level is approximately 380 V for 400 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]* 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 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.

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
AEr	Station Address Setting Error	The node address for the communication option is not in the permitted setting range.	• For CC-Link communication, set *F6-10 [CC-Link Node Address]* correctly. • For MECHATROLINK communication, set *F6-20 [MECHATROLINK Station Address]* correctly. • For CANopen communication, set *F6-35 [CANopen Node ID Selection]* correctly.
Note: If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Select = 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 detected, the terminal assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will switch ON. • 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 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 to operate the drive from a smartphone or tablet. • If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Selection = Alarm]* will activate. • Parameter *o2-27 [bCE Detection Selection]* enables and disables *bCE* detection.			
Code	**Name**	**Causes**	**Possible Solutions**
boL	Braking Transistor Overload	The duty cycle of the braking transistor is high (the regeneration power or repetition frequency is high).	• Install a braking unit (CDBR series). • Install a regenerative converter. • Increase the deceleration time.
		You enabled the protective function for the braking transistor when you have a regenerative converter.	Set *L8-55 = 0 [Internal DB TransistorProtection = Disable]*.
		The braking transistor in the drive is broken.	Replace the drive.
Note: If the drive detects this error, the terminal assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.			
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.

Code	Name	Causes	Possible Solutions
		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 Select = 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
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.
		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 Select = Alarm]* will activate.

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:
• 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 assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.
• If the drive detects this error, it will operate the motor as specified by the stopping method set in *H5-04 [Communication Error Stop Method]*.

Code	Name	Causes	Possible Solutions
CP1	Comparator 1 Limit Error	The monitor value set in *H2-20 [Comparator 1 Monitor Selection]* was in the range of *H2-21 [Comparator 1 Lower Limit]* and *H2-22 [Comparator 1 Upper Limit]*.	Examine the monitor value and remove the cause of the error.

Note:
• The drive detects this error when the terminal is assigned to *H2-01 to H2-03 = 66 [MFDO Function Select = Comparator1]*.
• If the drive detects this error, the terminal assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.
• *H2-33 [Comparator1 Protection Selection]* enables and disables *CP1* detection.

Code	Name	Causes	Possible Solutions
CP2	Comparator 2 Limit Error	The monitor value set in *H2-26 [Comparator 2 Monitor Selection]* was outside the range of *H2-27 [Comparator 2 Lower Limit]* and *H2-28 [Comparator 2 Upper Limit]*.	Examine the monitor value and remove the cause of the error.

Note:
• The drive detects this error when the terminal is assigned to *H2-01 to H2-03 = 67 [MFDO Function Select = Comparator2]*.
• If the drive detects this error, the terminal assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.
• *H2-35 [Comparator2 Protection Selection]* enables and disables *CP2* detection.

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
CyC	MECHATROLINK CommCycleSettingErr	The communications cycle setting of the controller is not in the permitted range of the MECHATROLINK interface option.	Set the communications cycle of the controller in the permitted range of the MECHATROLINK interface option.

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

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 C1-08 [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 Select = 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
dnE	Drive Disabled	A terminal set for *H1-xx = 6A [Drive Enable]* turned OFF.	Examine the operation sequence.

Note:
If the drive detects this error, the terminal assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.

Code	Name	Causes	Possible Solutions
dWA2	DriveWorksEZ Alarm 2	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 assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.

Code	Name	Causes	Possible Solutions
dWA3	DriveWorksEZ Alarm 3	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 assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.

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 assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.

Code	Name	Causes	Possible Solutions
E5	MECHATROLINK Watchdog Timer Err	The drive detected a watchdog circuit exception while it received data from the controller.	Examine the MECHATROLINK cable connection. If this error occurs frequently, examine the wiring and decrease the effects of electrical interference as specified by these manuals: • MECHATROLINK-II Installation Guide (MECHATROLINK Members Association, manual number MMATDEP011) • MECHATROLINK-III Installation Manual (MECHATROLINK Members Association, publication number MMATDEP018)

Note:
• If the drive detects this error, the terminal assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.
• If the drive detects this error, it will operate the motor as specified by the stop method set in *F6-25 [MECHATROLINK Watchdog Error Sel]*.

Code	Name	Causes	Possible Solutions
EF	FWD/REV Run Command Input Error	A forward command and a reverse command were input 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 assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.

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 assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.
• Set the stopping method for this fault 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.
		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 assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.

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 assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.

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 assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.

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 assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.

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 assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.

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 = 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 assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.

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 assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.

Code	Name	Causes	Possible Solutions
EF8	External Fault (Terminal S8)	MFDI terminal S8 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 S8.
		External Fault [H1-08 = 2C to 2F] is set to MFDI terminal S8, but the terminal is not in use.	Correctly set the MFDI.

Note:
If the drive detects this error, the terminal assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.

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
FbH	Excessive PID Feedback	The *FbH* detection level is set incorrectly.	Adjust *b5-36 [PID High Feedback Detection Lvl]* and *b5-37 [PID High Feedback Detection Time]*.
		There is a problem with the PID feedback wiring.	Correct errors with the PID control wiring.
		The feedback sensor is not operating correctly.	Examine the sensors on the control device side.
		A fault occurred in the feedback input circuit of the drive.	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 the PID feedback input is more than the level set in *b5-36* for longer than *b5-37*.
• If detected, the terminal assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.
• If the drive detects this fault, it will operate the motor as specified by the stop method set in *b5-12 [Feedback Loss Detection Select]*.

Code	Name	Causes	Possible Solutions
FbL	PID Feedback Loss	The *FbL* detection level is set incorrectly.	Adjust *b5-13 [PID Feedback Loss Detection Lvl]* and *b5-14 [PID Feedback Loss Detection Time]*.
		There is a problem with the PID feedback wiring.	Correct errors with the PID control wiring.
		The feedback sensor is not operating correctly.	Examine the sensors on the control device side.
		A fault occurred in the feedback input circuit of the drive.	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 PID feedback input is lower than the level set in *b5-13* for longer than *b5-14*.
• If the drive detects this error, the terminal assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.
• If the drive detects this error, it will operate the motor as specified by the stop method set in *b5-12 [Feedback Loss Detection Select]*.

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, C1-03, C1-05, or C1-07 [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 assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.			
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**
LoG	Com Error / Abnormal SD card	There is not a micro SD 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 is not correct. • 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**
LT-1	Cooling Fan Maintenance Time	The cooling fan is at 90% of its expected performance life.	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 estimated performance life 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 expected performance life.	Replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: When the estimated performance life is expired, the terminal assigned to *H2-01 to H2-03 = 2F [MFDO Function Select = Maintenance Notification]* will be ON.			
Code	**Name**	**Causes**	**Possible Solutions**
LT-3	SoftChargeBypassRelay MainteTime	The soft charge bypass relay is at 90% of its expected performance life.	Replace the control board or the drive. For information about replacing the control board, contact Yaskawa or your nearest sales representative.
Note: When the estimated performance life is expired, the terminal assigned to *H2-01 to H2-03 = 2F [MFDO Function Select = Maintenance Notification]* will be ON.			
Code	**Name**	**Causes**	**Possible Solutions**
LT-4	IGBT Maintenance Time (50%)	The IGBT is at 50% of its expected performance life.	Check the load, carrier frequency, and output frequency.
Note: When the estimated performance life is expired, the terminal assigned to *H2-01 to H2-03 = 2F [MFDO Function Select = Maintenance Notification]* will be ON.			

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 lower 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 have stopped.	1. Use the procedures in this manual to 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 assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.
• Set the stopping method for this fault in *L8-03 [Overheat Pre-Alarm Selection]*.

Code	Name	Causes	Possible Solutions
oH2	External Overheat (H1-XX=B)	An external device sent an *oH2*.	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]* that was set to MFDI terminals S1 to S8.

Note:
If the drive detects this error, the terminal assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.

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 C1-08 [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, H3-10, or H3-06 = E [MFAI Function Select = Motor Temperature (PTC Input)]*, the drive detects this fault if the motor overheat signal entered to analog input terminals A1 to A3 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 Select = 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 assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.
• Set the conditions that trigger the minor fault using *L6-01 [Torque Detection Selection 1]*.

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 assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.
• Set the conditions that trigger the minor fault using *L6-04 [Torque Detection Selection 2]*.

Code	Name	Causes	Possible Solutions
oL5	Mechanical Weakening Detection 1	The drive detected overtorque as specified by the conditions for mechanical weakening detection set in *L6-08 [Mechanical Fatigue Detect Select]*.	Do a deterioration diagnostic test on the machine side.

Note:
• If the drive detects this error, the terminal assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.
• If the drive detects this minor fault, it will operate the motor as specified by the Stopping Method set in *L6-08*.

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]*. • Use *H6-02 to H6-05 [Pulse Train Input Setting Parameters]* to adjust the pulse train gain.
		There is an incorrect number of PG pulses set in the drive.	Set *H6-02 [Terminal RP Frequency Scaling]* to the pulse train frequency during 100% reference (maximum motor rotation speed).
		The *oS* detection level is set incorrectly.	Adjust *F1-08 [Overspeed Detection Level]* and *F1-09 [Overspeed Detection Delay Time]*.

Note:
• The drive detects this error if the motor speed is more than the value set in *F1-08* for longer than *F1-09*.
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will activate.
• If the drive detects this error, it will operate the motor as specified by the stopping method set in *F1-03 [Overspeed Detection Selection]*.

Code	Name	Causes	Possible Solutions
ov	DC Bus Overvoltage	There are surge voltages in the input power supply.	Connect a DC link choke to the drive. **Note:** If you turn the phase advancing capacitors ON and OFF and use thyristor converters in the same power supply system, there can be surge voltages that irregularly increase the input voltage.
		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 match 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. • 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 200 V class drives. The detection level is approximately 820 V for 400 V class drives.
• If the drive detects this error, the terminal assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.

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 all wiring errors with the main circuit power supply.
		Loose wiring in the input power terminals.	Tighten the screws to the correct tightening torque.
		The drive input power voltage is changing too much.	• Examine the supply voltage for problems. • Make the drive input power stable.
		Unsatisfactory balance between voltage phases.	• Examine the supply voltage for problems. • Make the drive input power stable. • If the supply voltage is good, examine the magnetic contactor on the main circuit side for problems.

Code	Name	Causes	Possible Solutions
		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 capacitor. Contact Yaskawa or your nearest sales representative for more information.
			• Examine the supply voltage 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 assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.
• Use *L8-05 [Input Phase Loss Protection Sel]* to enable and disable *PF* detection.

Code	Name	Causes	Possible Solutions
PGo	Encoder (PG) Feedback Loss	The encoder cable is disconnected or wired incorrectly.	Examine for wiring errors or disconnected wires in the encoder cable, and repair problems.
		The encoder is not receiving power.	Examine the encoder power supply.
		The holding brake is stopping the motor.	Release the holding brake.

Note:
• The drive detects this error if it does not receive the speed detection pulse signal from the encoder in the detection time set in *F1-14 [Encoder Open-Circuit Detect Time]*.
• If the drive detects this error, the terminal assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.
• If the drive detects this error, it will operate the motor as specified by the Stopping Method set in *F1-02 [PG Open Circuit Detection Select]*.

Code	Name	Causes	Possible Solutions
PGoH	Encoder (PG) Hardware Fault	The encoder cable is disconnected.	Correct any disconnected wires in the encoder cable.

Note:
• If the drive detects this error, the terminal set to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will activate.
• Parameters *F1-20 [Encoder 1 PCB Disconnect Detect]* or *F1-36 [Encoder 2 PCB Disconnect Detect]* enable and disable *PGoH* detection.
• If the drive detects this error, it will operate the motor as specified by the stopping method set in *F1-02 [PG Open Circuit Detection Select]*.

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 assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.

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 detected, the terminal assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.

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 Select = 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 Select = Alarm]* will activate.

Code	Name	Causes	Possible Solutions
TiM	Keypad Time Not Set	You put a battery in the keypad, but you have not set the date and time.	Set the date and time with the keypad.

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 expected performance life.	Replace the IGBT or the drive. Contact Yaskawa or your nearest sales representative for more information.

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 assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.
• 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 assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.
• 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
UL5	Mechanical Weakening Detection 2	The drive detected undertorque as specified by the conditions for mechanical weakening detection set in *L6-08 [Mechanical Fatigue Detect Select]*.	Examine the machine for deterioration.

Note:
• If the drive detects this error, the terminal assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.
• If the drive detects this error, it will operate the motor as specified by the Stopping Method set in *L6-08*.

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, GFCI, or RCM/RCD) (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 assigned to *H2-01 to H2-03 = 10 [MFDO Function Select = Alarm]* will be ON.

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*.
		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*.
Code	**Name**	**Causes**	**Possible Solutions**
oPE03	Multi-Function Input Setting Err	The settings for these parameters do not agree: • *F3-10 to F3-25 [Terminal D1 to DF Function Selection]* • *H1-01 to H1-08 [Terminals S1 to S8 Function Selection]* • *H7-01 to H7-04 [Virtual Multi-Function Inputs 1 to 4]*	Correct the parameter settings.
		The settings for the standby mode function do not agree: • *b8-50 = 0 [Standby Mode Selection = Disabled]* and *H2-xx = 65 [MFDO Function Select = Standby Output]* • *b8-50 = 1 [Enabled]* and *H2-xx* ≠ *65*	Correct the parameter settings.
		The settings for MFDIs overlap. **Note:** This does not include *H1-xx = 20 to 2F [MFDI Function Select = External Fault]* and *[Reserved]*.	Set the parameters correctly to prevent MFDI function overlap.
		These pairs of MFDI functions are not set to Digital Inputs (*H1-xx*, *F3-10 to F3-25*, and *H7-01 to H7-04*) at the same time: • Setting values *10 [Up Command]* and *11 [Down Command]* • Setting values *75 [Up 2 Command]* and *76 [Down 2 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*, *F3-10 to F3-25*, and *H7-01 to H7-04*) at the same time: • Setting values *10 [Up Command]* and *11 [Down Command]* • Setting values *75 [Up 2 Command]* and *76 [Down 2 Command]* • Setting value *A [Accel/Decel Ramp Hold]* • 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.

Code	Name	Causes	Possible Solutions
		These commands are set in Digital Inputs (*H1-xx*, *F3-10 to F3-25*, 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 *16 [Motor 2 Selection]* and *1A [Accel/Decel Time Selection 2]* • 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)]* • Setting values *60 [DC Injection Braking Command]* and *6A [Drive Enable]* • Setting values *16 [Motor 2 Selection]* and *75, 76 [Up 2 Command, Down 2 Command]*	Remove the function settings that are not in use.
		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 settings were entered while *H1-xx = 2 [External Reference 1/2 Selection]*: • *b1-15 = 4 [Frequency Reference Selection 2 = Pulse Train Input]* • *H6-01 ≠ 0 [Terminal RP Pulse Train Function ≠ Frequency Reference]*	Set *H6-01 = 0*.
		These settings were entered while *H1-xx = 2 [External Reference 1/2 Selection]*: • *b1-15 = 3 [Option PCB]* or *b1-16 = 3 [Run Command Selection 2 = Option PCB]* • No option card is connected to the drive.	Connect an input option card to the drive.
		These settings were entered while *H1-xx = 2 [External Reference 1/2 Selection]*: • *b1-15 = 1 [Analog Input]* • *H3-02 ≠ 0 [Terminal A1 Function Selection ≠ Frequency Reference]* or *H3-10 ≠ 0 [Terminal A2 Function Selection ≠ Frequency Reference]*	Set *H3-02 = 0* or *H3-10 = 0*.
		These parameters are set at the same time: • *H1-xx ≠ 6A [Drive Enable]* • *H2-xx = 38 [Drive Enabled]*	Correct the parameter settings.
		These parameters are set at the same time: • *H6-01 ≠ 3 [PG Speed Feedback (V/F Control)]* • *H1-xx = 7E [Reverse Rotation Identifier]*	Correct the parameter settings.
		These parameters are set at the same time: • *H1-xx = 75/76 [Up 2 /Down 2 Command]* • *H3-01, H3-05, H3-09 = 1 [Terminal A1, A2, A3 Signal Level Select = -10 to +10V (Bipolar Reference)]*	Remove one of the function settings.
		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.
		These settings do not agree: • A PG-RT3 option is connected to the drive. • *H1-xx = 16 [Motor 2 Selection]* is set.	Correct the parameter settings. **Note:** The Motor Switch function is not available with the PG-RT3 option.
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 or the pulse train input 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.	

Code	Name	Causes	Possible Solutions
		The following parameters are set at the same time: • *b1-01 = 4 [Pulse Train Input]* • *H6-01 ≠ 0 [Terminal RP Pulse Train Function ≠ Frequency Reference]*	Set *H6-01 = 0*.
		The following parameters are set at the same time: • *F3-01 = 6 [Digital Input Function Selection = BCD (5-digit), 0.01 Hz]* • *F3-03 = 0, 1 [Digital Input Data Length Select = 8-bit, 12-bit]*	Set *F3-03 = 2 [16-bit]*.
		These parameters are set and there is an AI-A3 option card connected to the drive: • *H1-xx = 2 [External Reference 1/2 Selection]* • *b1-15 = 3 [Frequency Reference Selection 2 = Option PCB]* • *F2-01 = 0 [Analog Input Function Selection = 3 Independent Channels]*	Correct the parameter settings.
Code	**Name**	**Causes**	**Possible Solutions**
oPE06	Control Method Selection Error	*A1-02 = 1, 3, or 7 [Control Method Selection = CL-V/f, CLV, CLV/PM]* is set, but there is no encoder option card connected to the drive.	• Connect an encoder option card to the drive. • Set *A1-02* correctly.
Code	**Name**	**Causes**	**Possible Solutions**
oPE07	Analog Input Selection Error	The settings for *H3-02, H3-06, and H3-10 [MFAI Function Select]* and *H7-30 [Virtual Analog Input Selection]* overlap.	Set *H3-02, H3-06, 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]*
		The following parameters are set at the same time: • *H3-02, H3-06, H3-10, H7-30 = B [PID Feedback]* • *H6-01 = 1 [Terminal RP Pulse Train Function = PID Feedback Value]*	Remove the function settings that are not in use.
		The following parameters are set at the same time: • *H3-02, H3-06, H3-10, H7-30 = C [PID Setpoint]* • *H6-01 = 2 [PID Setpoint Value]*	
		The following parameters are set at the same time: • *H3-02, H3-06, H3-10, H7-30 = C* • *b5-18 = 1 [b5-19 PID Setpoint Selection = Enabled]*	
		The following parameters are set at the same time: • *H6-01 = 2* • *b5-18 = 1*	
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 = 2 [Control Method Selection = OLV]*, you used these parameter settings: • *n2-02 > n2-03 [Automatic Freq Regulator Time 1 > Automatic Freq Regulator Time 2]* • *C4-02 > C4-06 [Torque Compensation Delay Time > Motor 2 Torque Comp Delay Time]*	• Set *n2-02 < n2-03*. • Set *C4-02 < C4-06*.
		When *A1-02 = 0 [Control Method Selection = V/f]*, you used these parameter settings: • H6-01 = 3 [Terminal RP Pulse Train Function = Speed Feedback (V/F Control)] • H1-xx = 16 [MFDI Function Select = Motor 2 Selection]	Correct the parameter settings. **Note:** You cannot use Speed Feedback (V/F Control) with the Motor Switch function.
		When *A1-02 = 5 [PM Open Loop Vector]*, 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.

Code	Name	Causes	Possible Solutions
		When *A1-02 = 5 to 7 [Control Methods for PM Motors]*, 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 to 7*, you set *E5-09 ≠ 0* and *E5-24 ≠ 0*.	Set *E5-09 = 0* or *E5-24 = 0*.
		When *A1-02 = 6 [PM Advanced Open Loop Vector]*, you used these parameter settings: • *n8-57 = 0 [HFI Overlap Selection = Disabled]* • You set *E1-09 [Minimum Output Frequency]* < the 5% value of *E1-06*.	Correct the parameter settings.
		When *A1-02 = 6*, you set these parameters: • *n8-35 = 0 [Initial Pole Detection Method = Pull-in]* • *n8-57 = 1 [Enabled]*	Correct the parameter settings.
		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]*.
Code	**Name**	**Causes**	**Possible Solutions**
oPE09	PID Control Selection Fault	These parameters are set at the same time: • *b5-15 ≠ 0.0 [PID Sleep Function Start Level ≠ 0.0 Hz]* • *b1-03 = 2, 3 [Stopping Method Selection = DC Injection Braking to Stop, Coast to Stop with Timer]*	• Set *b5-15 ≠ 0.0*. • Set *b1-03 = 0, 1 [Ramp to Stop, Coast to Stop]*.
		These parameters are set at the same time: • *b5-01 = 1, 2 [Enabled (Standard), Enabled (D = Feedforward)]* • *d2-02 ≠ 0.0 [Frequency Reference Lower Limit ≠ 0.0%]*	Correct the parameter settings.
		These parameters are set at the same time: • *b5-01 = 1, 2 [Enabled (Standard), Enabled (D = Feedforward)]* • *b5-11 = 1 [PID Output Reverse Selection = Negative Output Accepted]*	Correct the parameter settings.
		These parameters are set at the same time: • *b5-01 = 3, 4 [Trim (Fref+PID Out, D = Fdbk), Trim (Fref+PID Out, D = FeedFwd)]* • *d2-02 ≠ 0.0* has been set.	Correct the parameter settings.
Note: The drive detects this error if the PID control function selection is incorrect. (When *b5-01 = 1 to 4 [PID Mode Setting = PID Control Enabled]*)			
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. The drive sets the carrier frequency to the value set to *C6-03*.	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
oPE13	Pulse Monitor Selection Error	*H6-06 = 101, 102, 105, or 116 [Terminal MP Monitor Selection = Frequency Reference, Output Frequency, Motor Speed, Output Frequency after Soft Starter]* has not been set when *H6-07 = 0 [Terminal MP Frequency Scaling = 0 Hz]*.	Set *H6-06* correctly.
Code	**Name**	**Causes**	**Possible Solutions**
oPE15	Torque Control Setting Error	More than one parameter is selecting torque control at the same time. • *d5-01 = 1 [Torque Control Selection = Torque Control]* • *H1-xx = 71 [MFDI Function Select = Torque Control]*	Correct the parameter settings.
		Droop control and Feed Forward control are enabled at the same time that torque control is selected. • *d5-01 = 1* or *H1-xx = 71* • *b7-01 ≠ 0.0 [Droop Control Gain ≠ 0.0%]* or *n5-01 = 1 [Feed Forward Control Selection = Enabled]*	Correct the parameter settings.
		KEB Ride-Thru 2 (N.O., N.C.) is enabled at the same time that torque control is selected. • *d5-01 = 1* or *H1-xx = 71* • *H1-xx = 7A [KEB Ride-Thru 2 Activate (N.C.)]* or *H1-xx = 7b [KEB Ride-Thru 2 Activate (N.O.)]*	Correct the parameter settings.
		After a momentary power loss, drive operation will enable KEB when torque control is selected. • *d5-01 = 1* or *H1-xx = 71* • *L2-01 = 3, 4, 5 [Power Loss Ride Through Select = Kinetic Energy Backup: L2-02, Kinetic Energy Backup: CPU Power, or Kinetic Energy Backup: DecelStop]*	Correct the parameter settings.
		Optimal deceleration or overexcitation deceleration 2 is enabled at the same time that torque control is selected. • *d5-01 = 1* or *H1-xx = 71* • *L3-04 = 2, 5 [Stall Prevention during Decel = Intelligent (Ignore Decel Ramp), Overexcitation/ High Flux 2]*	Correct the parameter settings.
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.
Code	**Name**	**Causes**	**Possible Solutions**
oPE18	Online Tuning Param Setting Err	The parameters that control online tuning are set incorrectly. In OLV control, one of these parameters was set when *n6-01 = 2 [Online Tuning Selection = Voltage Correction Tuning]*: • *E2-02 [Motor Rated Slip]* is set to 30% of the default setting or lower. • *E2-06 [Motor Leakage Inductance]* is set to 50% of the default setting or lower. • *E2-03 = 0 [Motor No-Load Current = 0 A]* has been set.	Set *E2-02, E2-03, and E2-06* correctly.
Code	**Name**	**Causes**	**Possible Solutions**
oPE20	PG-F3 Setting Error	The value set in *F1-01 [Encoder 1 Pulse Count (PPR)]* does not agree with the number of encoder pulses.	• Examine the *F1-01* value and the number of encoder pulses. • Set *F1-01* correctly.
		The calculation encoder signal frequency at maximum speed is more than 20 kHz.	Decrease the value set for *E1-04 [Maximum Output Frequency]* and make sure that the output frequency of the encoder is not more than 20 kHz.

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]*	
		These parameter pairs are set incorrectly: • *H2-21 [Comparator 1 Lower Limit] > H2-22 [Comparator 1 Upper Limit]* • *H2-27 [Comparator 2 Lower Limit] > H2-28 [Comparator 2 Upper Limit]*	• Set parameters *H2-21 ≤ H2-22*. • Set parameters *H2-27 ≤ H2-28*.

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.
		Auto-Tuning results were not in the applicable parameter setting range, and *E2-07* or *E2-08 [Motor Saturation Coefficient 2]* have temporary values.	• Examine and repair damaged motor wiring. • If you can uncouple the motor and load, remove the motor from the machine and do Rotational Auto-Tuning again.
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 motor rated slip that was measured after compensation with *E2-08 [Motor Saturation Coefficient 2]* is not in the applicable range.	
		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**
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.

Code	Name	Causes	Possible Solutions
		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 prblem. 3. Do Auto-Tuning again.
Code	**Name**	**Causes**	**Possible Solutions**
Er-03	STOP Button was Pressed	During Auto-Tuning, STOP was pushed.	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**
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]* or *n8-57 = 1 [HFI Overlap Selection = Enabled]*, 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] and n8-57 = 0 [Disabled]*. 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]* or *n8-57 = 1 [HFI Overlap Selection = Enabled]*, 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]* and *n8-57 = 0 [Disabled]*. Do not change the settings unless necessary.
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.
		The value of *L7-01 or L7-02 [Forward/Reverse Torque Limit]* is small.	Increase the value set in *L7-01 or L7-02*.
		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-10	Motor Direction Error	There is defective drive and motor wiring.	Examine and repair motor wiring.
		There is defective drive and encoder wiring.	Examine and repair the wiring to the encoder.
		The direction of the motor and the setting of *F1-05 [PG 1 Rotation Selection]* are opposite.	Set *F1-05* correctly.
		The machine pulled the motor to rotate in the opposite direction.	Disconnect the machine from the motor and do Rotational Auto-Tuning again.
		When the torque reference is 100% or higher, the sign of the speed reference was opposite of the detected speed.	
Code	**Name**	**Causes**	**Possible Solutions**
Er-11	Motor Speed Error	The torque reference during acceleration is too high (100%).	• Increase the value set in *C1-01 [Acceleration Time 1]*. • Disconnect the machine from the motor and do Rotational Auto-Tuning again.
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 Alarm	The motor rated current value is incorrect.	Correctly set the rated current indicated on the motor nameplate and perform Auto-Tuning again.
		The drive could not complete tuning for leakage inductance in fewer than 300 seconds.	Examine and repair motor wiring.
Code	**Name**	**Causes**	**Possible Solutions**
Er-14	Motor Speed Error 2	The motor speed was more than two times the amplitude of speed reference during Inertia Tuning.	Decrease the value set in *C5-01 [ASR Proportional Gain 1]*.
Code	**Name**	**Causes**	**Possible Solutions**
Er-15	Torque Saturation Error	During Inertia Tuning, the output torque was more than the value set in *L7-01 to L7-04 [Torque Limit]*.	• Increase the value set in *L7-01 to L7-04 [Torque Limit]* as much as possible. • Decrease the values set for the frequency and amplitude of the test signals used when doing inertia tuning. First, decrease the test signal amplitude, and then do Inertia Tuning. If the error continues, decrease the test signal frequency and do Inertia Tuning again.
Code	**Name**	**Causes**	**Possible Solutions**
Er-16	Inertia ID Error	The inertia found by the drive was too small or too large during Inertia Tuning (10% or less, or 50000% or more).	• Decrease the values set for the frequency and amplitude of the test signals used when doing inertia tuning. First, decrease the test signal amplitude, and then do Inertia Tuning. If the error continues, decrease the test signal frequency and do Inertia Tuning again • Correctly set the motor inertia as specified by the motor, and do Inertia Tuning again.
Code	**Name**	**Causes**	**Possible Solutions**
Er-17	Reverse Prohibited Error	*b1-04 = 1 [Reverse Operation Selection = Reverse disabled]* has been set. **Note:** You cannot do Inertia Tuning if the drive cannot rotate the motor in reverse.	1. Enable reverse in the target machine. 2. Set *b1-04 = 0 [Reverse enabled]*. 3. Do Inertia Tuning again.
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-21	Z Pulse Correction Error	The motor is wired incorrectly.	1. Repair motor and encoder wiring errors. 2. Do Z Pulse Offset Tuning again.
		The encoder is wired incorrectly.	
		You did Auto-Tuning on a coasting motor.	1. Wait for the motor to fully stop. 2. Do Z Pulse Offset Tuning again.
		The setting for the direction of the encoder motor rotation is incorrect.	1. Set the direction of motor rotation of the encoder in *F1-05 [Encoder 1 Rotation Selection]* correctly. 2. Do Z Pulse Offset Tuning again.
		The number of encoder pulses is incorrect.	1. Set the number of encoder pulses in *F1-01 [Encoder 1 Pulse Count (PPR)]* correctly. 2. Do Z Pulse Offset Tuning again.
		The motor Inertia is too large.	Increase the value set in *n8-02 [Pole Alignment Current Level]*.
		Parameter *b1-04 = 1 [Reverse Operation Selection = Reverse Disabled]* and you did Z Pulse Offset Tuning.	• If the machine prevents reverse rotation, disconnect the motor from the machinery, set *b1-04 = 0 [Reverse Enabled]*, then do Z Pulse Offset Tuning. When tuning is complete, set *b1-04 = 1 [Reverse Disabled]*. • If the machine does not prevent reverse rotation, set *b1-04 = 0* and do Z Pulse Offset Tuning.

Code	Name	Causes	Possible Solutions
		The motor vibrates during tuning.	• Increase the values set in *n8-03 [Pole Position Detection Time]* and *n8-04 [Pole Alignment Time]*. • Decrease the value set in *n8-02 [Pole Alignment Current Level]*.
		The encoder is damaged.	• Examine the signal output from the encoder. • Replace the encoder.
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 doing Stationary Auto-Tuning, the motor may not be able to use high frequency injection control. Contact Yaskawa or your nearest sales representative for more information.

2.8 Backup Function Operating Mode Display and Errors

◆ Operating Mode Display

When you use the LCD keypad to do the backup function, the keypad shows the running operation on the LCD display. These indicators do not show that an error has occurred.

Keypad Display	Name	Display	Status
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 match 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 show the error codes. If there are errors, refer to these tables:

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 backup the data when *o3-02 = 0 [Copy Allowed Selection = Disabled]*.	Set *o3-02 = 1 [Enabled]* and backup 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 Occurs Without Power Loss

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.

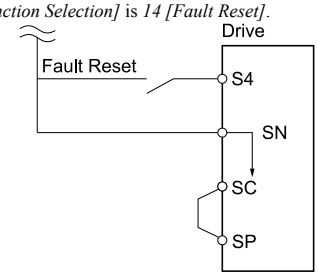
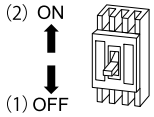
◆ Fault Occurs Without Power Loss

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

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

◆ The Parameter Settings Will Not Change

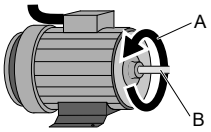
Causes	Possible Solutions
The drive is operating the motor (the drive is in Drive Mode).	Stop the drive and change to Programming Mode.
Parameter *A1-01 = 0 [Access Level Selection = Operation Only]*.	Set *A1-01 = 2 [Access Level Selection = Advanced Level]* or *A1-01 = 3 [Expert Level]*.
Parameter *H1-xx = 1B [MFDI Function Select = Programming Lockout]*.	Turn ON the terminals to which *H1-xx = 1B* is set, and then change the parameters.
An incorrect password was entered 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 the password is set, it will not be possible to change these parameters until the password matches: • *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.
The drive stopped, LO/RE was pushed, and changed the Run command source to the keypad.	Do one of these two: • Push LO/RE. • Re-energize the drive. **Note:** Set *o2-01 = 0 [LO/RE Key Function Selection = Disabled]* to prevent changing the Run command source with LO/RE.
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 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: DIP switch S1-1 and *H3-01 [Terminal A1 Signal Level Select]* • Terminal A2: DIP switch S1-2 and *H3-09 [Terminal A2 Signal Level Select]* • Terminal A3: DIP switch S4, S1-3 and *H3-05 [Terminal A3 Signal Level Select]*

Causes	Possible Solutions
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, H3-06 = 1 [MFAI Function Select = Frequency Gain]* and voltage (current) is not input. • View *U1-13 to U1-15 [Terminal A1, A2, A3 Input Voltage]* to see if the analog input values set to terminals A1, A2, and A3 are applicable.
STOP was pushed.	Turn the Run command OFF then ON from an external input. **Note:** When you push STOP during operation, the drive will ramp to stop. Set *o2-02 = 0 [STOP Key Function Selection = Disabled]* to disable the STOP function.
The 2-wire sequence and 3-wire sequence are set incorrectly.	• Set one of the parameters *H1-03 to H1-08 [Terminals S3 to S8 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 H1-08 ≠ 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.  **A - Forward Rotation Direction** **B - Load Shaft** **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.	Turn ON 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 400 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 200 V class drive, 1200 V for a 400 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.

◆ 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.	Check the values set in *C1-01, C1-03, C1-05, or C1-07 [Acceleration Time]* 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, H3-07 [Terminal A1, A2, A3 Gain Setting]* if you use MFAI.

Causes	Possible Solutions
The frequency reference is set incorrectly.	When *H3-02, H3-10, H3-06 = 1 [MFAI Function Select = Frequency Gain]* are set, see if voltage (current) has been set. • Check the values set in *H3-02, H3-10, and H3-06*. • Use *U1-13 to U1-15 [Terminal A1, A2, A3 Input Voltage]* to make sure that the analog input values set to terminals A1, A2, and A3 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]*.
Parameter *A1-02 = 4 [Control Method Selection = Advanced Open Loop Vector]* and the speed estimation response is too slow.	Increase the value set in *n4-65 [Flux Estimate Response@High Freq]* in 0.1-unit increments.
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]* • Terminal A3: *H3-07 [Terminal A3 Gain Setting]*, *H3-08 [Terminal A3 Bias Setting]*
The drive is receiving frequency bias signals from analog input terminals A1 to A3 and the sum of all signals makes the frequency reference.	• Examine parameters *H3-02, H3-10, H3-06 [MFAI Function Select]*. If two or more of these parameters are set to *0*, change the settings. • Use *U1-13 to U1-15 [Terminal A1, A2, A3 Input Voltage]* to make sure that the analog input values set to terminals A1, A2, and A3 are applicable.
The motor rotates faster than the frequency reference at low speed.	Reduce the value set in *n4-70 [Speed Command Comp @ Low Freq]*.
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
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]*.

Causes	Possible Solutions
Too much current is flowing through the drive.	Set *E5-01 [PM Motor Code Selection]* correctly as specified by the motor. For special-purpose motors, enter the correct value to *E5-xx* as specified by the motor test report.
Operation is not stable when *n8-57 = 1 [HFI Overlap Selection = Enabled]*.	• Do High Frequency Injection Auto-Tuning. • Decrease the value set in *n8-41 [HFI P Gain]* in increments of 0.5. **Note:** Set *n8-41 > 0.0* for IPM motors.

◆ 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 hunting prevention function is disabled.	• Set *n1-01 = 1 [Hunting Prevention Selection = Enabled]*. • Increase the value of *n2-01 [SpdFeedbackDetectCtr (AFR) Gain]* or *n2-02 [SpdFeedbackDetCtr (AFR)TimeConst1]*.

◆ Deceleration Takes Longer Than Expected When Dynamic Braking Is Enabled

Causes	Possible Solutions
The stall prevention during deceleration setting is incorrect.	• Examine the setting for *L3-04 [Decel Stall Prevention Selection]*. • When the drive has a dynamic braking option installed, set *L3-04 = 0 [Disabled]*. • If the drive detects *ov [Overvoltage]*, set *L3-04 = 3 [General Purpose w/ DB resistor]*.
The deceleration time setting is too long.	Set *C1-02, C1-04, C1-06, or C1-08 [Deceleration Times]* to applicable values.
The motor torque is not sufficient.	Use a larger motor. **Note:** If these items are correct, the demand on the motor is more than the motor capacity: • Parameter settings are correct. • The drive does not detect *ov [Overvoltage]*.

The drive and motor system reached the torque limit.	• Examine the values set in *L7-01 to L7-04 [Torque Limit]* and increase them if necessary.
	Note:
	If the torque limit is enabled, deceleration time can increase because the drive cannot output more torque than the limit.
	• If *H3-02, H3-10, H3-06 = 10, 11, 12, 15 [MFAI Function Select = Torque Limit]* has been set, examine the settings for the MFAIs.
	  • Examine the values set in *H3-02, H3-10, and H3-06*.
	  • Use *U1-13 to U1-15 [Terminal A1, A2, A3 Input Voltage]* to make sure that the analog input values set to terminals A1, A2, and A3 are applicable.

The load is more than the internal torque limit as specified by the drive rated current.	Replace the drive with a larger capacity model.

◆ 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.

◆ 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, H3-06 = B [MFAI Function Select = 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, H3-07 [Terminal A1, A2, A3 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 Prevent Select duringAccel = ILim Mode] has been set.	1. Check whether 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 *b1-21 = 1 [CLV Start Selection = Accept Run command at any speed]*. • 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 126
3.2 How to Read the Parameter List 127
3.3 Parameter Groups 128
3.4 A: Initialization Parameters 130
3.5 b: Application 132
3.6 C: Tuning 142
3.7 d: Reference Settings 147
3.8 E: Motor Parameters 151
3.9 F: Options 156
3.10 H: Terminal Functions 167
3.11 L: Protection Functions 184
3.12 n: Special Adjustment 193
3.13 o: Keypad-Related Settings 200
3.14 q: DriveWorksEZ Parameters 205
3.15 r: DWEZ Connection 1-20 206
3.16 T: Motor Tuning 207
3.17 U: Monitors 211
3.18 Parameters that Change from the Default Settings with A1-02 [Control Method Selection] 222
3.19 Parameters that Change from the Default Settings with E3-01 [Motor 2 Control Mode Selection] 227
3.20 Parameters Changed by E1-03 [V/f Pattern Selection] 228
3.21 Defaults by Drive Model and Duty Rating ND/HD 230
3.22 Parameters Changed by PM Motor Code Selection 248

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 Modes

Icon	Description
	The parameter is available when operating the drive with V/f Control.
	The parameters is available when operating the drive with Closed Loop V/f Control.
	The parameter is available when operating the drive with Open Loop Vector Control.
	The parameter is available when operating the drive with Closed Loop Vector Control.
	The parameter is available when operating the drive with Advanced Open Loop Vector 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 Advanced Open Loop Vector Control for PM.
	The parameter is available when operating the drive with Closed 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	The parameter can be changed settings during run.
Expert	The parameter that is available in Expert Mode only. *1

*1 Set *A1-01 = 3 [Access Level Selection = Expert Level]* to display 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
b6	Dwell Function
b7	Droop Control
b8	Energy Saving
b9	Zero Servo
C1	Accel & Decel Time
C2	S-Curve Characteristics
C3	Slip Compensation
C4	Torque Compensation
C5	Auto Speed Regulator (ASR)
C6	Duty & Carrier Frequency
d1	Frequency Reference
d2	Reference Limits
d3	Jump Frequency
d4	Frequency Ref Up/Down & Hold
d5	Torque Control
d6	Field Weakening /Forcing
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
F1	PG Option Setup (Encoder)
F2	Analog Input Option
F3	Digital Input Option
F4	Analog Output Option
F5	Digital Output Option
F6	Communication Options
F7	Ethernet Options
H1	Digital Inputs
H2	Digital Outputs

Parameters	Name
H3	Analog Inputs
H4	Analog Outputs
H5	Modbus Communication
H6	Pulse Train Input/Output
H7	Virtual Inputs / Outputs
L1	Motor Protection
L2	Power Loss Ride Through
L3	Stall Prevention
L4	Speed Detection
L5	Fault Restart
L6	Torque Detection
L7	Torque Limit
L8	Drive Protection
L9	Drive Protection 2
n1	Hunting Prevention
n2	Auto Freq Regulator (AFR)
n3	High Slip/Overexcite Braking
n4	Adv Open Loop Vector Tune
n5	Feed Forward Control
n6	Online Tuning
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
T0	Tuning Mode Selection
T1	InductionMotor Auto-Tuning
T2	PM Motor Auto-Tuning
T3	ASR and Inertia Tuning
T4	EZ Tuning
U1	Operation Status Monitors
U2	Fault Trace
U3	Fault History
U4	Maintenance Monitors
U5	PID Monitors

Parameters	Name
U6	Operation Status Monitors

Parameters	Name
U8	DriveWorksEZ Monitors

3.4 A: Initialization Parameters

◆ A1: Initialization

No. (Hex.)	Name	Description	Default (Range)
A1-00 (0100) RUN	Language Selection	Sets the language for the LCD 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 7 : Chinese 8 : Czech 9 : Russian 10 : Turkish 11 : Polish 12 : Greek	0 (0 - 12)
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	2 (0 - 3)
A1-02 (0102)	Control Method Selection	Sets the control method for the drive application and the motor. 0 : V/f Control 1 : V/f Control with Encoder 2 : Open Loop Vector 3 : Closed Loop Vector 4 : Advanced Open Loop Vector 5 : PM Open Loop Vector 6 : PM Advanced Open Loop Vector 7 : PM Closed Loop Vector 8 : EZ Vector Control	2 (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	0 (0 - 3330)
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	Set the 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 : General-purpose 1 : Water Supply Pump 2 2 : Conveyor 3 : Exhaust Fan 4 : HVAC Fan 5 : Air Compressor	0 (0 - 5)
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)

No. (Hex.)	Name	Description	Default (Range)
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 to A2-32 (0106 - 0125)	User Parameters 1 to 32	You can select a maximum of 32 parameters for the drive and set them to parameters *A2-01 to A2-32*. The [User Parameters] section of the keypad main menu shows the set parameters. You can immediately access these set parameters. **Note:** Settings for *A2-01 to A2-32* change when the *A1-06 [Application Preset]* value changes.	Parameters in General-Purpose Setup Mode (Determined by A1-06)
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 (Setting Range)
b1-01 (0180)	Frequency Reference Selection 1	Sets the input method for the frequency reference. 0 : Keypad 1 : Analog Input 2 : Memobus/Modbus Communications 3 : Option PCB 4 : Pulse Train Input	1 (0 - 4)
b1-02 (0181)	Run Command Selection 1	Sets the input method for the Run command. 0 : Keypad 1 : Digital Input 2 : Memobus/Modbus Communications 3 : Option PCB	1 (0 - 3)
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 = 3, 4, 5, 6, 7, 8 [Control Method Selection = CLV, AOLV, OLV/PM, AOLV/PM, CLV/PM, 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	0 (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	0 (0, 1)
b1-05 (0184)	Operation Below Minimum Freq	Sets the drive operation when the frequency reference decreases to less than the value set in *E1-09 [Minimum Output Frequency]*. 0 : Operate at Frequency Reference 1 : Baseblock (Motor Coasts) 2 : Operate at Minimum Frequency 3 : Operate at Zero Speed	0 (0 - 3)
b1-06 (0185)	Digital Input Reading	Sets the number of times that the drive reads the sequence input command to prevent malfunction because of noise. 0 : Single Scan 1 : Double Scan	1 (0, 1)
b1-07 (0186)	LOCAL/REMOTE Run Selection	Sets drive response to an existing Run command when the drive receives a second Run command from a different location. 0 : Disregard Existing RUN Command 1 : Accept Existing RUN Command	0 (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)
b1-09 (0188) Expert	LOCAL/REMOTE Select during RUN	Sets the function that lets you use the LO/RE during operation to switch between LOCAL and REMOTE Modes. 0 : Disabled 1 : Enabled	0 (0, 1)
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)
b1-15 (01C4)	Frequency Reference Selection 2	Sets the input method for frequency reference 2. 0 : Keypad 1 : Analog Input 2 : Memobus/Modbus Communications 3 : Option PCB 4 : Pulse Train Input	0 (0 - 4)

No. (Hex.)	Name	Description	Default (Setting Range)
b1-16 (01C5)	Run Command Selection 2	Sets the input method for Run Command 2 when the user switches the control circuit terminals ON/OFF to change the Run command source. 0 : Keypad 1 : Digital Input 2 : Memobus/Modbus Communications 3 : Option PCB	0 (0 - 3)
b1-17 (01C6)	Run Command at Power Up	Sets drive response when energizing a 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	0 (0, 1)
b1-21 (0748) Expert	CLV Start Selection	Sets the conditions for the drive to accept a Run command when *A1-02 = 3, 7 [Control Method Selection = CLV, CLV/PM]*. Usually it is not necessary to change this setting. 0 : Reject RUN if b2-01<U1-05<E1-09 1 : Accept RUN Command at Any Speed	0 (0, 1)
b1-35 (1117) Expert	Digital Input Deadband Time	Sets the deadband time for MFDIs.	0.0 ms (0.0 to 100.0 ms)

◆ 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, Short Circuit Braking, and Zero Servo. **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. Sets the time of Zero Speed Control at start when *A1-02 = 3, 7 [Control Method Selection = CLV, CLV/PM]*.	A1-02 = 4: 0.03 s Other than A1-02 = 4: 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. Sets the time of Zero Speed Control at stop when *A1-02 = 3, 7 [Control Method Selection = CLV, CLV/PM]*.	Determined by A1-02 (0.00 - 10.00 s)
b2-08 (0190)	Magnetic Flux Compensation Value	Sets how much current the drive injects when DC Injection Braking at Start starts (Initial Excitation) as a percentage of *E2-03 [Motor No-Load Current]*.	0% (0 - 1000%)
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.	A1-02 = 8: 0.00 s Other than A1-02 = 8: 0.50 s (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, 6 [OLV/PM, AOLV/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 : Disabled 1 : Enabled	Determined by A1-02 (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%)

No. (Hex.)	Name	Description	Default (Range)
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)
b3-10 (019A) Expert	Speed Estimation Detection Gain	Sets the gain to correct estimated frequencies from Speed Estimation Speed Search.	1.05 (1.00 - 1.20)
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 222 for information about the initial value of *b3-14 [Bi-directional Speed Search]* that applies when you set these parameters: –*A1-02 = 0, 2, 8 [Control Method Selection = V/f, OLV, 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, 2, 8* –*E9-01 = 0* –*b3-24 = 2 [Current Detection 2]* • Refer to page 222 for information about the initial value of *b3-14* that applies when you set these parameters: –*A1-02 = 1, 4, 8 [CL-V/f, AOLV, 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%.	150% (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, 2 [Control Method Selection = V/f, OLV]*: 2 –*A1-02 = 1 [CL-V/f]*: 1 –*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]*.	2 (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)

No. (Hex.)	Name	Description	Default (Range)
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)
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)
b3-35 (0BC3) Expert	Low Back EMF Detection Level	Sets the Low Back EMF Detection Level. Usually it is not necessary to change this setting.	10% (5 - 50%)
b3-36 (0BC4) Expert	High Back EMF Detection Level	Sets the voltage level for Speed Search restart. Usually it is not necessary to change this setting.	0.970 (0.500 - 1.000)
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)
b3-61 (1B96) Expert	Init Magnet Pole Estimation Gain	Adjusts the Initial Pole Detection response gain when *A1-02 = 6 [Control Method Selection = AOLV/PM]*. Set *b3-61 > 0.0* for a general IPM motor. The drive sets this value automatically when High Frequency Injection Tuning completes correctly. **Note:** • It is available when *n8-35 = 1 [Initial Pole Detection Method = High Frequency Injection]*. • To adjust the Initial Pole Detection response gain when *A1-02 = 5, 7 [OLV/PM, CLV/PM]*, set *n8-41 [HFI P Gain]*.	5.0 (-20.0 - +20.0)

◆ 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 until the contact is turned ON after the function set with *H2-01* turns ON.	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)

No. (Hex.)	Name	Description	Default (Range)
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 2 : Standard (D on feedback) 3 : Fref + PID Trim 4 : Fref + PID Trim (D on feedback) 5 : Same as 7series & prior, b5-01=1 6 : Same as 7series & prior, b5-01=2 7 : Same as 7series & prior, b5-01=3 8 : Same as 7series & prior, b5-01=4 **Note:** Use settings 5 to 8 when the drive is a replacement for a previous generation drive.	0 (0 - 8)
b5-02 (01A6) RUN	Proportional Gain (P)	Sets the proportional gain (P) that is applied to PID input.	1.00 (0.00 - 25.00)
b5-03 (01A7) RUN	Integral Time (I)	Sets the integral time (I) that is applied to PID input.	1.0 s (0.0 - 360.0 s)
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)

No. (Hex.)	Name	Description	Default (Range)
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)
b5-12 (01B0)	Feedback Loss Detection Select	Sets the drive response to PID Feedback Low/High. Sets drive operation after the drive detects PID feedback Low/High. 0 : Digital Out Only, Always Detect 1 : Alarm + Digital Out, Always Det 2 : Fault + Digital Out, Always Det 3 : Digital Out Only, @ PID Enable 4 : Alarm + Digital Out, @PID Enable 5 : Fault + Digital Out, @PID Enable	0 (0 - 5)
b5-13 (01B1)	PID Feedback Loss Detection Lvl	Sets the level that triggers *PID Feedback Loss [FbL]* detection 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%)
b5-14 (01B2)	PID Feedback Loss Detection Time	Sets the length of time that PID Feedback must be less than *b5-13 [PID Feedback Loss Detection Lvl]* to detect *PID Feedback Loss [FbL]*.	1.0 s (0.0 - 25.5 s)
b5-15 (01B3)	PID Sleep Function Start Level	Sets the output level that triggers the PID Sleep function.	Determined by A1-02 (0.0 - 590.0)
b5-16 (01B4)	PID Sleep Delay Time	Sets a delay time to start or stop the PID Sleep function.	0.0 s (0.0 - 25.5 s)
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)
b5-18 (01DC)	b5-19 PID Setpoint Selection	Sets the function that enables and disables *b5-19 [PID Setpoint Value]*. 0 : Disabled 1 : Enabled	0 (0, 1)
b5-19 (01DD) RUN	PID Setpoint Value	Sets the PID setpoint when *b5-18 = 1 [b5-19 PID Setpoint Selection = Enabled]*.	0.00% (0.00 - 100.00%)
b5-20 (01E2)	PID Unit Selection	Sets the number of digits to set and show the PID setpoint. 0 : 0.01Hz units 1 : 0.01% units 2 : rev/min 3 : User Units	1 (0 - 3)
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%)
b5-36 (01A1)	PID High Feedback Detection Lvl	Sets the level that triggers *Excessive PID Feedback [FbH]* 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 - 100%)
b5-37 (01A2)	PID High Feedback Detection Time	Sets the length of time that the PID feedback signal must be more than the level set in *b5-36 [PID Feedback High Detection Lvl]* to cause *Excessive PID Feedback [FbH]*.	1.0 s (0.0 - 25.5 s)

No. (Hex.)	Name	Description	Default (Range)
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.	Determined by b5-20 (1 - 60000)
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)	Determined by b5-20 (0 - 3)
b5-40 (017F)	Frequency Reference Monitor @PID	Sets the contents for monitor *U1-01 [Frequency Reference]* in PID control. 0 : U1-01 Includes PID Output 1 : U1-01 Excludes PID Output	0 (0, 1)
b5-47 (017D)	PID Trim Mode Output Reverse Sel	Sets reverse motor rotation when the PID control output is negative. 0 : Lower Limit is Zero 1 : Negative Output Accepted	1 (0, 1)
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)
b5-55 (0BE1)	PID Feedback Monitor Selection	Sets the monitor (*Ux-xx*) used as the PID Feedback. Set the *x-xx* part of the *Ux-xx [Monitor]*.	000 (000 - 999)
b5-56 (0BE2)	PID Feedback Monitor Gain	Sets the gain for the monitor set in *b5-55 [PID Feedback Monitor Selection]*.	1.00 (0.00 - 10.00)
b5-57 (11DD)	PID Feedback Monitor Bias	Sets the bias for the monitor specified in *b5-55 [PID Feedback Monitor Selection]*.	0.00 (-10.00 - +10.00)
b5-58 to b5-60: (1182 - 1184) RUN	PID Setpoints 2 to 4	Sets the PID setpoint when *H1-xx = 3E or 3F [MFDI Function Selection = PID Setpoint Selection 1/2]*. This value is 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%)
b5-61 (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%)
b5-63 (119C)	PID Differential FB Monitor Sel	Selects the monitor (*Ux-xx*) used as the PID Differential Feedback. Set the *x-xx* part of the *Ux-xx [Monitor]*.	000 (000 - 999)
b5-64 (119D)	PID Differential FB Monitor Gain	Sets the gain for the monitor specified in *b5-63 [PID Differential FB Monitor Sel]*.	1.00 (0.00 - 10.00)
b5-65 (119F)	PID Differential FB Monitor Bias	Sets the bias for the monitor specified in *b5-63 [PID Differential FB Monitor Sel]*.	0.00 (-10.00 - +10.00)
b5-66 (11DE)	PID Feedback Monitor Level	Sets the signal level for the monitor specified in *b5-55 [PID Feedback Monitor Selection]*. 0 : Absolute 1 : Bi-directional (+/-)	0 (0, 1)
b5-67 (11DF)	PID Differential FB Monitor Lvl	Sets the signal level for the monitor specified in *b5-63 [PID Differential FB Monitor Sel]*. 0 : Absolute 1 : Bi-directional (+/-)	0 (0, 1)
b5-89 (0B89) RUN	Sleep Method Selection	Sets sleep and wake up operation when using PID. 0 : Standard 1 : EZ Sleep/Wake-up	0 (0, 1)
b5-90 (0B90)	EZ Sleep Unit	Sets the measurement units for *b5-91 [EZ Sleep Minimum Speed]* and *b5-92 [EZ Sleep Level]*. 0 : 0.1Hz units 1 : rev/min	0 (0, 1)
b5-91 (0B91) RUN	EZ Sleep Minimum Speed	Sets the minimum speed for the EZ Sleep/Wakeup function. This parameter uses the largest value from *b5-91*, *b5-34 [PID Output Lower Limit Level]*, and *d2-02 [Frequency Reference Lower Limit]*.	0.0 Hz or 0 min^{-1} (r/min) (0.0 to 590.0 Hz or 0 to 35400 min^{-1} (r/min))

No. (Hex.)	Name	Description	Default (Range)
b5-92 (0B92) RUN	EZ Sleep Level	Sets the value that the output frequency or motor speed must be less than for longer than *b5-93 [EZ Sleep Time]* to enter Sleep Mode.	0.0 Hz or 0 min^{-1} (r/min) (0.0 to 590.0 Hz or 0 to 35400 min^{-1} (r/min))
b5-93 (0B93) RUN	EZ Sleep Time	Sets the length of time that the output frequency or motor speed must be less than *b5-92 [EZ Sleep Level]* to enter Sleep Mode.	5.0 s (0.0 - 1000.0 s)
b5-94 (0B94) RUN	EZ Sleep Wake-up Level	Sets the level at which the drive resumes operation when exiting Sleep Mode.	0.00% (0.00 - 600.00%)
b5-95 (0B95)	EZ Sleep Wake-up Mode	Sets the wake-up mode to use when exiting Sleep Mode. 0 : Absolute 1 : Setpoint Delta	0 (0, 1)
b5-96 (0B96) RUN	EZ Sleep Wake-up Time	Sets the EZ Wake-up time.	1.0 s (0.0 - 1000.0 s)

◆ b6: Dwell Function

No. (Hex.)	Name	Description	Default (Range)
b6-01 (01B6)	Dwell Reference at Start	Sets the output frequency that the drive will hold momentarily when the motor starts.	0.0 (Determined by A1-02)
b6-02 (01B7)	Dwell Time at Start	Sets the length of time that the drive will hold the output frequency when the motor starts.	0.0 s (0.0 - 10.0 s)
b6-03 (01B8)	Dwell Reference at Stop	Sets the output frequency that the drive will hold momentarily when ramping to stop the motor.	0.0 (Determined by A1-02)
b6-04 (01B9)	Dwell Time at Stop	Sets the length of time for the drive to hold the output frequency when ramping to stop the motor.	0.0 s (0.0 - 10.0 s)

◆ b7: Droop Control

No. (Hex.)	Name	Description	Default (Range)
b7-01 (01CA) RUN	Droop Control Gain	Sets the amount of deceleration when the torque reference is at 100% as a percentage of *E1-04 [Maximum Output Frequency]*.	0.0% (0.0 - 100.0%)
b7-02 (01CB) RUN	Droop Control Delay Time	Sets the responsiveness of Droop control. Decrease this setting when drive response is slow. Increase this setting when hunting or oscillation occur.	0.05 s (0.03 - 2.00 s)
b7-03 (017E)	Droop Control Limit Selection	Sets the Droop control limit function. 0 : Disabled 1 : Enabled	1 (0, 1)

◆ 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 2 : Automatic Optimization **Note:** Setting *2* is available only when *A1-02 = 6, 7 [Control Method Selection = AOLV/PM, CLV/PM]* and in Expert Mode.	0 (0 - 2)
b8-02 (01CD) RUN Expert	Energy Saving Gain	Sets the gain for Energy-saving control.	Determined by A1-02 (0.0 - 10.0)
b8-03 (01CE) RUN Expert	Energy Saving Filter Time	Sets the responsiveness for Energy-saving control.	Determined by A1-02 , C6-01 and o2-04 (0.00 - 10.00 s)
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.	Determined by C6-01, 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%)
b8-16 (01F8) Expert	PM E-Save Coefficient Ki	Sets torque linearity. This parameter uses the Ki value from the motor nameplate. Usually it is not necessary to change this setting.	1.00 (0.00 - 3.00)
b8-17 (01F9) Expert	PM E-Save Coefficient Kt	Sets torque linearity. This parameter uses the Kt value from the motor nameplate. Usually it is not necessary to change this setting.	1.00 (0.00 - 3.00)
b8-18 (01FA) Expert	E-Save d-axis Current FilterTime	Sets the d-axis current reference filter time constant.	0.100 s (0.000 - 5.000 s)
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)
b8-21 (0B42) Expert	PM E-Save Search Gain	Sets the gain of Energy-saving control search operations.	0.3Hz (0.1 - 20.0 Hz)
b8-22 (0B43) Expert	PM E-Save Search LPF Cutoff Freq	Sets the frequency of the filter used to extract the high-efficiency phase from search operations. Usually it is not necessary to change this setting.	10.0 Hz (1.0 - 30.0 Hz)
b8-23 (0B44) Expert	PM E-Save Search Limit	Sets the search operations output limit. Usually it is not necessary to change this setting.	15.0 degrees (0.0 - 30.0 degrees)
b8-24 (0B45) Expert	PM E-Save High Freq ACR Gain	Sets the gain for high-frequency current control.	200.0 Hz (100.0 - 1000.0 Hz)
b8-25 (0B46) Expert	PM E-Save Search Start Level	Sets the start level for search operations.	10.0% (0.0 - 100.0%)

No. (Hex.)	Name	Description	Default (Range)
b8-26 (0B47) Expert	PM E-Save Power Setpoint	Sets a value to increase torque accuracy.	0.0% (-10.0 - +10.0%)
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)
b8-50 (0B0D)	Standby Mode Selection	Sets the Standby Mode function. 0 : Disabled 1 : Enabled	0 (0, 1)
b8-51 (0B01)	Standby Mode Wait Time	Sets the delay time before turning off the electromagnetic contactor after the drive stops.	600 s (0 - 6000 s)

◆ b9: Zero Servo

No. (Hex.)	Name	Description	Default (Range)
b9-01 (01DA)	Zero Servo Gain	Sets the responsiveness for the Zero Servo function.	5 (0 - 100)
b9-02 (01DB)	Zero Servo Completion Window	Sets the range to trigger an output terminal set for “Zero Servo Complete” during Zero Servo operation. Be sure to set the deviation from the Zero Servo start position.	10 (0 - 16383)

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.	10.0 s (0.0 - 6000.0 s)
C1-02 (0201) RUN	Deceleration Time 1	Sets the length of time to decelerate from maximum output frequency to zero.	10.0 s (0.0 - 6000.0 s)
C1-03 (0202) RUN	Acceleration Time 2	Sets the length of time to accelerate from zero to maximum output frequency.	10.0 s (0.0 - 6000.0 s)
C1-04 (0203) RUN	Deceleration Time 2	Sets the length of time to decelerate from maximum output frequency to zero.	10.0 s (0.0 - 6000.0 s)
C1-05 (0204) RUN	Acceleration Time 3	Sets the length of time to accelerate from zero to maximum output frequency.	10.0 s (0.0 - 6000.0 s)
C1-06 (0205) RUN	Deceleration Time 3	Sets the length of time to decelerate from maximum output frequency to zero.	10.0 s (0.0 - 6000.0 s)
C1-07 (0206) RUN	Acceleration Time 4	Sets the length of time to accelerate from zero to maximum output frequency.	10.0 s (0.0 - 6000.0 s)
C1-08 (0207) RUN	Deceleration Time 4	Sets the length of time to decelerate from maximum output frequency to zero.	10.0 s (0.0 - 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 (0.0 - 6000.0 s)
C1-10 (0209)	Accel/Decel Time Setting Units	Sets the setting units for *C1-01 to C1-08 [Accel/Decel Times 1 to 4]*, *C1-09 [Fast Stop Time]*, *L2-06 [Kinetic Energy Backup Decel Time]*, and *L2-07 [Kinetic Energy Backup Accel Time]*. 0 : 0.01 s (0.00 to 600.00 s) 1 : 0.1 s (0.0 to 6000.0 s)	1 (0, 1)
C1-11 (020A)	Accel/Decel Time Switching Frequency	Sets the frequency at which the drive will automatically change acceleration and deceleration times.	Determined by A1-02 (0.0 - 590.0 Hz)
C1-14 (0264) RUN	Accel/Decel Rate Frequency	Sets the base frequency used to calculate acceleration and deceleration rates.	0.0 Hz (0.0 - 590.0 Hz)

◆ 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 changing the slip compensation gain: • *E2-01 [Motor Rated Current (FLA)]* • *E2-02 [Motor Rated Slip]* • *E2-03 [Motor No-Load Current]*	Determined by A1-02 (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)
C3-03 (0211)	Slip Compensation Limit	Sets the upper limit for the slip compensation function as a percentage of the motor rated slip.	200% (0 - 250%)
C3-04 (0212)	Slip Compensation at Regen	Sets the slip compensation function during regenerative operation. 0 : Disabled 1 : Enabled Above 6Hz 2 : Enabled Above C3-15	0 (0 - 2)
C3-05 (0213)	Output Voltage Limit Selection	Sets the automatic reduction of motor magnetic flux when the output voltage is saturated. 0 : Disabled 1 : Enabled	0 (0, 1)
C3-16 (0261) Expert	Vout Modulation Limit Start Lvl	Sets the modulation factor that starts the output voltage limit operation when *C3-05 = 1 [Output Voltage Limit Selection = Enabled]*.	90.0% (70.0 - 90.0%)
C3-17 (0262) Expert	Vout Modulation Limit Max Level	Sets the modulation factor used with *C3-18 [Output Voltage Limit Level]* for the output voltage limit operation when *C3-05 = 1 [Output Voltage Limit Selection = Enabled]*.	100.0% (85.0 - 100.0%)
C3-18 (0263) Expert	Output Voltage Limit Level	Sets the maximum drop width of the voltage reference when *C3-05 = 1 [Output Voltage Limit Selection = Enabled]*.	90.0% (50.0 - 100.0%)
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 changing the slip compensation gain: • *E4-01 [Motor 2 Rated Current]* • *E4-02 [Motor 2 Rated Slip]* • *E4-03 [Motor 2 Rated No-Load Current]*	Determined by E3-01 (0.0 - 2.5)
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.	Determined by E3-01 (0 - 10000 ms)
C3-23 (0242)	Motor 2 Slip Compensation Limit	Sets the upper limit for the slip compensation function as a percentage of the motor 2 rated slip.	200% (0 - 250%)
C3-24 (0243)	Motor 2 Slip Comp during Regen	Sets the slip compensation during regenerative operation function for motor 2. 0 : Disabled 1 : Enabled Above 6Hz 2 : Enabled Above C3-15	0 (0 - 2)
C3-28 (1B5B) Expert	Adaptive Slip Control Mode	Sets the slip compensation function mode. 0 : Normal 1 : Advanced	0 (0, 1)

◆ 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 operating 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)
C4-03 (0217)	Torque Compensation @ FWD Start	Set the amount of torque reference for forward start as a percentage of the motor rated torque.	0.0% (0.0 - 200.0%)
C4-04 (0218)	Torque Compensation @ REV Start	Sets the amount of torque reference for reverse start as a percentage of the motor rated torque.	0.0% (-200.0 - 0.0%)
C4-05 (0219)	Torque Compensation Time	Sets the starting torque constant to use with *C4-03 and C4-04 [Torque Compensation @ FWD/REV Start]*.	10 ms (0 - 200 ms)
C4-06 (021A)	Motor 2 Torque Comp Delay Time	Sets the value if *ov [Overvoltage]* occurs with sudden changes in the load, at the end of acceleration, or at the start of deceleration.	150 ms (0 - 10000 ms)
C4-07 (0341) RUN	Motor 2 Torque Compensation Gain	Sets the gain for motor 2 torque compensation function when using the Motor Switch function.	1.00 (0.00 - 2.50)
C4-19 (0B8D) Expert	Torque Ripple Suppress Min Freq	Adjust this if slow oscillation occurs at low speeds. Increase this parameter in 1.0 Hz increments when current ripples and torque ripples occur during low-speed operation. Set this parameter to 0.0 to disable the function if increasing the value does not fix the problem. Usually it is not necessary to change this setting.	0.1 Hz (0.0 - 10.0 Hz)
C4-20 (0BCB) Expert	Voltage Compensation Adjust 1	Sets voltage precision compensation. Usually it is not necessary to change this setting.	120 (0 - 200)
C4-21 (0BCC) Expert	Voltage Compensation Adjust 2	Sets voltage precision compensation. Usually it is not necessary to change this setting.	5 (0 - 10)
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)
C5-05 (021F)	ASR Limit	Set the ASR output limit as a percentage of *E1-04 [Maximum Output Frequency]*.	5.0% (0.0 - 20.0%)
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)

No. (Hex.)	Name	Description	Default (Range)
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%)
C5-12 (0386)	Integral Operation @ Accel/ Decel	Sets ASR integral operation during acceleration and deceleration. 0 : Disabled 1 : Enabled	0 (0, 1)
C5-17 (0276) Expert	Motor Inertia	Sets the motor inertia. **Note:** The default settings and the display units for setting ranges are different for different drive models. • 0.0001 kgm² units (setting range: 0.0001 kgm² to 6.0000 kgm²): 2004 to 2021, 4002 to 4012 • 0.001 kgm² units (setting range: 0.001 kgm² to 60.000 kgm²): 2030 to 2211, 4018 to 4103 • 0.01 kgm² units (setting range: 0.01 kgm² to 600.00 kgm²): 2257 to 2415, 4140 to 4720	Determined by o2-04, C6-01, and E5-01 (0.0001 - 600.00 kgm²)
C5-18 (0277) Expert	Load Inertia Ratio	Sets the load inertia ratio for the motor inertia.	1.0 (0.0 - 6000.0)
C5-21 (0356) RUN	Motor 2 ASR Proportional Gain 1	Sets the gain to adjust ASR response for motor 2.	Determined by E3-01 (0.00 - 300.00)
C5-22 (0357) RUN	Motor 2 ASR Integral Time 1	Sets the ASR integral time for motor 2.	Determined by E3-01 (0.000 - 60.000 s)
C5-23 (0358) RUN	Motor 2 ASR Proportional Gain 2	Sets the gain to adjust ASR response for motor 2.	Determined by E3-01 (0.00 - 300.00)
C5-24 (0359) RUN	Motor 2 ASR Integral Time 2	Sets the ASR integral time for motor 2.	Determined by E3-01 (0.000 - 60.000 s)
C5-25 (035A)	Motor 2 ASR Limit	Set the motor 2 ASR output limit as a percentage of *E1-04 [Maximum Output Frequency]*.	5.0% (0.0 - 20.0%)
C5-26 (035B)	Motor 2 ASR Delay Time	Sets the motor 2 filter time constant of the torque reference output from the speed loop. Usually it is not necessary to change this setting.	Determined by E3-01 (0.000 - 0.500 s)
C5-27 (035C)	Motor 2 ASR Gain Switchover Freq	Sets the frequency where the drive will switch between these parameters: *C5-21 and C5-23 [Motor 2 ASR Proportional Gain 1/2]* *C5-22 and C5-24 [Motor 2 ASR Integral Time 1/2]*	0.0 (0.0 - 400.0)
C5-28 (035D)	Motor 2 ASR Integral Limit	Set the upper limit of the motor 2 ASR integral amount as a percentage of the rated load.	400% (0 - 400%)
C5-29 (0B18) Expert	Speed Control Response	Sets the level of speed control responsiveness. Usually it is not necessary to change this setting. 0 : Standard 1 : High Performance 1	0 (0, 1)
C5-32 (0361)	Motor 2 Integral Oper at Acc/Dec	Sets ASR integral operation during acceleration and deceleration for motor 2. 0 : Disabled 1 : Enabled	0 (0, 1)
C5-37 (0278) Expert	Motor 2 Inertia	Sets the motor inertia for motor 2. **Note:** The default settings and the display units for setting ranges are different for different drive models. • 0.0001 kgm² units (setting range: 0.0001 kgm² to 6.0000 kgm²): 2004 to 2021, 4002 to 4012 • 0.001 kgm² units (setting range: 0.001 kgm² to 60.000 kgm²): 2030 to 2211, 4018 to 4103 • 0.01 kgm² units (setting range: 0.01 kgm² to 600.00 kgm²): 2257 to 2415, 4140 to 4720	Determined by o2-04, C6-01 (0.0001 - 600.00 kgm²)
C5-38 (0279) Expert	Motor 2 Load Inertia Ratio	Sets the load inertia ratio for the motor 2 inertia.	1.0 (0.0 - 6000.0)
C5-39 (030D)	ASR Primary Delay Time Const 2	Sets the filter time constant used when the torque reference is output from ASR. Usually it is not necessary to change this parameter.	0.000 s (0.000 - 0.500 s)

No. (Hex.)	Name	Description	Default (Range)
C5-50 (0B14) Expert	Notch Filter Frequency	Sets the machine resonance frequency. **Note:** Set *C5-50 = 0 [0 Hz]* to disable the notch filter.	0 Hz (0, or 2 to 100 Hz)
C5-51 (0B15) Expert	Notch Filter Bandwidth	Sets the notch width of the notch filter. **Note:** Set *C5-50 = 0 [Notch Filter Frequency = 0 Hz]* to disable the notch filter.	1.0 (0.5 - 5.0)

◆ C6: Duty & Carrier Frequency

No. (Hex.)	Name	Description	Default (Range)
C6-01 (0223)	Normal / Heavy Duty Selection	Sets the drive duty rating. 0 : Heavy Duty Rating 1 : Normal Duty Rating	1 (0, 1)
C6-02 (0224)	Carrier Frequency Selection	Sets the carrier frequency for the transistors in the drive. 1 : 2.0 kHz 2 : 5.0 kHz (4.0 kHz AOLV/PM) 3 : 8.0 kHz (6.0 kHz AOLV/PM) 4 : 10.0 kHz (8.0 kHz AOLV/PM) 5 : 12.5 kHz (10.0 kHz AOLV/PM) 6 : 15.0 kHz (12.0 kHz AOLV/PM) 7 : Swing PWM1 (Audible Sound 1) 8 : Swing PWM2 (Audible Sound 2) 9 : Swing PWM3 (Audible Sound 3) A : Swing PWM4 (Audible Sound 4) F : User Defined (C6-03 to C6-05) **Note:** The carrier frequency for Swing PWM 1 to 4 is equivalent to 2.0 kHz.	Determined by A1-02, C6-01, 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 - 15.0 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 - 15.0 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)
C6-09 (022B)	Carrier Freq at Rotational Tune	Sets the Auto-Tuning carrier frequency. Usually it is not necessary to change this setting. 0 : 5kHz 1 : use C6-03	0 (0, 1)

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*. **Note:** When *A1-02 = 6, 7 [Control Method Selection = AOLV/PM, CLV/PM]*, the drive changes *o1-03 = 1 [0.01% (100% = E1-04)]*.	0.00 Hz (0.00 - 590.00 Hz)
d1-02 (0281) RUN	Reference 2	Sets the frequency reference in the units from *o1-03 [Frequency Display Unit Selection]*. **Note:** When *A1-02 = 6, 7 [Control Method Selection = AOLV/PM, CLV/PM]*, the drive changes *o1-03 = 1 [0.01% (100% = E1-04)]*.	0.00 Hz (0.00 - 590.00 Hz)
d1-03 (0282) RUN	Reference 3	Sets the frequency reference in the units from *o1-03 [Frequency Display Unit Selection]*. **Note:** When *A1-02 = 6, 7 [Control Method Selection = AOLV/PM, CLV/PM]*, the drive changes *o1-03 = 1 [0.01% (100% = E1-04)]*.	0.00 Hz (0.00 - 590.00 Hz)
d1-04 (0283) RUN	Reference 4	Sets the frequency reference in the units from *o1-03 [Frequency Display Unit Selection]*. **Note:** When *A1-02 = 6, 7 [Control Method Selection = AOLV/PM, CLV/PM]*, the drive changes *o1-03 = 1 [0.01% (100% = E1-04)]*.	0.00 Hz (0.00 - 590.00 Hz)
d1-05 (0284) RUN	Reference 5	Sets the frequency reference in the units from *o1-03 [Frequency Display Unit Selection]*. **Note:** When *A1-02 = 6, 7 [Control Method Selection = AOLV/PM, CLV/PM]*, the drive changes *o1-03 = 1 [0.01% (100% = E1-04)]*.	0.00 Hz (0.00 - 590.00 Hz)
d1-06 (0285) RUN	Reference 6	Sets the frequency reference in the units from *o1-03 [Frequency Display Unit Selection]*. **Note:** When *A1-02 = 6, 7 [Control Method Selection = AOLV/PM, CLV/PM]*, the drive changes *o1-03 = 1 [0.01% (100% = E1-04)]*.	0.00 Hz (0.00 - 590.00 Hz)
d1-07 (0286) RUN	Reference 7	Sets the frequency reference in the units from *o1-03 [Frequency Display Unit Selection]*. **Note:** When *A1-02 = 6, 7 [Control Method Selection = AOLV/PM, CLV/PM]*, the drive changes *o1-03 = 1 [0.01% (100% = E1-04)]*.	0.00 Hz (0.00 - 590.00 Hz)
d1-08 (0287) RUN	Reference 8	Sets the frequency reference in the units from *o1-03 [Frequency Display Unit Selection]*. **Note:** When *A1-02 = 6, 7 [Control Method Selection = AOLV/PM, CLV/PM]*, the drive changes *o1-03 = 1 [0.01% (100% = E1-04)]*.	0.00 Hz (0.00 - 590.00 Hz)
d1-09 (0288) RUN	Reference 9	Sets the frequency reference in the units from *o1-03 [Frequency Display Unit Selection]*. **Note:** When *A1-02 = 6, 7 [Control Method Selection = AOLV/PM, CLV/PM]*, the drive changes *o1-03 = 1 [0.01% (100% = E1-04)]*.	0.00 Hz (0.00 - 590.00 Hz)
d1-10 (028B) RUN	Reference 10	Sets the frequency reference in the units from *o1-03 [Frequency Display Unit Selection]*. **Note:** When *A1-02 = 6, 7 [Control Method Selection = AOLV/PM, CLV/PM]*, the drive changes *o1-03 = 1 [0.01% (100% = E1-04)]*.	0.00 Hz (0.00 - 590.00 Hz)
d1-11 (028C) RUN	Reference 11	Sets the frequency reference in the units from *o1-03 [Frequency Display Unit Selection]*. **Note:** When *A1-02 = 6, 7 [Control Method Selection = AOLV/PM, CLV/PM]*, the drive changes *o1-03 = 1 [0.01% (100% = E1-04)]*.	0.00 Hz (0.00 - 590.00 Hz)
d1-12 (028D) RUN	Reference 12	Sets the frequency reference in the units from *o1-03 [Frequency Display Unit Selection]*. **Note:** When *A1-02 = 6, 7 [Control Method Selection = AOLV/PM, CLV/PM]*, the drive changes *o1-03 = 1 [0.01% (100% = E1-04)]*.	0.00 Hz (0.00 - 590.00 Hz)
d1-13 (028E) RUN	Reference 13	Sets the frequency reference in the units from *o1-03 [Frequency Display Unit Selection]*. **Note:** When *A1-02 = 6, 7 [Control Method Selection = AOLV/PM, CLV/PM]*, the drive changes *o1-03 = 1 [0.01% (100% = E1-04)]*.	0.00 Hz (0.00 - 590.00 Hz)
d1-14 (028F) RUN	Reference 14	Sets the frequency reference in the units from *o1-03 [Frequency Display Unit Selection]*. **Note:** When *A1-02 = 6, 7 [Control Method Selection = AOLV/PM, CLV/PM]*, the drive changes *o1-03 = 1 [0.01% (100% = E1-04)]*.	0.00 Hz (0.00 - 590.00 Hz)

No. (Hex.)	Name	Description	Default (Range)
d1-15 (0290) RUN	Reference 15	Sets the frequency reference in the units from *o1-03 [Frequency Display Unit Selection]*. **Note:** When *A1-02 = 6, 7 [Control Method Selection = AOLV/PM, CLV/PM]*, the drive changes *o1-03 = 1 [0.01% (100% = E1-04)]*.	0.00 Hz (0.00 - 590.00 Hz)
d1-16 (0291) RUN	Reference 16	Sets the frequency reference in the units from *o1-03 [Frequency Display Unit Selection]*. **Note:** When *A1-02 = 6, 7 [Control Method Selection = AOLV/PM, CLV/PM]*, the drive changes *o1-03 = 1 [0.01% (100% = E1-04)]*.	0.00 Hz (0.00 - 590.00 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 Select = Jog Reference Selection]* to use the Jog frequency reference. **Note:** When *A1-02 = 6, 7 [Control Method Selection = AOLV/PM, CLV/PM]*, the drive sets *o1-03 = 1 [0.01% (100% = E1-04)]*.	6.00 Hz (0.00 - 590.00 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 (Determined by A1-02)
d3-02 (0295)	Jump Frequency 2	Sets the median value of the frequency band that the drive will avoid.	0.0 Hz (Determined by A1-02)
d3-03 (0296)	Jump Frequency 3	Sets the median value of the frequency band that the drive will avoid.	0.0 Hz (Determined by A1-02)
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 or the frequency bias (Up/Down 2) 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]* • *75/76 [Up/Down 2 Command]* 0 : Disabled 1 : Enabled	0 (0, 1)
d4-03 (02AA) RUN	Up/Down 2 Bias Step Frequency	Sets the bias that the Up/Down 2 function adds to or subtracts from the frequency reference.	0.00 Hz (0.00 - 99.99 Hz)
d4-04 (02AB) RUN	Up/Down 2 Ramp Selection	Sets the acceleration and deceleration times for the Up/Down 2 function to apply the bias to the frequency reference. 0 : Use Selected Accel/Decel Time 1 : Use Accel/Decel Time 4	0 (0, 1)
d4-05 (02AC) RUN	Up/Down 2 Bias Mode Selection	Sets the function that saves the bias value to the drive when you open or close the two *Up/Down 2 Commands [H1-xx = 75, 76]*. Set *d4-03 [Up/Down 2 Bias Step Frequency] = 0.00* before you set this parameter. 0 : Hold when Neither Up/Down Closed 1 : Reset when Neither / Both Closed	0 (0, 1)
d4-06 (02AD)	Frequency Ref Bias (Up/Down 2)	Saves the bias value from the Up/Down 2 Command where 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 [Maximum Speed]*	0.0% (-99.9 - +100.0%)
d4-07 (02AE) RUN	Analog Freq Ref Fluctuate Limit	If the frequency reference changes for more than the level set to this parameter, then the bias value will be held. The value is set 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]*	1.0% (0.1 - 100.0%)
d4-08 (02AF) RUN	Up/Down 2 Bias Upper Limit	Sets the upper limit of the Up/Down 2 bias 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%)
d4-09 (02B0) RUN	Up/Down 2 Bias Lower Limit	Sets the lower limit of the Up/Down 2 bias 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% (-99.9 - 0.0%)
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)

◆ d5: Torque Control

No. (Hex.)	Name	Description	Default (Range)
d5-01 (029A)	Torque Control Selection	Sets the drive for torque control or speed control. 0 : Speed Control 1 : Torque Control	0 (0, 1)
d5-02 (029B)	Torque Reference Delay Time	Sets the primary delay time constant for the torque reference filter.	Determined by A1-02 (0 - 1000 ms)

No. (Hex.)	Name	Description	Default (Range)
d5-03 (029C)	Speed Limit Selection	Sets the torque control speed limit method. 1 : Active Frequency Reference 2 : d5-04 Setting	1 (1, 2)
d5-04 (029D)	Speed Limit	Sets the speed limit during Torque Control as a percentage of *E1-04 [Maximum Output Frequency]*. Set *d5-03 = 2 [Speed Limit Selection = d5-04 Setting]* before you set this parameter.	0% (-120 - +120%)
d5-05 (029E)	Speed Limit Bias	Sets the speed limit bias value as a percentage of *E1-04 [Maximum Output Frequency]*.	10% (0 - 120%)
d5-06 (029F)	Speed/Torque Changeover Time	Sets the delay time to switch between Speed Control and Torque Control. Set *H1-xx = 71 [MFDI Function Selection = Torque Control]* before you set this parameter.	0 ms (0 - 1000 ms)
d5-08 (02B5)	Uni-directional Speed Limit Bias	Sets the direction of the speed limit reference to which Speed Limit Bias *[d5-05]* applies. 0 : Disabled 1 : Enabled	1 (0, 1)

◆ d6: Field Weakening /Forcing

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 - 590.0 Hz)
d6-03 (02A2)	Field Forcing Selection	Sets the field forcing function. 0 : Disabled 1 : Enabled	0 (0, 1)
d6-06 (02A5)	Field Forcing Limit	Sets the limit value for field forcing to increase the motor excitation current reference as a percentage of *E2-03 [Motor No-Load Current]*. Usually it is not necessary to change this setting.	400% (100 - 400%)

◆ 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.*	200 V Class: 240 V, 400 V: 480 V (200 V Class: 155 to 255 V, 400 V Class: 310 to 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:** • When *A1-02 = 2 [Control Method Selection = OLV]*, settings *0* to *E* are not available. • 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.	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.	200 V Class: 230.0 V, 400 V: 460.0 V (200 V Class: 0.0 - 255.0 V, 400 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 , C6-01 and o2-04 (200 V Class: 0.0 - 255.0 V, 400 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 (200 V Class: 0.0 to 255.0 V, 400 V Class: 0.0 to 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)

No. (Hex.)	Name	Description	Default (Range)
E1-12 (030B) Expert	Mid Point B Voltage	Sets a middle point voltage for the V/f pattern.	0.0 V (200 V Class: 0.0 to 255.0 V, 400 V Class: 0.0 to 510.0 V)
E1-13 (030C) Expert	Base Voltage	Sets the base voltage for the V/f pattern.	0.0 V (200 V Class: 0.0 - 255.0 V,400 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, C6-01 (10% to 200% of the drive rated current)
E2-02 (030F)	Motor Rated Slip	Sets motor rated slip.	Determined by o2-04, C6-01 (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, C6-01 (0 to E2-01)
E2-04 (0311)	Motor Pole Count	Sets the number of motor poles. **Note:** • When *A1-02 = 0, 1, 3 [Control Method Selection = V/f, CL-V/f, CLV]*, the maximum value is 120. • When *A1-02 = 2, 4 [OLV, AOLV]*, the maximum value is 48.	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, C6-01 (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, C6-01 (0.0 - 60.0%)
E2-07 (0314)	Motor Saturation Coefficient 1	Sets the motor iron-core saturation coefficient at 50% of the magnetic flux.	0.50 (0.00 - 0.50)
E2-08 (0315)	Motor Saturation Coefficient 2	Sets the motor iron-core saturation coefficient at 75% of the magnetic flux.	0.75 (E2-07 - 0.75)
E2-09 (0316) Expert	Motor Mechanical Loss	Sets the mechanical loss of the motor. It is set as a percentage of *E2-11 [Motor Rated Power]*. Usually it is not necessary to change this setting.	0.0% (0.0 - 10.0%)
E2-10 (0317)	Motor Iron Loss	Sets the motor iron loss.	Determined by o2-04, C6-01 (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, C6-01 (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:** When you change this setting, the drive will set all parameters that are dependent on this parameter to their default settings. 0 : V/f Control 1 : V/f Control with Encoder 2 : Open Loop Vector 3 : Closed Loop Vector	0 (0 - 3)
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 - 590.0 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 (200 V Class: 0.0 - 255.0 V, 400 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)

No. (Hex.)	Name	Description	Default (Range)
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 (200 V Class: 0.0 - 255.0 V, 400 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 (200 V Class: 0.0 - 255.0 V, 400 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 (200 V Class: 0.0 to 255.0 V, 400 V Class: 0.0 to 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 (200 V Class: 0.0 to 255.0 V, 400 V Class: 0.0 to 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, C6-01 (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, C6-01 (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, C6-01 (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, C6-01 (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, C6-01 (0.0 - 60.0%)
E4-07 (0343)	Motor 2 Saturation Coefficient 1	Sets the motor 2 iron-core saturation coefficient at 50% of the magnetic flux.	0.50 (0.00 - 0.50)
E4-08 (0344)	Motor 2 Saturation Coefficient 2	Sets the motor 2 iron-core saturation coefficient at 75% of the magnetic flux.	0.75 (E4-07 - 0.75)
E4-09 (033F) Expert	Motor 2 Mechanical Loss	Sets the mechanical loss of motor 2. It is set as a percentage of *E4-11 [Motor 2 Rated Power]*. Usually it is not necessary to change this setting.	0.0% (0.0 - 10.0%)
E4-10 (0340)	Motor 2 Iron Loss	Sets the motor iron loss for motor 2.	Determined by o2-04, C6-01 (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, C6-01 (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 set some parameters to their correct settings automatically.	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, C6-01 (0.10 - 650.00 HP)
E5-03 (032B)	PM Motor Rated Current (FLA)	Sets the PM motor rated current (FLA).	Determined by o2-04, C6-01 (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 = 7 [Control Method Selection = CLV/PM]*, the maximum value is 120. • When *A1-02 = 5, 6 or 8 [OLV/PM, AOLV/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 the PM motors. 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/s) (0.0 - 2000.0 mV/(rad/s))
E5-11 (0333)	Encoder Z-Pulse Offset	Sets the encoder Z-pulse offset.	0.0 degrees (-180.0 - +180.0 degrees)
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})
E5-25 (035E) Expert	Polarity Estimation Timeout	Sets the function that switches polarity for initial polarity estimation. Usually it is not necessary to change this setting. 0 : Disabled 1 : Enabled	0 (0, 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)
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.	200 V Class: 230.0 V, 400 V: 460.0 V (200 V Class: 0.0 - 255.0 V,400 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 power in the units from *o1-58 [Motor Power Unit Selection]*.	Determined by E9-02 and o2-04 (0.00 - 650.00 HP)
E9-08 (11EB)	Motor Pole Count	Sets the number of motor poles.	4 (2 to 120)

No. (Hex.)	Name	Description	Default (Range)
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

◆ F1: Encoder Option Setup

No. (Hex.)	Name	Description	Default (Range)
F1-01 (0380)	Encoder 1 Pulse Count (PPR)	Sets the number of output pulses for each motor revolution.	1024 ppr (1 - 60000 ppr)
F1-02 (0381)	Encoder Signal Loss Detect Sel	Sets the method to stop the motor or let the motor continue operating when the drive detects *PGo [Encoder (PG) Feedback Loss]*. 0 : Ramp to Stop 1 : Coast to Stop 2 : Fast Stop (Use C1-09) 3 : Alarm Only 4 : No Alarm Display	1 (0 - 4)
F1-03 (0382)	Overspeed Detection Selection	Sets the method to stop the motor or let the motor continue operating when the drive detects *oS [Overspeed]*. 0 : Ramp to Stop 1 : Coast to Stop 2 : Fast Stop (Use C1-09) 3 : Alarm Only	1 (0 - 3)
F1-04 (0383)	Speed Deviation Detection Select	Sets the method to stop the motor or let the motor continue operating when the drive detects *dEv [Speed Deviation]*. 0 : Ramp to Stop 1 : Coast to Stop 2 : Fast Stop (Use C1-09) 3 : Alarm Only	3 (0 - 3)
F1-05 (0384)	Encoder 1 Rotation Selection	Sets the output sequence for the A and B pulses from the encoder, assuming that the motor is operating in the forward direction. 0 : Pulse A leads in FWD Direction 1 : Pulse B leads in FWD Direction	Determined by A1-02 (0, 1)
F1-06 (0385)	Encoder 1 Pulse Monitor Scaling	Sets the ratio between the pulse input and the pulse output of the encoder as a 3-digit number. The first digit is the numerator and the second and third digits set the denominator. The dividing ratio = (1 + x)/yz when the setting value is a 3-digit value (xyz).	001 (001 - 032, 102 - 132 (1 - 1/32))
F1-08 (0387)	Overspeed Detection Level	Sets the detection level of *oS [Overspeed]* as a percentage when 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 [Maximum Speed]*	115% (0 - 120%)
F1-09 (0388)	Overspeed Detection Delay Time	Sets the length of time that the speed feedback must be more than the *F1-08* level to cause *oS [Overspeed]*.	Determined by A1-02 (0.0 - 2.0 s)
F1-10 (0389)	Speed Deviation Detection Level	Sets the detection level of *dEv [Speed Deviation]* as a percentage when 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 [Maximum Speed]*	10% (0 - 50%)
F1-11 (038A)	Speed Deviation Detect DelayTime	Sets the length of time that the difference between the frequency reference and speed feedback must be more than the level in *F1-10* to cause *dEv [Speed Deviation]*.	0.5 s (0.0 - 10.0 s)
F1-12 (038B)	Encoder 1 Gear Teeth 1	Sets the number of gear teeth on the motor side. This parameter and *F1-13 [Encoder 1 Gear Teeth 2]* set the gear ratio between the motor and encoder.	0 (0 - 1000)
F1-13 (038C)	Encoder 2 Gear Teeth 1	Sets the number of gear teeth on the load side. This parameter and *F1-12 [Encoder 1 Gear Teeth 1]* set the gear ratio between the motor and encoder.	0 (0 - 1000)
F1-14 (038D)	Encoder Open-Circuit Detect Time	Sets the length of time that the drive must not receive a pulse signal to cause *PGo [Encoder (PG) Feedback Loss]*. **Note:** Motor speed and load conditions can cause *ov [Overvoltage]* and *oC [Overcurrent]* faults.	2.0 s (0.0 - 10.0 s)
F1-18 (03AD)	Deviation 3 Detection Selection	Sets the number of rotations necessary to detect conditions that invert the torque reference and rate of acceleration and cause *dv3 [Inversion Detection]*.	10 (0 - 10)

No. (Hex.)	Name	Description	Default (Range)
F1-19 (03AE)	Deviation 4 Detection Selection	Sets the number of pulses necessary to cause *dv4 [Inversion Prevention Detection]*.	128 (0 - 5000)
F1-20 (03B4)	Encoder 1 PCB Disconnect Detect	Sets the function that enables and disables detection of a disconnected encoder connection cable to cause *PGoH [Encoder (PG) Hardware Fault]*. 0 : No 1 : Yes	1 (0, 1)
F1-21 (03BC)	Encoder 1 Signal Selection	Sets the number of channels for the signal to the encoder option card. 0 : A Pulse Detection 1 : AB Pulse Detection	0 (0, 1)
F1-30 (03AA)	Motor 2 Encoder PCB Port Select	Sets the drive port to install the motor 2 encoder option card. 0 : CN5-C 1 : CN5-B	1 (0, 1)
F1-31 (03B0)	Encoder 2 Pulse Count (PPR)	Sets the number of output pulses for each motor revolution for motor 2.	1024 ppr (1 - 60000 ppr)
F1-32 (03B1)	Encoder 2 Rotation Selection	Sets the output sequence for the A and B pulses from the encoder for motor 2. This parameter assumes that the motor is operating in the forward direction. 0 : Pulse A leads in FWD Direction 1 : Pulse B leads in FWD Direction	0 (0, 1)
F1-33 (03B2)	Encoder 2 Gear Teeth 1	Sets the number of gear teeth on the motor side for motor 2. This parameter and *F1-34 [Encoder 2 Gear Teeth 2]* set the gear ratio between the motor and encoder.	0 (0 - 1000)
F1-34 (03B3)	Encoder 2 Gear Teeth 2	Sets the number of gear teeth on the load side for motor 2. This parameter and *F1-33 [Encoder 2 Gear Teeth 1]* set the gear ratio between the motor and encoder.	0 (0 - 1000)
F1-35 (03BE)	Encoder 2 Pulse Monitor Scaling	Sets the ratio between the pulse input and the pulse output of the encoder as a 3-digit number for motor 2. The first digit is the numerator and the second and third digits set the denominator. The dividing ratio = (1 + x)/yz when the setting value is a 3-digit value (xyz).	001 (001 - 032, 102 - 132 (1 - 1/32))
F1-36 (03B5)	Encoder 2 PCB Disconnect Detect	Sets the function that enables and disables detection of a disconnected encoder connection cable to cause *PGoH [Encoder (PG) Hardware Fault]* for motor 2. 0 : Disabled 1 : Enabled	1 (0, 1)
F1-37 (03BD)	Encoder 2 Signal Selection	Sets the number of channels for the signal to the encoder option card for motor 2. 0 : A Pulse Detection 1 : AB Pulse Detection	0 (0, 1)
F1-50 (03D2)	PG-F3 Option Encoder Type	Sets the type of encoder connected to the PG-F3 option. 0 : EnDat Sin/Cos 1 : EnDat Serial Only 2 : HIPERFACE	0 (0 - 2)
F1-51 (03D3)	PG-F3 PGoH Detection Level	The drive will detect *PGoH [Encoder (PG) Hardware Fault]* if the value of this parameter is smaller than the value of $\sqrt{\sin^2\theta + \cos^2\theta}$. **Note:** This function is enabled when *F1-20 = 1 [Encoder 1 PCB Disconnect Detect = Enabled]*.	80% (1 - 100%)
F1-52 (03D4)	Serial Encoder Comm Speed	Sets the communication speed between the PG-F3 option and the serial encoder. 0 : 1M/9600bps 1 : 500k/19200bps 2 : 1M/38400bps	0 (0 - 2)

◆ F2: Analog Input Option

No. (Hex.)	Name	Description	Default (Range)
F2-01 (038F)	Analog Input Function Selection	Sets the input method for the analog reference used with AI-A3. 0 : 3 Independent Channels 1 : 3 Channels Added Together	0 (0, 1)
F2-02 (0368) RUN	Analog Input Option Card Gain	Sets the analog reference gain as a percentage when the maximum output frequency is 100%. **Note:** • Set *F2-01 = 1 [Analog Input Function Selection = 3 Channels Added Together]* to enable this function. • 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% (-999.9 - +999.9%)
F2-03 (0369) RUN	Analog Input Option Card Bias	Sets the analog reference bias as a percentage when the maximum output frequency is 100%. **Note:** • Set *F2-01 = 1 [Analog Input Function Selection = 3 Channels Added Together]* to enable this function. • 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% (-999.9 - +999.9%)

◆ F3: Digital Input Option

No. (Hex.)	Name	Description	Default (Range)
F3-01 (0390)	Digital Input Function Selection	Sets the data format of digital input signals. This parameter is enabled when *o1-03 = 0 or 1 [Frequency Display Unit Selection = 0.01 Hz or 0.01% (100% = E1-04)]*. **Note:** When *o1-03 = 2* or *3 [Revolutions Per Minute (RPM) or User Units (o1-10 & o1-11)]*, the input signal will be BCD. The *o1-03* value sets the setting units. 0 : BCD, 1% units 1 : BCD, 0.1% units 2 : BCD, 0.01% units 3 : BCD, 1 Hz units 4 : BCD, 0.1 Hz units 5 : BCD, 0.01 Hz units 6 : BCD (5-digit), 0.02 Hz 7 : Binary input 8 : Multi-Function Digital Input	8 (0 - 8)
F3-03 (03B9)	Digital Input Data Length Select	Sets the number of bits to set the frequency reference with *DI-A3*. 0 : 8-bit 1 : 12-bit 2 : 16-bit	2 (0 - 2)
F3-10 (0BE3) Expert	Terminal D0 Function Selection	Sets the function for terminal D0 of the DI-A3 option when *F3-01 = 8 [Digital Input Function Selection = Multi-Function Digital Input]*.	F (1 - 19F)
F3-11 (0BE4) Expert	Terminal D1 Function Selection	Sets the function for terminal D1 of the DI-A3 option when *F3-01 = 8 [Digital Input Function Selection = Multi-Function Digital Input]*.	F (1 - 19F)
F3-12 (0BE5) Expert	Terminal D2 Function Selection	Sets the function for terminal D2 of the DI-A3 option when *F3-01 = 8 [Digital Input Function Selection = Multi-Function Digital Input]*.	F (1 - 19F)
F3-13 (0BE6) Expert	Terminal D3 Function Selection	Sets the function for terminal D3 of the DI-A3 option when *F3-01 = 8 [Digital Input Function Selection = Multi-Function Digital Input]*.	F (1 - 19F)
F3-14 (0BE7) Expert	Terminal D4 Function Selection	Sets the function for terminal D4 of the DI-A3 option when *F3-01 = 8 [Digital Input Function Selection = Multi-Function Digital Input]*.	F (1 - 19F)
F3-15 (0BE8) Expert	Terminal D5 Function Selection	Sets the function for terminal D5 of the DI-A3 option when *F3-01 = 8 [Digital Input Function Selection = Multi-Function Digital Input]*.	F (1 - 19F)

No. (Hex.)	Name	Description	Default (Range)
F3-16 (0BE9) Expert	Terminal D6 Function Selection	Sets the function for terminal D6 of the DI-A3 option when *F3-01 = 8 [Digital Input Function Selection = Multi-Function Digital Input]*.	F (1 - 19F)
F3-17 (0BEA) Expert	Terminal D7 Function Selection	Sets the function for terminal D7 of the DI-A3 option when *F3-01 = 8 [Digital Input Function Selection = Multi-Function Digital Input]*.	F (1 - 19F)
F3-18 (0BEB) Expert	Terminal D8 Function Selection	Sets the function for terminal D8 of the DI-A3 option when *F3-01 = 8 [Digital Input Function Selection = Multi-Function Digital Input]*.	F (1 - 19F)
F3-19 (0BEC) Expert	Terminal D9 Function Selection	Sets the function for terminal D9 of the DI-A3 option when *F3-01 = 8 [Digital Input Function Selection = Multi-Function Digital Input]*.	F (1 - 19F)
F3-20 (0BED) Expert	Terminal DA Function Selection	Sets the function for terminal DA of the DI-A3 option when *F3-01 = 8 [Digital Input Function Selection = Multi-Function Digital Input]*.	F (1 - 19F)
F3-21 (0BEE) Expert	Terminal DB Function Selection	Sets the function for terminal DB of the DI-A3 option when *F3-01 = 8 [Digital Input Function Selection = Multi-Function Digital Input]*.	F (1 - 19F)
F3-22 (0BEF) Expert	Terminal DC Function Selection	Sets the function for terminal DC of the DI-A3 option when *F3-01 = 8 [Digital Input Function Selection = Multi-Function Digital Input]*.	F (1 - 19F)
F3-23 (0BF0) Expert	Terminal DD Function Selection	Sets the function for terminal DD of the DI-A3 option when *F3-01 = 8 [Digital Input Function Selection = Multi-Function Digital Input]*.	F (1 - 19F)
F3-24 (0BF1) Expert	Terminal DE Function Selection	Sets the function for terminal DE of the DI-A3 option when *F3-01 = 8 [Digital Input Function Selection = Multi-Function Digital Input]*.	F (1 - 19F)
F3-25 (0BF2) Expert	Terminal DF Function Selection	Sets the function for terminal DF of the DI-A3 option when *F3-01 = 8 [Digital Input Function Selection = Multi-Function Digital Input]*.	F (1 - 19F)

◆ F4: Analog Output Option

No. (Hex.)	Name	Description	Default (Range)
F4-01 (0391)	Terminal V1 Function Selection	Sets the monitor signal output from terminal V1. Set the *x-xx* part of the *Ux-xx [Monitor]*. For example, set *F4-01 = 102* to monitor *U1-02 [Output Frequency]*.	102 (000 - 999)
F4-02 (0392) RUN	Terminal V1 Gain	Sets the gain of the monitor signal that is sent from terminal V1. Sets the analog signal output level from the terminal V1 at 10 V or 20 mA as 100% when an output for monitoring items is 100%.	100.0% (-999.9 - +999.9%)
F4-03 (0393)	Terminal V2 Function Selection	Sets the monitor signal output from terminal V2. Set the *x-xx* part of the *Ux-xx [Monitor]*. For example, set *F4-03 = 103* to monitor *U1-03 [Output Current]*.	103 (000 - 999)
F4-04 (0394) RUN	Terminal V2 Gain	Sets the gain of the monitor signal that is sent from terminal V2. Sets the analog signal output level from terminal V2 at 10 V or 20 mA as 100% when an output for monitoring items is 100%.	50.0% (-999.9 - +999.9%)
F4-05 (0395) RUN	Terminal V1 Bias	Sets the bias of the monitor signal that is sent from terminal V1. When an output for monitoring items is 0%, this parameter sets the analog signal output level from the V1 terminal as a percentage of 10 V or 20 mA.	0.0% (-999.9 - +999.9%)
F4-06 (0396) RUN	Terminal V2 Bias	Sets the bias of the monitor signal that is sent from terminal V2. Set the level of the analog signal sent from the V2 terminal 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)
F4-07 (0397)	Terminal V1 Signal Level	Sets the output signal level for terminal V1. 0 : 0 to 10 V 1 : -10 to 10 V	0 (0, 1)
F4-08 (0398)	Terminal V2 Signal Level	Sets the output signal level for terminal V2. 0 : 0 to 10 V 1 : -10 to 10 V	0 (0, 1)

◆ F5: Digital Output Option

No. (Hex.)	Name	Description	Default (Range)
F5-01 (0399)	Terminal P1-PC Function Select	Sets the function of terminal P1-PC on the DO-A3 option. Set *F5-09 = 2 [DO-A3 Output Mode Selection = Programmable (F5-01 to F5-08)]* to enable this function.	0 (0 - 1A7)
F5-02 (039A)	Terminal P2-PC Function Select	Sets the function of terminal P2-PC on the DO-A3 option. Set *F5-09 = 2 [DO-A3 Output Mode Selection = Programmable (F5-01 to F5-08)]* to enable this function.	1 (0 - 1A7)
F5-03 (039B)	Terminal P3-PC Function Select	Sets the function of terminal P3-PC on the DO-A3 option. Set *F5-09 = 2 [DO-A3 Output Mode Selection = Programmable (F5-01 to F5-08)]* to enable this function.	2 (0 - 1A7)
F5-04 (039C)	Terminal P4-PC Function Select	Sets the function of terminal P4-PC on the DO-A3 option. Set *F5-09 = 2 [DO-A3 Output Mode Selection = Programmable (F5-01 to F5-08)]* to enable this function.	4 (0 - 1A7)
F5-05 (039D)	Terminal P5-PC Function Select	Sets the function of terminal P5-PC on the DO-A3 option. Set *F5-09 = 2 [DO-A3 Output Mode Selection = Programmable (F5-01 to F5-08)]* to enable this function.	6 (0 - 1A7)
F5-06 (039E)	Terminal P6-PC Function Select	Sets the function of terminal P6-PC on the DO-A3 option. Set *F5-09 = 2 [DO-A3 Output Mode Selection = Programmable (F5-01 to F5-08)]* to enable this function.	37 (0 - 1A7)
F5-07 (039F)	Terminal M1-M2 Function Select	Sets the function of terminal M3-M2 on the DO-A3 option. Set *F5-09 = 2 [DO-A3 Output Mode Selection = Programmable (F5-01 to F5-08)]* to enable this function.	F (0 - 1A7)
F5-08 (03A0)	Terminal M3-M4 Function Select	Sets the function of terminal M3-M4 on the DO-A3 option. Set *F5-09 = 2 [DO-A3 Output Mode Selection = Programmable (F5-01 to F5-08)]* to enable this function.	F (0 - 1A7)
F5-09 (03A1)	DO-A3 Output Mode Selection	Sets the output mode of signals from the DO-A3 option. 0 : Predefined Individual Outputs 1 : Binary Output 2 : Programmable (F5-01 to F5-08)	0 (0 - 2)

◆ 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 a *bUS [Option Communication Error]*. 0 : Ramp to Stop 1 : Coast to Stop 2 : Fast Stop 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)
F6-04 (03A5)	bUS Error Detection Time	Sets the delay time for the drive to detect *bUS [Option Communication Error]*. **Note:** When you install an option card in the drive, the parameter value changes to 0.0 s.	2.0 s (0.0 - 5.0 s)

No. (Hex.)	Name	Description	Default (Range)
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)
F6-10 (03B6)	CC-Link Node Address	Sets the node address for CC-Link communication. Restart the drive after you change the parameter setting. **Note:** Be sure to set a node address that is different than all other node addresses. Do not set this parameter to *0*. Incorrect parameter settings will cause *AEr [Station Address Setting Error]* errors and the L.ERR LED on the option will come on.	0 (0 - 64)
F6-11 (03B7)	CC-Link Communication Speed	Sets the communication speed for CC-Link communication. Restart the drive after you change the parameter setting. 0 : 156 kbps 1 : 625 kbps 2 : 2.5 Mbps 3 : 5 Mbps 4 : 10 Mbps	0 (0 - 4)
F6-14 (03BB)	BUS Error Auto Reset	Sets the automatic reset function for *bUS [Option Communication Errors]*. 0 : Disabled 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)
F6-20 (036B)	MECHATROLINK Station Address	Sets the station address for MECHATROLINK communication. Restart the drive after you change the parameter setting. **Note:** • The setting range changes if using MECHATROLINK-II or MECHATROLINK-III: –MECHATROLINK-II (SI-T3) range: 20 - 3F –MECHATROLINK-III (SI-ET3) range: 03 - EF • Be sure to set a node address that is different than all other node addresses. Incorrect parameter settings will cause *AEr [Station Address Setting Error]* errors and the L.ERR LED on the option will come on. • When the station addressis 20 or 3F, the drive detects *AEr* errors.	0021h (MECHATROLINK-II: 0020h - 003Fh, MECHATROLINK-III: 0003h - 00EFh)
F6-21 (036C)	MECHATROLINK Frame Size	Sets the frame size for MECHATROLINK communication. Restart the drive after you change the parameter setting. 0 : 32byte (M-2) / 64byte (M-3) 1 : 17byte (M-2) / 32byte (M-3)	0 (0, 1)
F6-22 (036D)	MECHATROLINK Link Speed	Sets the communications speed for MECHATROLINK-II. Restart the drive after you change the parameter setting. **Note:** This parameter is only available with the MECHATROLINK-II option. 0 : 10 Mbps 1 : 4 Mbps	0 (0, 1)
F6-23 (036E)	MECHATROLINK Monitor Select (E)	Sets the MEMOBUS register used for the monitor functions of INV_CTL (drive operation control command) and INV_I/O (drive I/O control command). Restart the drive after you change the parameter setting.	0000h (0000h - FFFFh)
F6-24 (036F)	MECHATROLINK Monitor Select (F)	Sets the MEMOBUS register used for the monitor functions of INV_CTL (drive operation control command) and INV_I/O (drive I/O control command). Restart the drive after you change the parameter setting.	0000h (0000h - FFFFh)

No. (Hex.)	Name	Description	Default (Range)
F6-25 (03C9)	MECHATROLINK Watchdog Error Sel	Sets the method to stop the motor or let the motor continue operating when the drive detects an *E5 [MECHATROLINK Watchdog Timer Err]*. 0 : Ramp to Stop 1 : Coast to Stop 2 : Fast Stop (Use C1-09) 3 : Alarm Only	1 (0 - 3)
F6-26 (03CA)	MECHATROLINK Allowable No of Err	Sets the number of times that the option must detect a *bUS* alarm to cause a *bUS [Option Communication Error]*.	2 (2 - 10 times)
F6-30 (03CB)	PROFIBUS-DP Node Address	Sets the node address for PROFIBUS-DP communication. Restart the drive after you change the parameter setting. **Note:** Be sure to set an address that is different than all other node addresses. Do not set this parameter to 0.	0 (0 - 125)
F6-31 (03CC)	PROFIBUS-DP Clear Mode Selection	Sets what the drive will do after it receives the Clear Mode command. 0 : Reset 1 : Hold Previous State	0 (0, 1)
F6-32 (03CD)	PROFIBUS-DP Data Format Select	Sets the data format of PROFIBUS-DP communication. Restart the drive after you change the parameter setting. 0 : PPO Type 1 : Conventional 2 : PPO (bit0) 3 : PPO (Enter) 4 : Conventional (Enter) 5 : PPO (bit0, Enter)	0 (0 - 5)
F6-35 (03D0)	CANopen Node ID Selection	Sets the node address for CANopen communication. Restart the drive after you change the parameter setting. **Note:** Be sure to set an address that is different than all other node addresses. Do not set this parameter to *0*. Incorrect parameter settings will cause *AEr [Station Address Setting Error]* errors and the L. ERR LED on the option will come on.	0 (0 - 126)
F6-36 (03D1)	CANopen Communication Speed	Sets the CANopen communications speed. Restart the drive after you change the parameter setting. 0 : Detect Automatically 1 : 10 kbps 2 : 20 kbps 3 : 50 kbps 4 : 125 kbps 5 : 250 kbps 6 : 500 kbps 7 : 800 kbps 8 : 1 Mbps	6 (0 - 8)
F6-45 (02FB)	BACnet Node Address	Sets the node address for BACnet communication. **Note:** Be sure to set an address that is different than all other node addresses. Do not set this parameter to 0.	1 (0 - 127)
F6-46 (02FC)	BACnet Baud Rate	Sets the BACnet communications speed. 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)
F6-47 (02FD)	Rx to Tx Wait Time	Sets the wait time for the drive to receive and send BACnet communication.	5 ms (5 - 65 ms)
F6-48 (02FE)	BACnet Device Object Identifier0	Sets the last word of BACnet communication addresses.	0 (0 - FFFF)
F6-49 (02FF)	BACnet Device Object Identifier1	Sets the last word of BACnet communication addresses.	0 (0 - 3F)

No. (Hex.)	Name	Description	Default (Range)
F6-50 (03C1)	DeviceNet MAC Address	Sets the MAC address for DeviceNet communication. Restart the drive after you change the parameter setting. **Note:** Be sure to set a MAC address that is different than all other node addresses. Do not set this parameter to 0. Incorrect parameter settings will cause *AEr [Station Address Setting Error]* errors and the MS LED on the option will flash.	64 (0 - 64)
F6-51 (03C2)	DeviceNet Baud Rate	Sets the DeviceNet communications speed. Restart the drive after you change the parameter setting. 0 : 125 kbps 1 : 250 kbps 2 : 500 kbps 3 : Adjustable from Network 4 : Detect Automatically	4 (0 - 4)
F6-52 (03C3)	DeviceNet PCA Setting	Sets the format of data that the DeviceNet communication master sends to the drive.	21 (0 - 255)
F6-53 (03C4)	DeviceNet PPA Setting	Sets the format of data that the drive sends to the DeviceNet communication master.	71 (0 - 255)
F6-54 (03C5)	DeviceNet Idle Fault Detection	Sets the function to detect *EF0 [Option Card External Fault]* when the drive does not receive data from the DeviceNet master. 0 : Enabled 1 : Disabled, No Fault Detection 2 : Vendor Specific 3 : RUN Forward 4 : Reverse run	0 (0 - 4)
F6-55 (03C6)	DeviceNet Baud Rate Monitor	Sets the function to see the actual DeviceNet communications speed using the keypad. This parameter functions as a monitor only. 0 : 125 kbps 1 : 250 kbps 2 : 500 kbps	0 (0 - 2)
F6-56 (03D7)	DeviceNet Speed Scaling	Sets the speed scale for DeviceNet communication.	0 (-15 - +15)
F6-57 (03D8)	DeviceNet Current Scaling	Sets the current scale of the DeviceNet communication master.	0 (-15 - +15)
F6-58 (03D9)	DeviceNet Torque Scaling	Sets the torque scale of the DeviceNet communication master.	0 (-15 - +15)
F6-59 (03DA)	DeviceNet Power Scaling	Sets the power scale of the DeviceNet communication master.	0 (-15 - +15)
F6-60 (03DB)	DeviceNet Voltage Scaling	Sets the voltage scale of the DeviceNet communication master.	0 (-15 - +15)
F6-61 (03DC)	DeviceNet Time Scaling	Sets the time scale of the DeviceNet communication master.	0 (-15 - +15)
F6-62 (03DD)	DeviceNet Heartbeat Interval	Sets the heartbeat for DeviceNet communication. Set this parameter to 0 to disable the heartbeat function.	0 (0 - 10)
F6-63 (03DE)	DeviceNet Network MAC ID	Sets the function to see the actual DeviceNet MAC address using the keypad. This parameter functions as a monitor only.	63 (0 - 63)
F6-64 to F6-67 (03DF - 03E2)	Dynamic Out Assembly 109 Param 1 to 4	Sets Configurable Outputs 1 to 4 written to the MEMOBUS register.	0000h (0000h - FFFFh)
F6-68 to F6-71 (03E3, 03E4, 03C7, and 03C8)	Dynamic In Assembly 159 Param 1 to 4	Sets Configurable Inputs 1 to 4 written to the MEMOBUS register.	0000h (0000h - FFFFh)
F6-72 (081B)	PowerLink Node Address	Sets the node ID for PowerLink communication. **Note:** Be sure to set an address that is different than all other node addresses. Do not set this parameter to 0.	0 (0 - 255)

◆ 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 - F7-27 (03FB - 03FF) F7-28- F7-32 (0370 - 0374)	Dynamic Out Param 1 to 10 for CommCard	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 - F7-42 (0375 - 037E)	Dynamic In Param 1 to 10 for CommCard	Sets Input Assembly 166. 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
F7-60 (0780)	PZD1 Write (Control Word)	Sets the MEMOBUS/Modbus address for PZD1 (PPO output). PZD1 (PPO output) functions as the STW when *F7-60 = 0, 1, or 2*.	0
F7-61 (0781)	PZD2 Write (Frequency Reference)	Sets the MEMOBUS/Modbus address for PZD2 (PPO output). PZD2 (PPO output) functions as the HSW when *F7-61 = 0, 1, or 2*.	0
F7-62 (0782)	PZD3 Write	Sets the MEMOBUS/Modbus address for PZD3 (PPO output). A value of 0, 1, or 2 will disable the PZD3 (PPO output) write operation to the MEMOBUS/Modbus register.	0
F7-63 (0783)	PZD4 Write	Sets the MEMOBUS/Modbus address for PZD4 (PPO output). A value of 0, 1, or 2 will disable the PZD4 (PPO output) write operation to the MEMOBUS/Modbus register.	0
F7-64 (0784)	PZD5 Write	Sets the MEMOBUS/Modbus address for PZD5 (PPO output). A value of 0, 1, or 2 will disable the PZD5 (PPO output) write operation to the MEMOBUS/Modbus register.	0

No. (Hex.)	Name	Description	Default (Range)
F7-65 (0785)	PZD6 Write	Sets the MEMOBUS/Modbus address for PZD6 (PPO output). A value of 0, 1, or 2 will disable the PZD6 (PPO output) write operation to the MEMOBUS/Modbus register.	0
F7-66 (0786)	PZD7 Write	Sets the MEMOBUS/Modbus address for PZD7 (PPO output). A value of 0, 1, or 2 will disable the PZD7 (PPO output) write operation to the MEMOBUS/Modbus register.	0
F7-67 (0787)	PZD8 Write	Sets the MEMOBUS/Modbus address for PZD8 (PPO output). A value of 0, 1, or 2 will disable the PZD8 (PPO output) write operation to the MEMOBUS/Modbus register.	0
F7-68 (0788)	PZD9 Write	Sets the MEMOBUS/Modbus address for PZD9 (PPO output). A value of 0, 1, or 2 will disable the PZD9 (PPO output) write operation to the MEMOBUS/Modbus register.	0
F7-69 (0789)	PZD10 Write	Sets the MEMOBUS/Modbus address for PZD10 (PPO output). A value of 0, 1, or 2 will disable the PZD10 (PPO output) write operation to the MEMOBUS/Modbus register.	0
F7-70 (078A)	PZD1 Read (Status Word)	Sets the MEMOBUS/Modbus address for PZD1 (PPO Read). PZD1 (PPO input) functions as the ZSW when *F7-70 = 0*.	0
F7-71 (078B)	PZD2 Read (Output Frequency)	Sets the MEMOBUS/Modbus address for PZD2 (PPO Read). PZD2 (PPO input) functions as the HIW when *F7-71 = 0*.	0
F7-72 (078C)	PZD3 Read	Sets the MEMOBUS/Modbus address for PZD3 (PPO Read). A value of 0 will disable the PZD3 (PPO Read) load operation from the MEMOBUS/Modbus register.	0
F7-73 (078D)	PZD4 Read	Sets the MEMOBUS/Modbus address for PZD4 (PPO Read). A value of 0 will disable the PZD4 (PPO Read) load operation from the MEMOBUS/Modbus register.	0
F7-74 (078E)	PZD5 Read	Sets the MEMOBUS/Modbus address for PZD5 (PPO Read). A value of 0 will disable the PZD5 (PPO Read) load operation from the MEMOBUS/Modbus register.	0
F7-75 (078F)	PZD6 Read	Sets the MEMOBUS/Modbus address for PZD6 (PPO Read). A value of 0 will disable the PZD6 (PPO Read) load operation from the MEMOBUS/Modbus register.	0
F7-76 (0790)	PZD7 Read	Sets the MEMOBUS/Modbus address for PZD7 (PPO Read). A value of 0 will disable the PZD7 (PPO input) load operation from the MEMOBUS/Modbus register.	0
F7-77 (0791)	PZD8 Read	Sets the MEMOBUS/Modbus address for PZD8 (PPO Read). A value of 0 will disable the PZD8 (PPO Read) load operation from the MEMOBUS/Modbus register.	0
F7-78 (0792)	PZD9 Read	Sets the MEMOBUS/Modbus address for PZD9 (PPO Read). A value of 0 will disable the PZD9 (PPO Read) load operation from the MEMOBUS/Modbus register.	0
F7-79 (0793)	PZD10 Read	Sets the MEMOBUS/Modbus address for PZD10 (PPO Read). A value of 0 will disable the PZD10 (PPO Read) load operation from the MEMOBUS/Modbus register.	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 the drive is initialized 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 the drive is initialized for *3-Wire Initialization [A1-03 = 3330]*.	41 (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:** When you initialize the drive for *3-Wire Initialization [A1-03 = 3330]*, the default setting is *3*.	4 (0 - 1FF)
H1-07 (0404)	Terminal S7 Function Selection	Sets the function for MFDI terminal S7. **Note:** When you initialize the drive for *3-Wire Initialization [A1-03 = 3330]*, the default setting is *4*.	6 (0 - 1FF)
H1-08 (0405)	Terminal S8 Function Selection	Sets the function for MFDI terminal S8.	8 (0 - 1FF)
H1-21 (0B70)	Terminal S1 Function Selection 2	Sets the second function for MFDI terminal S1.	F (1 - 19F)
H1-22 (0B71)	Terminal S2 Function Select 2	Sets the second function for MFDI terminal S2.	F (1 - 19F)
H1-23 (0B72)	Terminal S3 Function Selection 2	Sets the second function for MFDI terminal S3.	F (1 - 19F)
H1-24 (0B73)	Terminal S4 Function Selection 2	Sets the second function for MFDI terminal S4.	F (1 - 19F)
H1-25 (0B74)	Terminal S5 Function Selection 2	Sets the second function for MFDI terminal S5.	F (1 - 19F)
H1-26 (0B75)	Terminal S6 Function Selection 2	Sets the second function for MFDI terminal S6.	F (1 - 19F)
H1-27 (0B76)	Terminal S7 Function Selection 2	Sets the second function for MFDI terminal S7.	F (1 - 19F)
H1-28 (0B77)	Terminal S8 Function Selection 2	Sets the second function for MFDI terminal S8.	F (1 - 19F)
H1-40 (0B54)	Mbus Reg 15C0h bit0 Input Func	Selects MFDI function assigned to *bit 0* of the MEMOBUS register *15C0 (Hex.)*.	F (1 - 19F)
H1-41 (0B55)	Mbus Reg 15C0h bit1 Input Func	Selects MFDI function assigned to *bit 1* of the MEMOBUS register *15C0 (Hex.)*.	F (1 - 19F)
H1-42 (0B56)	Mbus Reg 15C0h bit2 Input Func	Selects MFDI function assigned to *bit 2* of the MEMOBUS register *15C0 (Hex.)*.	F (1 - 19F)

■ H1-xx: MFDI Setting Values

Setting Value	Function	Description
0	3-Wire Sequence	Sets the direction of motor rotation for 3-wire sequence.
1	LOCAL/REMOTE Selection	Sets drive control for the keypad (LOCAL) or an external source (REMOTE). ON : LOCAL OFF : REMOTE
2	External Reference 1/2 Selection	Sets the drive to use Run command source 1/2 or Reference command source 1/2 when in REMOTE Mode. ON : *b1-15 = [Frequency Reference Selection 2], b1-16 [Run Command Selection 2]* OFF : *b1-01 = [Frequency Reference Selection 1], b1-02 [Run Command Selection 1]*
3	Multi-Step Speed Reference 1	Uses speed references *d1-01 to d1-16* to set a multi-step speed reference.
4	Multi-Step Speed Reference 2	Uses speed references *d1-01 to d1-16* to set a multi-step speed reference.
5	Multi-Step Speed Reference 3	Uses speed references *d1-01 to d1-16* 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*. The JOG Frequency Reference (JOG command) overrides Frequency References *1 to 16 (d1-01 to d1-16)*.
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
D	Ignore Speed Fdbk (V/f w/o Enc)	Sets the command to disable speed feedback control and run the drive in V/f control or use speed feedback from the encoder. ON : Speed feedback control disable (V/f Control) OFF : Speed feedback control enable (Closed Loop V/f Control)
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 reverse at the Jog Frequency set in *d1-17 [Jog Reference]*.
14	Fault Reset Procedure	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 : Operate motor 2 OFF : Operate motor 1

Setting Value	Function	Description
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 to 8 [PID Mode Setting = Enabled]*. ON : PID control disabled OFF : PID control enabled
1A	Accel/Decel Time Selection 2	Set this function and *H1-xx = 7[Accel/Decel Time Selection 1]* together. Sets the drive to use *Acceleration/Deceleration Time 3 [C1-05, C1-06]* or *Acceleration/Deceleration Time 4 [C1-07, C1-08]*.
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, A2, or A3 and hold the frequency reference at that frequency.
20 to 2F	External fault	Sets a command to stop the drive when a failure or fault occurs on an external device. 20 : External Fault (NO-Always-Ramp) 21 : External Fault (NC-Always-Ramp) 22 : External Fault (NO-@Run-Ramp) 23 : External Fault (NC-@Run-Ramp) 24 : External Fault (NO-Always-Coast) 25 : External Fault (NC-Always-Coast) 26 : External Fault (NO-@Run-Coast) 27 : External Fault (NC-@Run-Coast) 28 : External Fault (NO-Always-FStop) 29 : External Fault (NC-Always-FStop) 2A : External Fault (NO-@Run-FStop) 2B : External Fault (NC-@Run-FStop) 2C : External Fault (NO-Always-Alarm) 2D : External Fault (NC-Always-Alarm) 2E : External Fault (NO-@Run-Alarm) 2F : External Fault (NC-@Run-Alarm)
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.
32	Multi-Step Speed Reference 4	Uses speed references *d1-01 to d1-16* to set a multi-step speed reference.
34	PID Soft Starter Disable	Sets the PID soft starter function. ON : No OFF : Yes
35	PID Input (Error) Invert	Sets the command to turn the terminal ON and OFF to switch the PID input level (polarity).
3E	PID Setpoint Selection 1	Set this function and *H1-xx = 3F [PID Setpoint Selection 2]* together. Sets the function to switch the PID setpoint to *b5-58 to b5-60 [PID Setpoint 2 to 4]*.
3F	PID Setpoint Selection 2	Set this function and *H1-xx = 3E [PID Setpoint Selection 1]* at the same time. Sets the function to switch the PID setpoint to *b5-58 to b5-60 [PID Setpoint 2 to 4]*.
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)]* at the same time. ON : Forward Run OFF : Run Stop **Note:** • If you activate the Forward Run command terminal and the Reverse Run command terminal, the drive will detect minor fault/alarm *EF [FWD/REV Run Command Input Error]* 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)]* at the same time. ON : Reverse Run OFF : Run Stop **Note:** • If you activate the Forward Run command terminal and the Reverse Run command terminal, the drive will detect minor fault/alarm *EF [FWD/REV Run Command Input Error]* 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)]*.

Setting Value	Function	Description
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)]* at the same time. 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	Offset Frequency 1	Sets the function to add the offset frequency set in *d7-01 [Offset Frequency 1]* to the frequency reference when the terminal activates.
45	Offset Frequency 2	Sets the function to add the offset frequency set in *d7-02 [Offset Frequency 2]* to the frequency reference when the terminal activates.
46	Offset Frequency 3	Sets the function to add the offset frequency set in *d7-03 [Offset Frequency 3]* to the frequency reference when the terminal activates.
47	Node Setup (CANopen)	Sets the function in CANopen communications to start the Node Setup function to set the drive node address from the host controller.
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 only when you use 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]* when *H1-xx = 61 and 62* are set 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]* when *H1-xx = 61 and 62* are set 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.
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	Sets the command to use high-slip braking to stop the motor.
6A	Drive Enable	Sets the function to show *dnE [Drive Enabled]* on the keypad and ignore Run commands when the terminal is OFF.
71	Torque Control	Sets the function to switch between torque control and speed control. ON : Torque Control OFF : Speed Control
72	Zero Servo	Sets the function to hold a stopped motor.
75	Up 2 Command	Sets the function to increase the frequency reference bias value to accelerate the motor when the terminal is activated. Set this function and *H1-xx = 76 [Down 2 Command]* together. **Note:** When you use this function, use *d4-08* and *d4-09 [Up/Down 2 Bias Upper Limit/Lower Limit]* to set the optimal bias limit value.
76	Down 2 Command	Sets the function to decrease the frequency reference bias value to decelerate the motor when the terminal is activated. Set this function and *H1-xx = 75 [Up 2 Command]* at the same time. **Note:** When you use this function, use *d4-08* and *d4-09 [Up/Down 2 Bias Upper Limit/Lower Limit]* to set the optimal bias limit value.
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
78	Analog TorqueRef Polarity Invert	Sets the rotation direction of the external torque reference. ON : External torque reference reverse direction OFF : External torque reference forward direction

Setting Value	Function	Description
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.
7E	Reverse Rotation Identifier	Sets the rotation direction of the motor when in Simple Closed Loop V/f Control method and *F1-21, F1-37 = 0 [Encoder Option Function Selection = A pulse detection]*, or when in Closed Loop V/f Control method. ON : Reverse run OFF : Forward run
90 - 97	DWEZ Digital Inputs 1 to 8	Sets digital inputs used with DriveWorksEZ. Refer to the DriveWorksEZ online manual for more information.
9F	DWEZ Disable	Sets operation of the DriveWorksEZ program saved in the drive. ON : No OFF : Yes **Note:** Set *A1-07 = 2 [DriveWorksEZ Function Selection = Digital input]* to enable this function.
101 to 19F	Inverse Inputs of 1 to 9F	Sets the function of the selected MFDI to operate inversely. To select the function, enter "1xx", where the "xx" is the function setting value. **Note:** You cannot use inverse input for all functions. Refer to the GA800 Technical Reference (SIEPC71061737) for more information.

◆ 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:** Set this parameter to *F* when the terminal is not being used or to use the terminal in through mode.	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)

No. (Hex.)	Name	Description	Default (Range)
H2-10 (0B3D)	Modbus Register 2 Bit Select	Sets the bit of the MEMOBUS/Modbus register output to the MFDO terminal.	0000 (0000 - FFFF)
H2-20 (1540)	Comparator 1 Monitor Selection	Sets the monitor number for comparator 1. Set the *x-xx* part of the *Ux-xx [Monitor]*. For example, set *H2-20 = 102* to monitor *U1-02 [Output Frequency]*.	102 (000 - 999)
H2-21 (1541)	Comparator 1 Lower Limit	Sets the lower limit detection level for comparator 1 when the full scale analog output for the monitor selected in *H2-20 [Comparator 1 Monitor Selection]* is the 100% value.	0.0% (0.0 - 300.0%)
H2-22 (1542)	Comparator 1 Upper Limit	Sets the upper limit detection level for comparator 1 when the full scale analog output for the monitor selected in *H2-20 [Comparator 1 Monitor Selection]* is the 100% value.	0.0% (0.0 - 300.0%)
H2-23 (1543)	Comparator 1 Hysteresis	Sets the hysteresis level for comparator 1 as a percentage of the full scale analog output for the monitor selected in *H2-20 [Comparator 1 Monitor Selection]*.	0.0% (0.0 - 10.0%)
H2-24 (1544)	Comparator 1 On-Delay Time	Sets the on-delay time for comparator 1.	0.0 s (0.0 - 600.0 s)
H2-25 (1545)	Comparator 1 Off-Delay Time	Sets the off-delay time for comparator 1.	0.0 s (0.0 - 600.0 s)
H2-26 (1546)	Comparator 2 Monitor Selection	Sets the monitor number for comparator 2. Set the *x-xx* part of the *Ux-xx [Monitor]*. For example, set *H2-26 = 103* to monitor *U1-03 [Output Current]*.	103 (000 - 999)
H2-27 (1547)	Comparator 2 Lower Limit	Sets the lower limit detection level for comparator 2 as a percentage of the full scale analog output for the monitor selected in *H2-26 [Comparator 2 Monitor Selection]*.	0.0% (0.0 - 300.0%)
H2-28 (1548)	Comparator 2 Upper Limit	Sets the upper limit detection level for comparator 2 as a percentage of the full scale analog output for the monitor selected in *H2-26 [Comparator 2 Monitor Selection]*.	0.0% (0.0 - 300.0%)
H2-29 (1549)	Comparator 2 Hysteresis	Sets the hysteresis level for comparator 2 as a percentage of the full scale analog output for the monitor selected in *H2-26 [Comparator 2 Monitor Selection]*.	0.0% (0.0 - 10.0%)
H2-30 (154A)	Comparator 2 On-Delay Time	Sets the on-delay time for comparator 2.	0.0 s (0.0 - 600.0 s)
H2-31 (154B)	Comparator 2 Off-Delay Time	Sets the off-delay time for comparator 2.	0.0 s (0.0 - 600.0 s)
H2-32 (159A)	Comparator 1 Filter Time	Sets the time constant that is applied to the primary delay filter used for the analog output of the monitor selected with *H2-20 [Comparator 1 Monitor Selection]*.	0.0s (0.0 - 10.0 s)
H2-33 (159B)	Comparator1 Protection Selection	Sets drive operation when it detects *CP1 [Comparator1 Limit Fault]*. 0 : Ramp to Stop 1 : Coast to Stop 2 : Fast Stop (Use C1-09) 3 : Alarm Only 4 : Digital Output Only	4 (0 - 4)
H2-34 (159C)	Comparator 2 Filter Time	Sets the time constant that is applied to the primary delay filter used for the analog output of the monitor selected with *H2-26 [Comparator 2 Monitor Selection]*.	0.0s (0.0 - 10.0 s)
H2-35 (159D)	Comparator2 Protection Selection	Sets drive operation when it detects *CP2 [Comparator2 Limit Fault]*. 0 : Ramp to Stop 1 : Coast to Stop 2 : Fast Stop (Use C1-09) 3 : Alarm Only 4 : Digital Output Only	4 (0 - 4)
H2-36 (159E)	Comparator 1 Ineffective Time	Sets the length of time that *CP1 [Comparator1 Limit Fault]* is disabled.	0.0 s (0.0 - 1000.0 s)
H2-37 (159F)	Comparator 2 Ineffective Time	Sets the length of time that *CP2 [Comparator2 Limit Fault]* is disabled.	0.0 s (0.0 - 1000.0 s)
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)

No. (Hex.)	Name	Description	Default (Range)
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)
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

<table>
<tr><th>Setting Value</th><th>Function</th><th>Description</th></tr>
<tr><td>0</td><td>During Run</td><td>The terminal activates when the Run command is input and when the drive is outputting voltage.
ON : Drive is running
OFF : Drive is stopping</td></tr>
<tr><td>1</td><td>Zero Speed</td><td>The terminal activates when the output frequency < E1-09 [Minimum Output Frequency] or b2-01 [DC Injection/Zero SpeedThreshold].
Note:
Parameter A1-02 [Control Method Selection] selects which parameter is the reference.
<table>
<tr><th>A1-02 Setting</th><th>Control method selection</th><th>Parameter Used as the Reference</th></tr>
<tr><td>0</td><td>V/f</td><td>E1-09</td></tr>
<tr><td>1</td><td>CL-V/f</td><td>E1-09</td></tr>
<tr><td>2</td><td>OLV</td><td>b2-01</td></tr>
<tr><td>3</td><td>CLV</td><td>E1-09</td></tr>
<tr><td>4</td><td>AOLV</td><td>E1-09</td></tr>
<tr><td>5</td><td>OLV/PM</td><td>E1-09</td></tr>
<tr><td>6</td><td>AOLV/PM</td><td>E1-09</td></tr>
<tr><td>7</td><td>CLV/PM</td><td>b2-01</td></tr>
<tr><td>8</td><td>EZOLV</td><td>E1-09</td></tr>
</table>
ON : Output frequency < value of E1-09 or b2-01.
OFF : Output frequency ≥ value of E1-09 or b2-01.</td></tr>
<tr><td>2</td><td>Speed Agree 1</td><td>The terminal turns on 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.
• The drive outputs the motor speed status when A1-02 = 3, 7 [CLV, CLV/PM]. It also outputs the motor speed status when A1-02 = 4 and n4-72 = 1.
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.</td></tr>
</table>

Setting Value	Function	Description
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. • The drive outputs the motor speed status when *A1-02 = 3, 7 [CLV, CLV/PM]*. It also outputs the motor speed status when *A1-02 = 4* and *n4-72 = 1*. 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 turns off, the terminal continues to remain off until the output frequency reaches the level set with *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. • The drive outputs the motor speed status when *A1-02 = 3, 7 [CLV, CLV/PM]*. It also outputs the motor speed status when *A1-02 = 4* and *n4-72 = 1*. ON : The output frequency is less than the value of *L4-01* or does not exceed the value of *L4-01* + *L4-02*. OFF : The output frequency > *L4-01* + *L4-02*.
5	Frequency Detection 2	The terminal activates when the output frequency is higher than the value of *L4-01 [Speed Agree Detection Level]*. After the terminal activates, the terminal stays activated until the output frequency = *L4-01* - *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. • The drive outputs the motor speed status when *A1-02 = 3, 7 [CLV, CLV/PM]*. It also outputs the motor speed status when *A1-02 = 4* and *n4-72 = 1*. ON : The output frequency is higher than the value of *L4-01*. OFF : The output frequency < "*L4-01* - *L4-02*", or ≤ *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 less than the voltage set with *L2-05 [Undervoltage Detection Lvl (Uv1)]*. The terminal also turns on when there is a fault with the DC bus voltage. ON : The DC bus voltage is less than the setting value of *L2-05*. OFF : The DC bus voltage is more than the setting value of *L2-05*.
8	During Baseblock (N.O.)	The terminal turns on 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.
9	Frequency Reference from Keypad	Shows the selected frequency reference source. ON : The keypad is the frequency reference source. OFF : Parameter *b1-01 or b1-15 [Frequency Reference Selection 1 or 2]* is the frequency reference source.
A	Run Command Source	Shows the selected Run command source. ON : The keypad is the Run command source. OFF : Parameter *b1-02* or *b1-16* [Run Command Selection 1 or 2] is the Run command 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 < *L6-02* for longer than the time set with *L6-03 [Torque Detection Time 1]*.
C	Frequency Reference Loss	The terminal activates when the drive detects a loss of frequency reference.
D	Braking Resistor Fault	The terminal activates when the mounting-type braking resistor is overheating or when there is a braking transistor fault.
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 signals from the PLC are not configured.
10	Alarm	The terminal turns on when the drive detects a minor fault.
11	Fault Reset Command Active	The terminal turns on 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. • The drive outputs the motor speed status when *A1-02 = 3, 7 [Control Method Selection = CLV, CLV/PM]*. 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*".

Setting Value	Function	Description
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. • The drive outputs the motor speed status when *A1-02 = 3, 7 [Control Method Selection = CLV, CLV/PM]*. 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 is higher than the value of "*L4-03 [Speed Agree Detection Level (+/-)]* + *L4-04 [Speed Agree Detection Width (+/-)]*". After the terminal deactivates, the terminal stays off 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. • The drive outputs the motor speed status when *A1-02 = 3, 7 [Control Method Selection = CLV, CLV/PM]*. ON : The output frequency is less than the value of *L4-03* or it is not higher than the value of *L4-03* + *L4-04*. OFF : The output frequency is higher than the value of *L4-03* + *L4-04*.
16	Frequency Detection 4	The terminal activates when the output frequency is higher than the value of *L4-03 [Speed Agree Detection Level (+/-)]*. After the terminal activates, the terminal stays on 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. • The drive outputs the motor speed status when *A1-02 = 3, 7 [Control Method Selection = CLV, CLV/PM]*. ON : The output frequency is higher than the value of *L4-03*. OFF : The output frequency is less than the value of "*L4-03* - *L4-04*", or it is not higher than the value of *L4-03*.
17	Torque Detection 1 (N.C.)	The terminal deactivates when the drive detects overtorque or undertorque. OFF : The output current/torque is more than the torque value set with *L6-02 [Torque Detection Level 1]*, or the level is less than the torque value set with *L6-02 [Torque Detection Level 1]* for longer than the time set with *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 is more than the torque value set with *L6-05 [Torque Detection Level 2]*, or the level is less than the torque value set with *L6-05 [Torque Detection Level 2]* for longer than the time set with *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 is more than the torque value set with *L6-05 [Torque Detection Level 2]*, or the level is less than the torque value set with *L6-05 [Torque Detection Level 2]* for longer than the time set with *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 Selected	The terminal activates when motor 2 is selected. ON : Motor 2 Selection OFF : Motor 1 Selection
1D	During Regeneration	The terminal activates on when the motor is regenerating. ON : Motor is regenerating. OFF : Motor is operating or stopped.
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.
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	Safe Torque OFF	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
22	Mechanical Weakening Detection	The terminal activates when the drive detects mechanical weakening.
2F	Maintenance Notification	The terminal activates 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
30	During Torque Limit	The terminal activates when the torque reference is the torque limit set with *L7 parameters*, *H3-02, H3-06, or H3-10 [MFAI Function Selection]*.
31	During Speed Limit	The terminal activates when the speed limit is active.

Setting Value	Function	Description
32	In Speed Limit During Trq Ctrl	The motor accelerates in the forward direction or the reverse direction after enabling torque control and the externally input torque reference is disproportionate to the load. The output terminal activates when this speed is not higher than a constant speed and the motor speed is at the speed limit. This does not include operation when the drive is stopped.
33	Zero Servo Complete	The terminal activates when positioning in the range set with *b9-02 [Zero Servo Completion Window]* completes after sending the Zero-Servo command.
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.
3C	LOCAL Control Selected	The terminal activates when the Run command source or frequency reference source is LOCAL. ON : LOCAL OFF : REMOTE
3D	During Speed Search	The terminal activates when the drive is doing speed search.
3E	PID Feedback Low	The terminal activates when the drive detects *FbL [PID Feedback Loss]*.
3F	PID Feedback High	The terminal activates when the drive detects *FbH [Excessive PID Feedback]*.
4A	During KEB Ride-Thru	The 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 when you use a PM motor.
4C	During Fast Stop	The terminal activates when the fast stop is in operation.
4D	oH Pre-Alarm Time 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.
4E	Braking Transistor Fault (rr)	The terminal activates when the internal braking transistor overheats and the drive detects an *rr [Dynamic Braking Transistor Fault]* fault.
4F	Braking Resistor Overheat (rH)	The terminal activates when the braking resistor overheats and the drive detects an *rH [Braking Resistor Overheat]* fault.
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.
65	Standby Output	The terminal deactivates after the drive stops operating and after the time set with *b8-51 [Standby Mode Wait Time]*. ON : The Run command turns on and the magnetic contactor on the input side turns on. OFF : The Run command turns off and the drive stops operating. Then, the magnetic contactor on the input side turns off after the time set in *b8-51 [Standby Mode Wait Time]* elapses.
66	Comparator1	The terminal activates if the monitor value set with *H2-20 [Comparator 1 Monitor Selection]* is in range of the values of *H2-21 [Comparator 1 Lower Limit] and H2-22 [Comparator 1 Upper Limit]* for the time set in *H2-24 [Comparator 1 On-Delay Time]*.
67	Comparator2	The terminal activates if the monitor value set with *H2-26 [Comparator 2 Monitor Selection]* is not in the range of the values of *H2-27 [Comparator 2 Lower Limit]* and *H2-28 [Comparator 2 Upper Limit]* for the time set in *H2-30 [Comparator 2 On-Delay Time]*.
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 *LoG [Com Error / Abnormal SD card]*.
90 to 93	DWEZ Digital Outputs 1 to 4	Sets the DriveWorksEZ digital output. Refer to the DriveWorksEZ online manual for more information.
A0 to A7	DWEZ Extended Digital Outputs 1 to 8	Sets the digital output for the DriveWorksEZ DO-A3 option card. Refer to the DriveWorksEZ online manual for more information.
100 to 1A7	Inverse Outputs of 0 to A7	Causes inverse output of the function for the selected MFDO. Uses the last two digits of 1xx to select which function to inversely output.

◆ 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) 1 : -10 to +10V (Bipolar Reference) 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 - 32)
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%)
H3-05 (0413)	Terminal A3 Signal Level Select	Sets the input signal level for MFAI terminal A3. 0 : 0 to 10V (Lower Limit at 0) 1 : -10 to +10V (Bipolar Reference) 2 : 4 to 20 mA 3 : 0 to 20 mA	0 (0 - 3)
H3-06 (0414)	Terminal A3 Function Selection	Sets the function for MFAI terminal A3.	2 (0 - 32)
H3-07 (0415) RUN	Terminal A3 Gain Setting	Sets the gain of the analog signal input to MFAI terminal A3.	100.0% (-999.9 - +999.9%)
H3-08 (0416) RUN	Terminal A3 Bias Setting	Sets the bias of the analog signal input to MFAI terminal A3.	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) 1 : -10 to +10V (Bipolar Reference) 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.	0 (0 - 32)
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 the enabled terminal or terminals when *H1-xx = C [MFDI Function Select = Analog Terminal Enable Selection]* is ON. 1 : Terminal A1 only 2 : Terminal A2 only 3 : Terminals A1 and A2 4 : Terminal A3 only 5 : Terminals A1 and A3 6 : Terminals A2 and A3 7 : Terminals A1, A2, and A3	7 (1 - 7)
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)
H3-18 (02F2)	Terminal A3 Offset	Sets the offset level for analog signals input to terminal A3. Usually it is not necessary to change this setting.	0 (-500 - +500)

No. (Hex.)	Name	Description	Default (Range)
H3-40 (0B5C)	Mbus Reg 15C1h Input Function	Sets the MEMOBUS AI1 function.	F (4 - 2F)
H3-41 (0B5F)	Mbus Reg 15C2h Input Function	Sets the MEMOBUS AI2 function.	F (4 - 2F)
H3-42 (0B62)	Mbus Reg 15C3h Input Function	Sets the MEMOBUS AI3 function.	F (4 - 2F)
H3-43 (117F)	Mbus Reg Inputs FilterTime Const	Sets the time constant to apply a primary delay filter to the MEMOBUS analog input terminal.	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 C1-08 [Acceleration/Deceleration Times 1 to 4]* 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.

Setting Value	Function	Description
10	Forward Torque Limit	Enters the forward torque limit if 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%.
13	Torque Reference / Torque Limit	Enters the torque reference if the motor rated torque is 100%. This setting is the torque limit for speed control.
14	Torque Compensation	Enters the torque compensation value if the motor rated torque is 100%.
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.
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.
32	DWEZ Analog Input 3	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%)
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 changing these parameters. 0 : 0 to 10 Vdc 1 : -10 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 changing these parameters. 0 : 0 to 10 Vdc 1 : -10 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 *U1-08 [Output Power]* is set for analog output.	0.00 kW (0.00 - 650.00 kW)

◆ H5: Modbus 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 changing the parameter setting. • Setting 0 will not let the drive respond to MEMOBUS/Modbus communications.	1FH (0 - FFH)
H5-02 (0426)	Communication Speed Selection	Sets the communications speed for MEMOBUS/Modbus communications. **Note:** Restart the drive after changing the parameter setting. 0 : 1200 bps 1 : 2400 bps 2 : 4800 bps 3 : 9600 bps 4 : 19200 bps 5 : 38400 bps 6 : 57600 bps 7 : 76800 bps 8 : 115200 bps	3 (0 - 8)
H5-03 (0427)	Communication Parity Selection	Sets the communications parity used for MEMOBUS/Modbus communications. **Note:** Restart the drive after changing 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 *CE [Modbus Communication Error]* issues. 0 : Ramp to Stop 1 : Coast to Stop 2 : Fast Stop (Use C1-09) 3 : Alarm Only	3 (0 - 3)
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)
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)
H5-09 (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 = Memobus/Modbus Communications]* or *b1-16 = 2 [Run Command Selection 2 = Memobus/Modbus Communications]*. 0 : FWD/Stop, REV/Stop 1 : Run/Stop, FWD/REV	0 (0, 1)
H5-17 (11A1) Expert	ENTER command response @CPU BUSY	Sets operation when the EEPROM write command is sent without EEPROM write available. Usually it is not necessary to change this setting. 0 : Ignore Command(No ROM/RAM Write) 1 : Write to RAM Only	0 (0, 1)
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)

No. (Hex.)	Name	Description	Default (Range)
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)
H5-25 (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)

◆ H6: Pulse Train Input/Output

No. (Hex.)	Name	Description	Default (Range)
H6-01 (042C)	Terminal RP Pulse Train Function	Sets the function for pulse train input terminal RP. 0 : Frequency Reference 1 : PID Feedback Value 2 : PID Setpoint 3 : Speed Feedback (V/F Control)	0 (0 - 3)
H6-02 (042D) RUN	Terminal RP Frequency Scaling	Sets the frequency of the pulse train input signal used when the item selected with *H6-01 [Terminal RP Pulse Train Function]* is input at 100%.	1440 Hz (100 - 32000 Hz)
H6-03 (042E) RUN	Terminal RP Function Gain	Sets the gain used when the function in *H6-01 [Terminal RP Pulse Train Function]* is input to terminal RP.	100.0% (0.0 - 1000.0%)
H6-04 (042F) RUN	Terminal RP Function Bias	Sets the bias used when the function in *H6-01 [Terminal RP Pulse Train Function]* is input to terminal RP. Sets a value at the time when the pulse train is 0 Hz.	0.0% (-100.0 - 100.0%)
H6-05 (0430) RUN	Terminal RP Filter Time	Sets the time constant for the pulse train input primary delay filters.	0.10 s (0.00 - 2.00 s)
H6-06 (0431) RUN	Terminal MP Monitor Selection	Sets a function for pulse train monitor output terminal MP. Sets the "x-xx" part of the *Ux-xx* monitor.	102 (000, 031, 101, 102, 105, 116, 501, 502, 801 - 809, 821 - 825, 831 - 839, 851 - 855)
H6-07 (0432) RUN	Terminal MP Frequency Scaling	Sets the frequency of the pulse train output signal used when the monitor set with *H6-06 [Terminal MP Monitor Selection]* is 100%.	1440 Hz (0 - 32000 Hz)
H6-08 (043F)	Terminal RP Minimum Frequency	Sets the minimum frequency of the pulse train signal that terminal RP can detect.	0.5 Hz (0.1 - 1000.0 Hz)
H6-09 (156E)	Voltage Phase Sync MP Selection	Set whether to output the pulse synchronized with drive output voltage phase from the pulse train monitor output terminal MP. This parameter is only enabled when *H6-06 = 102 [Terminal MP Monitor Selection = Output Frequency]* and *H6-07 = 0 [Terminal MP Frequency Scaling = 0 Hz]*. 0 : Disabled 1 : Enabled	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 : No 1 : Yes	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 - 19F)
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 - 19F)
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 - 19F)
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 - 19F)
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 - 32)
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)

No. (Hex.)	Name	Description	Default (Range)
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 2 : Constant Torque 10:1 Speed Range 3 : Constant Torque 100:1 SpeedRange 4 : PM Variable Torque 5 : PM Constant Torque 6 : Variable Torque (50Hz) **Note:** When only one motor is connected to a drive, set *L1-01 = 1 to 6 [Enabled]*. External thermal relays are not necessary in these conditions.	Determined by A1-02 (0 - 6)
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 when the drive stops receiving power. 0 : Disabled 1 : Enabled	1 (0, 1)

◆ 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 2 : Enabled while CPU Power Active 3 : Kinetic Energy Backup: L2-02 4 : Kinetic Energy Backup: CPU Power 5 : Kinetic Energy Backup: DecelStop	0 (0 - 5)
L2-02 (0486)	Power Loss Ride Through Time	Sets the maximum time that the drive will wait until trying to restart after power loss.	Determined by o2-04, C6-01 (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, C6-01 (0.1 - 5.0 s)
L2-04 (0488)	Powerloss V/f Recovery Ramp Time	Sets the time for the drive output voltage to go back to correct voltage after completing speed searches.	Determined by o2-04, C6-01 (0.0 - 5.0 s)

No. (Hex.)	Name	Description	Default (Range)
L2-05 (0489)	Undervoltage Detection Lvl (Uv1)	Sets the voltage at which a *Uv1 [DC Bus Undervoltage]* fault is triggered or at which the KEB function is activated. 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 (200 V Class: 150 - 210 V, 400 V Class: 300 - 420 V)
L2-06 (048A) Expert	Kinetic Energy Backup Decel Time	Sets the deceleration time during KEB operation used to decrease the maximum output frequency to 0. **Note:** When *L2-29 = 1, 2, or 3 [Kinetic Energy Backup Method = Single Drive KEB Ride-Thru 2, System KEB Ride-Thru 1, or System 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 2 : System KEB Ride-Thru 1 3 : System KEB Ride-Thru 2	0 (0 - 3)
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 when *L2-01 = 3 to 5 [Power Loss Ride Through Select = Kinetic Energy Backup: L2-02, Kinetic Energy Backup: CPU Power, or Kinetic Energy Backup: DecelStop]*. 0 : Baseblock 1 : DC Injection Braking	0 (0, 1)
L2-31 (045D) Expert	KEB Start Voltage Offset Level	Sets the KEB start voltage offset.	Determined by A1-02 (200 V Class: 0 - 100 V,400 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 the Stall Prevention During Acceleration. 0 : Disabled 1 : Enabled 2 : Intelligent (Ignore Decel Ramp) 3 : Current Limit Acceleration	1 (0 to 3)
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. **Note:** The upper limit of the setting range changes when *C6-01 [Normal / Heavy Duty Selection]* changes. • 150% when *C6-01 = 0 [Heavy Duty Rating]*. • 110% when *C6-01 = 1 [Normal Duty Rating]*.	Determined by C6-01 and L8-38 (0 - 150%)
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%)

No. (Hex.)	Name	Description	Default (Range)
L3-04 (0492)	Stall Prevention during Decel	Sets the method that the drive will use to prevent overvoltage faults when decelerating. **Note:** 1. To connect a dynamic braking option (braking resistor or braking resistor unit) to the drive, set this parameter to *0 or 3*. Parameter values *1, 2, 4, and 5* will enable Stall Prevention function during deceleration, and the dynamic braking option will not function. 2. 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 = 6, 7, 8 [AOLV/PM, CLV/PM, EZOLV]*, the setting range is *0, 1*. 0 : No 1 : General Purpose 2 : Intelligent (Ignore Decel Ramp) 3 : General Purpose w/ DB resistor 4 : Overexcitation/High Flux 5 : Overexcitation/High Flux 2	1 (Determined by A1-02)
L3-05 (0493)	Stall Prevention during RUN	Sets the function to enable and disable Stall Prevention During Run. **Note:** 1. 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. 2. The setting range changes when the *A1-02 [Control Method]* value changes: • *A1-02 = 0, 1, 5 [V/f, CL-V/f, OLV/PM]*: 0 to 2 • *A1-02 =8[EZOLV]*: 0, 3 0 : Disabled 1 : Deceleration Time 1 (C1-02) 2 : Deceleration Time 2 (C1-04) 3 : Intelligent (Ignore Decel Ramp)	2 (0 - Determined by A1-02)
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)]*. • The upper limit of the setting range changes when *C6-01 [Normal / Heavy Duty Selection]* changes. −150% when *C6-01 = 0 [Heavy Duty Rating (HD)* for Constant Torque Applications]. −110% when *C6-01 = 1 [Normal Duty Rating (ND) for Variable Torque Applications]*.	Determined by C6-01 and L8-38 (5 - 150%)
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.	200 V Class: 375 V, 400 V: 750 V (200 V Class: 150 to 400 V, 400 V Class: 300 to 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.	Determined by A1-02 (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 : Disabled 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, C6-01, 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)

No. (Hex.)	Name	Description	Default (Range)
L3-34 (016F) Expert	Torque Limit Delay Time	Sets the filter time constant that returns the torque limit to its initial value when KEB operation operates in Single Drive KEB Ride-Thru mode.	Determined by A1-02 (0.000 - 1.000 s)
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)
L3-36 (11D0)	Current Suppression Gain@Accel	Sets the gain to suppress current and motor speed hunting during operation when *L3-01 = 3 [Stall Prevention during Accel = Current Limit Method]*. Usually it is not necessary to change this setting.	Determined by A1-02 (0.0 - 100.0)
L3-37 (11D1) Expert	Current Limit P Gain @ Accel	Suppresses current hunting during acceleration. Usually it is not necessary to change this setting.	5 ms (0 - 100 ms)
L3-38 (11D2) Expert	Current Limit I Time @ Accel	Suppresses current hunting and overshooting that occurs when the drive stalls during acceleration. Usually it is not necessary to change this setting.	10.0 (0.0 - 100.0)
L3-39 (11D3)	Current Limit Filter Time @Accel	Sets the time constant to adjust the acceleration rate when *L3-01 = 3 [Stall Prevention during Accel = Current Limit Method]*. Usually it is not necessary to change this setting.	100.0 ms (1.0 - 1000.0 ms)
L3-40 (11D4)	Current Limit S-Curve @ Acc/Dec	Sets the function to enable and disable the best S-curve characteristic used for current-limited acceleration. 0 : Disabled 1 : Enabled	0 (0, 1)

◆ 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. 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]*.	Determined by A1-02 (Determined by A1-02)
L4-02 (049A)	Speed Agree Detection Width	Sets the width to detect speed agree or motor speed. 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]*.	Determined by A1-02 (Determined by A1-02)
L4-03 (049B)	Speed Agree Detection Level (+/-)	Sets the level to detect speed agree or motor speed. 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]*.	Determined by A1-02 (Determined by A1-02)
L4-04 (049C)	Speed Agree Detection Width (+/-)	Sets the width to detect speed agree or motor speed. 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]*.	Determined by A1-02 (Determined by A1-02)
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)	0 (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)

No. (Hex.)	Name	Description	Default (Range)
L5-03 (04A0)	Continuous Method Max Restart T	Sets the time for which the drive will try to restart. If the drive cannot restart inthe time set in *L5-03*, the drive detects a fault. This is available when *L5-05 = 0 [Auto-Restart Method = Continuous/ Immediate Attempts]*.	10.0 s (0.5 - 180.0 s)
L5-04 (046C)	Interval Method Restart Time	Sets the time interval between each Auto Restart attempt. This function is enabled when *L5-05 = 1 [Auto Restart Operation Selection = Use L5-04 Time]*.	10.0 s (0.5 - 600.0 s)
L5-05 (0467)	Auto-Restart Method	Sets the count method for the Auto Restart operation. 0 : Continuous/Immediate Attempts 1 : Interval/Attempt after L5-04 sec	0 (0, 1)
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)
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)

◆ 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	0 (0 - 8)
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.	150% (0 - 300%)

No. (Hex.)	Name	Description	Default (Range)
L6-03 (04A3)	Torque Detection Time 1	Sets the detection time for Overtorque/Undertorque Detection 1.	0.1 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)
L6-07 (04E5)	Torque Detection Filter Time	Sets the time constant for a primary filter to the torque reference or to the output current used to detect overtorque/undertorque.	0 ms (0 - 1000 ms)
L6-08 (0468)	Mechanical Fatigue Detect Select	Sets the speed where the drive detects mechanical deterioration and how the drive operates (operation status) after detection. 0 : Disabled 1 : oL5 @ Speed > L6-09 - Alarm 2 : oL5 @ lSpeedl > L6-09 - Alarm 3 : oL5 @ Speed > L6-09 - Fault 4 : oL5 @ lSpeedl > L6-09 - Fault 5 : UL5 @ Speed < L6-09 - Alarm 6 : UL5 @ lSpeedl < L6-09 - Alarm 7 : UL5 @ Speed < L6-09 - Fault 8 : UL5 @ lSpeedl < L6-09 - Fault	0 (0 - 8)
L6-09 (0469)	Mech Fatigue Detect Speed Level	Sets the speed level where the drive will operate the mechanical deterioration detection function, 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]*	110.0% (-110.0 - 110.0%)
L6-10 (046A)	Mech Fatigue Detect Delay Time	Sets the time for mechanical deterioration detection.	0.1 s (0.0 - 10.0 s)
L6-11 (046B)	Mech Fatigue Hold Off Time	Sets the time that the drive will start mechanical deterioration detection triggered by the cumulative operation time of the drive.	0 h (0 - 65535 h)

◆ 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%)
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%)
L7-06 (04AC)	Torque Limit Integral Time	Sets the integral time constant for the torque limit function.	200 ms (5 - 10000 ms)

No. (Hex.)	Name	Description	Default (Range)
L7-07 (04C9)	Torque Limit during Accel/ Decel	Sets the torque limit function during acceleration and deceleration. 0 : Proportional only 1 : Proportional & Integral control	0 (0, 1)
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)
L7-35 (1B57) Expert	Low Freq Regen Torque Limit Lvl	Sets the torque limit used during low-speed regeneration. Usually it is not necessary to change this setting.	50.0% (0.0 - 200.0%)
L7-36 (1B58) Expert	Regen Torque Limit Derate Freq	Sets the frequency width at which *L7-35 [Low Freq Regen Torque Limit Lvl]* operates.	6.0 Hz (0.0 - 30.0 Hz)

◆ L8: Drive Protection

No. (Hex.)	Name	Description	Default (Range)
L8-01 (04AD)	3% ERF DB Resistor Protection	Sets the function to enable braking resistor protection with a Yaskawa ERF series braking resistor (3% ED) installed on the heatsink. 0 : Disabled 1 : Enabled	0 (0, 1)
L8-02 (04AE)	Overheat Alarm Level	Sets the *oH* detection level in temperature.	Determined by o2-04, C6-01 (50 - 150 °C)
L8-03 (04AF)	Overheat Pre-Alarm Selection	Sets the operation of drives when an *oH* alarm is detected. 0 : Ramp to Stop 1 : Coast to Stop 2 : Fast Stop (Use C1-09) 3 : Alarm Only 4 : Operate at Reduced Speed (L8-19)	3 (0 - 4)
L8-05 (04B1)	Input Phase Loss Protection Sel	Sets the function to enable and disable input phase loss detection. 0 : Disabled 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 Cooling Fan Ope Select = Dur Run (OffDly)]*.	60 s (0 - 300 s)
L8-12 (04B8)	Ambient Temperature Setting	Sets the ambient temperature of the drive installation area.	40 °C (-10 - +50 °C)
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)

No. (Hex.)	Name	Description	Default (Range)
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.	0.8 (0.1 - 0.9)
L8-20 (04C0) Expert	Control Fault & Step Out Detect	Sets operation after the drive detects a *CF* fault when *A1-02 = 4 [Control Method Selection = Advanced Open Loop Vector]*. 0 : Disabled 1 : CF/STPo Detection Enabled 2 : CF ALM/Stop	1 (0 - 2)
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/OpenChassis Enc/Ex Heatsink 1 : Side-by-Side Mounting 2 : IP20/NEMA Type 1/IP55 3 : Finless	Determined by the drive (0 - 3)
L8-38 (04EF)	Carrier Frequency Reduction	Sets the carrier frequency reduction function. The drive reduces the carrier frequency when the output current is more than a specified level. 0 : Disabled 1 : Enabled below 6 Hz 2 : Enabled for All Speeds	Determined by A1-02, C6-01 and o2-04 (0 - 2)
L8-40 (04F1)	Carrier Freq Reduction Off-Delay	Sets the length of time until the automatically reduced carrier frequency returns to the condition before the reduction.	Determined by A1-02 (0.00 - 2.00 s)
L8-41 (04F2)	High Current Alarm Selection	Sets the function to cause an *HCA [Current Alarm]* when the output current is more than 150% of the drive rated current. 0 : Disabled 1 : Enabled	0 (0, 1)
L8-51 (0471) Expert	STPo I Detection Level	Sets the *STPo [Motor Step-Out Detected]* detection level 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)]*	0.0% (0.0 - 300.0%)
L8-52 (0472) Expert	STPo Integration Level	Sets the detection level for *STPo [Motor Step-Out Detected]* related to the ACR integral value.	1.0 (0.1 - 2.0)
L8-53 (0473) Expert	STPo Integration Time	Sets the length of time until the drive detects *STPo* after it is more than the value of *L8-51 [STPo I Detection Level]*.	1.0 s (1.0 - 10.0 s)
L8-54 (0474) Expert	STPo Id Diff Detection	Sets the Id deviation detection function for *STPo [Motor Step-Out Detected]*. 0 : Disabled 1 : Enabled	1 (0, 1)
L8-55 (045F)	Internal DB TransistorProtection	Sets the protection function for the internal braking transistor. 0 : Disable 1 : Protection Enabled	1 (0, 1)
L8-56 (047D) Expert	Stall P @ Accel Activation Time	Sets the length time that the acceleration stall prevention function can continue to operate before the drive detects an *STPo [Motor Step-Out Detected]*.	5000 ms (100 - 5000 ms)
L8-57 (047E) Expert	Stall Prevention Retry Counts	Sets the number of times the acceleration stall prevention function can operate until speeds agree before the drive detects an *STPo [Motor Step-Out Detected]*.	10 (1 - 10 times)

No. (Hex.)	Name	Description	Default (Range)
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]*.	Determined by A1-02 (0 - 5000 times)
L8-93 (073C) Expert	Low Speed Pull-out DetectionTime	Sets the length of time the drive will wait to start baseblock after detecting *LSo [Low Speed Motor Step-Out]*.	1.0 s (0.0 - 10.0 s)
L8-94 (073D) Expert	Low Speed Pull-out Detect Level	Sets the detection level for *LSo [Low Speed Motor Step-Out]* as a percentage of *E1-04 [Maximum Output Frequency]*.	3% (0 - 10%)
L8-95 (077F) Expert	Low Speed Pull-out Amount	Sets the average count of *LSo [Low Speed Motor Step-Out]* detections.	10 (1 - 50 times)

◆ 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) 2 : Enabled (High Carrier Frequency)	Determined by o2-04 (0 to 2)
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)
n1-08 (1105) Expert	Current Detection Method	Sets how the drive decreases the motor vibration that is caused by leakage current. Usually it is not necessary to change this parameter. 0 : 2-Phases 1 : 3-Phases	0 (0, 1)
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 (50.0 - 500.0 ms)
n1-15 (0BF8) Expert	PWM Voltage Offset Calibration	Sets the calibration method that the drive uses to decrease torque/current ripple. 0 : No Calibration 1 : One Time Calibrate at Next Start 2 : Calibrate Every Time at Start	Determined by A1-02 (0 - 2)
n1-16 (0BFB) Expert	Hunting Prevention High Fc Gain	Sets the gain for the hunting prevention function. This parameter functions best with a high carrier frequency. Usually it is not necessary to change this parameter.	Determined by o2-04 (0.00 - 2.50)
n1-17 (0BFC) Expert	Hunting Prevent High Fc Filter	Sets the responsiveness of the hunting prevention function. Usually it is not necessary to change this parameter.	500 ms (0 - 1000 ms)
n1-20 (1588) Expert	Voltage Calibration Duration	Sets the calibration time at start. Usually it is not necessary to change this parameter.	50 ms (10 - 500 ms)

◆ n2: Auto Freq Regulator (AFR)

No. (Hex.)	Name	Description	Default (Range)
n2-01 (0584)	Automatic Freq Regulator Gain	Sets the gain of the AFR function as a magnification value. Usually it is not necessary to change this setting.	1.00 (0.00 - 10.00)
n2-02 (0585)	Automatic Freq Regulator Time 1	Sets the time constant that sets the rate of change for the AFR function. Usually it is not necessary to change this setting.	50 ms (0 - 2000 ms)
n2-03 (0586)	Automatic Freq Regulator Time 2	Sets the time constant that sets the speed difference of the AFR function. Use this parameter for speed searches or regeneration. Usually it is not necessary to change this setting.	750 ms (0 - 2000 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 of *E2-01 [Motor Rated Current (FLA)]*. Also set the current suppression to prevent exceeding drive overload tolerance. **Note:** The upper limit of the setting range changes when the setting for *C6-01 [Normal / Heavy Duty Selection]* changes. • 150% when *C6-01 = 0 [Heavy Duty Rating (HD) for Constant Torque Applications]*. • 110% when *C6-01 = 1 [Normal Duty Rating (ND) for Variable Torque Applications]*.	Determined by C6-01, L8-38 (0 - 150%)
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)
n3-14 (0532) Expert	OEB High Frequency Injection	Sets the function that injects harmonic signals during overexcitation deceleration. 0 : Disabled 1 : Enabled	0 (0, 1)
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)

◆ n4: Adv Open Loop Vector Tune

No. (Hex.)	Name	Description	Default (Range)
n4-60 (1B80)	Motoring Low Speed Comp Gain	Sets a compensation gain to improve the control qualities for motoring loads in the low speed range.	100.0% (50.0 - 200.0%)
n4-61 (1B81)	Low Speed Comp Frequency Level	Sets a frequency at which the settings *n4-60 [Motoring Low Speed Comp Gain]* and *n4-62 [Regen Low Speed Comp Gain]* are enabled. When the output frequency < n4-61, the drive adjusts the torque to agree with the settings for *n4-60* and *n4-62*. Usually it is not necessary to change this setting.	6.00 Hz (0.50 - 12.00 Hz)
n4-62 (1B82)	Regen Low Speed Comp Gain	Sets a compensation gain to improve the control qualities for regenerative loads in the low speed range.	100.0 (50.0 - 500.0)
n4-63 (1B83)	Speed EstimateResponse@High Freq	Sets the responsiveness of the speed estimation in high speed ranges, where the output frequency is ≥ *n4-67 [Estimate Gain Switchover Freq]*.	60.0 (0.1 - 300.0)
n4-64 (1B84)	Speed Estimate Response@Low Freq	Sets the responsiveness of the speed estimation in low speed ranges, where 0 ≤ the output frequency, which is < *n4-67 [Estimate Gain Switchover Freq]*.	60.0 (0.1 - 300.0)
n4-65 (1B85)	Flux Estimate Response@High Freq	Sets the responsiveness of the magnetic flux estimation in high speed ranges, where the output frequency is ≥ *n4-67 [Estimate Gain Switchover Freq]*. Usually it is not necessary to change this setting.	1.00 (0.50 - 3.00)
n4-66 (1B86)	Flux Estimate Response @Low Freq	Sets the responsiveness of the magnetic flux estimation in low speed ranges, where 0 ≤ the output frequency, which is < *n4-67 [Estimate Gain Switchover Freq]*. Usually it is not necessary to change this setting.	1.50 (0.50 - 3.00)
n4-67 (1B87)	Estimate Gain Switchover Freq	Sets the switching frequency for estimation gain for these parameters: *n4-63 [Speed EstimateResponse@High Freq]* *n4-64 [Speed Estimate Response@Low Freq]* *n4-65 [Flux Estimate Response@High Freq]* *n4-66 [Flux Estimate Response @Low Freq]* Usually it is not necessary to change this setting.	6.00 Hz (0.00 - E1-04 setting)
n4-68 (1B88)	Speed Estimation Filter Time	Sets the primary delay time constant for the speed estimation value. Usually it is not necessary to change this setting.	0.001 s (0.001 - 0.010 s)

No. (Hex.)	Name	Description	Default (Range)
n4-69 (1B89)	Flux Control Response	Unifies control of magnetic flux to make motor vibrations more stable.	1.00 (0.00 - 60.00)
n4-70 (1B8A)	Speed Command Comp @ Low Freq	Sets the function to make the drive more stable when operating at low speeds. Usually it is not necessary to change this setting.	1.00 Hz (0.00 - 6.00 Hz)
n4-71 (1B8B) Expert	Flux Estimation Method	Sets the flux estimation method. Usually it is not necessary to change this setting. 0 : Method 1 1 : Method 2	0 (0, 1)
n4-72 (1B8C)	Speed Feedback Mode	Sets the requirement for an encoder option when *A1-02 = 4 [Control Method Selection = Advanced Open Loop Vector]*. 0 : Without Encoder 1 : With Encoder	0 (0, 1)
n4-73 (1B8D)	PGo Recovery Selection	Sets the restart mode to Without Encoder Mode or the With Encoder Mode when an encoder is disconnected. 0 : Without Encoder 1 : With Encoder	0 (0, 1)
n4-74 (1B8E)	Limit of Flux Loop	Sets the control level for flux loop control output.	250% (100 - 500%)

◆ n5: Feed Forward Control

No. (Hex.)	Name	Description	Default (Range)
n5-01 (05B0)	Feed Forward Control Selection	Sets the feed forward function. 0 : Disabled 1 : Enabled	0 (0, 1)
n5-02 (05B1)	Motor Inertia Acceleration Time	Sets the length of time for the motor to accelerate from the stopped to the maximum frequency with a single motor at the rated torque. Inertia Tuning automatically sets the motor acceleration time.	Determined by C6-01, E5-01, and o2-04 (0.001 - 10.000 s)
n5-03 (05B2)	Feed Forward Control Gain	Sets the ratio between load inertia and motor inertia. Inertia Tuning automatically sets the Feedforward Control Gain value.	1.00 (0.00 - 100.00)
n5-04 (05B3) RUN Expert	Speed Response Frequency	Sets the response frequency for the speed reference. Usually it is not necessary to change this parameter.	Determined by A1-02 (0.00 - 500.00 Hz)

◆ n6: Online Tuning

No. (Hex.)	Name	Description	Default (Range)
n6-01 (0570)	Online Tuning Selection	Sets the type of motor data that Online Tuning uses for OLV control. 0 : Disabled 1 : Line-to-Line Resistance Tuning 2 : Voltage Correction Tuning	0 (0 - 2)
n6-05 (05C7) Expert	Online Tuning Gain	Sets the compensation gain when *n6-01 = 2 [Online Tuning Selection = Voltage Correction Tuning]*. Usually it is not necessary to change this parameter.	1.0 (0.1 - 50.0)
n6-11 (1B56) Expert	Online Resistance Tuning	Sets the responsiveness for online resistor tuning. Set this parameter to approximately *1.000* to enable the function. The function is disabled when the value is *0.000*.	0.000 (0.000 - 1.000)

◆ 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.	100 (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.	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.	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)
n8-01 (0540)	Pole Position Detection Current	Sets, as a percentage, the Initial Rotor Position Estimated Current, taking the *E5-03 [Motor Rated Current (FLA)]* as the 100% value. Usually it is not necessary to change this setting.	50% (0 - 100%)
n8-02 (0541) Expert	Pole Alignment Current Level	Sets the current at the time of polar attraction as a percentage of *E5-03 [Motor Rated Current (FLA)]*. Usually it is not necessary to change this setting.	80% (0 - 150%)
n8-03 (0542)	Pole Position Detection Time	Sets the length of the Current Starting Time, which is used for Z Pulse Offset Tuning. Usually it is not necessary to change this setting.	1.5 s (1.5 - 5.0 s)
n8-04 (0543) Expert	Pole Alignment Time	Sets the length of the Polar Attraction Time, which is used for Z Pulse Offset Tuning. Usually it is not necessary to change this setting.	1.5 s (1.5 - 5.0 s)
n8-11 (054A)	Observer Calculation Gain 2	Sets the gain for speed estimation. Usually it is not necessary to change this setting.	Determined by n8-72 (0.0 - 1000.0)
n8-14 (054D) Expert	Polarity Compensation Gain 3	Sets the gain for speed estimation. Usually it is not necessary to change this setting.	1.000 (0.000 - 10.000)

No. (Hex.)	Name	Description	Default (Range)
n8-15 (054E) Expert	Polarity Compensation Gain 4	Sets the gain for speed estimation. Usually it is not necessary to change this setting.	0.500 (0.000 - 10.000)
n8-21 (0554) Expert	Motor Back-EMF (Ke) Gain	Sets the gain for speed estimation. Usually it is not necessary to change this setting.	0.90 (0.80 - 1.00)
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)
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, you can set *n8-35 = 0 to 2*. • When you set *n8-35 = 1*, doHigh Frequency Injection Auto-Tuning. 0 : Pull-in 1 : High Frequency Injection 2 : Pulse Injection	Determined by A1-02 (0 - 2)
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]* or *n8-57 = 1 [HFI Overlap Selection = Enabled]* 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 200 V class drives and 400 V = 100% for a 400 V class drives. Usually it is not necessary to change this setting. **Note:** • Set *n8-35 = 1 [Initial Pole Detection Method = High Frequency Injection]* or *n8-57 = 1 [HFI Overlap Selection = Enabled]* 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)	PM Phase Compensation Gain	Sets the low-pass filter shut-off frequency for high frequency injection. **Note:** • Set *n8-35 = 1 [Initial Pole Detection Method = High Frequency Injection]* or *n8-57 = 1 [HFI Overlap Selection = Enabled]* 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.	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.	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)

No. (Hex.)	Name	Description	Default (Range)
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)
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	Sets the high efficiency control method for IPM motor. Usually it is not necessary to change this setting. 0 : Disabled 1 : Enabled (Vd) 2 : Enabled (Vd & Vq)	1 (0 - 2)
n8-57 (0574)	HFI Overlap Selection	Sets the function that detects motor speed with high frequency injection. **Note:** When you set *n8-57 = 1*, doHigh Frequency Injection Auto-Tuning. 0 : Disabled 1 : Enabled	0 (0, 1)
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 = 7, 8 [Control Method Selection = CLV/PM, EZOLV]*, this parameter is available in Expert Mode. • When *A1-02 = 8*, the default setting is −200 V Class: 230.0 V −400 V Class: 460.0 V	200 V Class: 200.0 V, 400 V Class: 400.0 V (200 V Class: 0.0 to 240.0 V, 400 V Class: 0.0 to 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 s)
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 s)
n8-69 (065D) Expert	Speed Observer Control P Gain	Sets the gain that the drive uses for speed estimation. Usually it is not necessary to change this setting.	1.00 (0.00 - 20.00)

No. (Hex.)	Name	Description	Default (Range)
n8-70 (065E) Expert	Speed Observer Control I Time	Sets the speed estimator integral time constant. It is available when *n8-72 = 1 [Speed Estimation Method Select = Method 2]*. Usually it is not necessary to change this setting.	0.0 s (0.0 - 100.0 s)
n8-71 (065F) Expert	Speed Observer Control D Gain	Set the speed estimator differential gain. It is available when *n8-72 = 1 [Speed Estimation Method Select = Method 2]*. Usually it is not necessary to change this setting.	5.00 (0.00 - 50.00)
n8-72 (0655) Expert	Speed Estimation Method Select	Selects the speed estimation method. Usually it is not necessary to change this setting. 0 : Method 1 1 : Method 2	1 (0, 1)
n8-73 (0656) Expert	Observer Mode Switch-Over Speed	Sets the speed level for pull-in current control at motor start as a percentage of *E1-06 [Base Frequency]*. Usually it is not necessary to change this setting.	10% (0 - 100%)
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%)
n8-94 (012D) Expert	Flux Position Estimation Method	Sets the criteria that the drive uses to find changes in speed or load. Usually it is not necessary to change this setting. 0 : Softstarter 1 : Speed Feedback	Determined by d5-01 (0, 1)
n8-95 (012E) Expert	Flux Position Est Filter Time	Sets the time constant of the filter used for the recognition criteria value for speed and load changes. Usually it is not necessary to change this setting.	30 ms (0 - 100 ms)

3.13 o: Keypad-Related Settings

◆ o1: Keypad Display

No. (Hex.)	Name	Description	Default (Range)
o1-01 (0500) RUN	User Monitor Selection	Sets the *U monitor* for the Drive Mode. This parameter is only available when you use an LED keypad.	106 (104 - 855)
o1-02 (0501) RUN	Monitor Selection at Power-up	Sets the monitor item that the keypad screen shows after energizing the drive. Refer to "U: Monitors" for information about the monitor items that the keypad screen can show. This parameter is only available when you use an LED keypad. 1 : Frequency Reference (U1-01) 2 : Direction 3 : Output Frequency (U1-02) 4 : Output Current (U1-03) 5 : User Monitor (*o1-01*)	1 (1 - 5)
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	Determined by A1-02 (0 - 3)
o1-04 (0503)	V/f Pattern Display Unit	Sets the setting unit for parameters that set the V/f pattern frequency. 0 : Hz 1 : min^{-1} (r/min) unit	Determined by A1-02 (0, 1)
o1-05 (0504) RUN	LCD Contrast Adjustment	Sets the contrast of the LCD display on the keypad.	5 (0 - 10)
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)
o1-24 to o1-35: (11AD - 11B8) RUN	Custom Monitor 1 to 12	Sets a maximum of 12 monitors as user monitors. This parameter is only available when using an LCD keypad.	o1-24: 101 o1-25: 102 o1-26: 103 o1-27 to o1-35: 0 (0, 101 - 999)
o1-36 (11B9) RUN	LCD Backlight Brightness	Sets the intensity of the LCD 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	1 (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 LCD keypad initial setup screen each time the drive is energized. This parameter is only available when using an LCD 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 when using an LCD keypad. 0 : Custom Monitor 1 : Bar Graph 2 : Analog Gauge 3 : Trend Plot	0 (0 - 3)

No. (Hex.)	Name	Description	Default (Range)
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 when using an LCD keypad. 0 : +/- Area (- o1-42 ~ o1-42) 1 : + Area (0 ~ o1-42) 2 : - Area (- o1-42 ~ 0)	0 (0 - 2)
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 when using an LCD 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 when using an LCD keypad. 0 : +/- Area (- o1-44 ~ o1-44) 1 : + Area (0 ~ o1-44) 2 : - Area (- o1-44 ~ 0)	0 (0 - 2)
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 when using an LCD 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 when using an LCD keypad. 0 : +/- Area (- o1-46 ~ o1-46) 1 : + Area (0 ~ o1-46) 2 : - Area (- o1-46 ~ 0)	0 (0 - 2)
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 when using an LCD 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 when using an LCD 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 when using an LCD 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 when using an LCD 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 when using an LCD 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 when using an LCD 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 when using an LCD 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 when using an LCD 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)

◆ o2: Keypad Operation

No. (Hex.)	Name	Description	Default (Range)
o2-01 (0505)	LO/RE Key Function Selection	Sets the function that lets you use LO/RE to switch between LOCAL and REMOTE Modes. 0 : Disabled 1 : Enabled	1 (0, 1)
o2-02 (0506)	STOP Key Function Selection	Sets the function to stop the drive with the STOP button on the keypad 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 replacing 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 the ENTER to change the frequency reference value with the keypad when 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)
o2-07 (0527)	Keypad RUN Direction @ Power-up	Sets the direction of motor rotation when the drive is energized and the keypad is the Run command source. 0 : Forward 1 : Reverse	0 (0, 1)
o2-09 (050D)	Reserved	-	-
o2-23 (11F8) RUN	External 24V Powerloss Detection	Sets the function to give a warning when the backup external 24 V power supply turns off when the main circuit power supply is in operation. 0 : Disabled 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 when using an LCD 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 are backed up, restored, and referenced. This parameter is only available when using an LCD 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 when using an LCD 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	0 (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 when using an LCD 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 when using an LCD 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 when using an LCD 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 when using an LCD keypad.	100 ms (100 - 60000 ms)
o5-03 (1553) RUN	Log Monitor Data 1	Sets the data log monitor. This parameter is only available when using an LCD keypad.	101 (000, 101 - 999)
o5-04 (1554) RUN	Log Monitor Data 2	Sets the data log monitor. This parameter is only available when using an LCD keypad.	102 (000, 101 - 999)
o5-05 (1555) RUN	Log Monitor Data 3	Sets the data log monitor. This parameter is only available when using an LCD keypad.	103 (000, 101 - 999)
o5-06 (1556) RUN	Log Monitor Data 4	Sets the data log monitor. This parameter is only available when using an LCD keypad.	107 (000, 101 - 999)
o5-07 (1557) RUN	Log Monitor Data 5	Sets the data log monitor. This parameter is only available when using an LCD keypad.	108 (000, 101 - 999)
o5-08 (1558) RUN	Log Monitor Data 6	Sets the data log monitor. This parameter is only available when using an LCD keypad.	V/f, OLV/PM: 0, CL-V/f, OLV, CLV, AOLV, AOLV/PM, CLV/PM, EZOLV: 105 (000, 101 - 999)
o5-09 (1559) RUN	Log Monitor Data 7	Sets the data log monitor. This parameter is only available when using an LCD keypad.	110 (000, 101 - 999)
o5-10 (155A) RUN	Log Monitor Data 8	Sets the data log monitor. This parameter is only available when using an LCD keypad.	112 (000, 101 - 999)
o5-11 (155B) RUN	Log Monitor Data 9	Sets the data log monitor. This parameter is only available when using an LCD keypad.	000 (000, 101 - 999)
o5-12 (155C) RUN	Log Monitor Data 10	Sets the data log monitor. This parameter is only available when using an LCD keypad.	000 (000, 101 - 999)

3.14 q: DriveWorksEZ Parameters

◆ q1-01 to q8-40: Reserved for DriveWorksEZ

No. (Hex.)	Name	Description	Default (Range)
q1-01 to q8-40 (1600 - 17E7)	Reserved for DriveWorksEZ	Refer to “DriveWorksEZ Operation Manual”.	These parameters are reserved for use with DriveWorksEZ.

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 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 1 : Control Tuning	0 (0, 1)

◆ 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)	Tuning Mode Selection	Sets the type of Auto-Tuning. 0 : Rotational Auto-Tuning 1 : Stationary Auto-Tuning 1 2 : Stationary Line-Line Resistance	Determined by A1-02 (Determined by A1-02)
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, C6-01 (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, C6-01 (200 V Class: 0.0 - 255.5 V, 400 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 - 590.0 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 - 35400 min^{-1} (r/min))
T1-08 (0708)	Encoder Pulse Count (PPR)	Sets the number of PG (pulse generator, encoder) pulses.	1024 ppr (0 - 60,000 ppr)
T1-09 (0709)	Motor No-Load Current	Sets the no-load current of the motor.	- (0A - T1-04; max. of 2999.9)
T1-10 (070A)	Motor Rated Slip Frequency	Sets motor rated slip.	- (0.000 - 20.000 Hz)
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)

No. (Hex.)	Name	Description	Default (Range)
T1-12 (0BDB)	Test Mode Selection	Sets the function to enable Test Mode after Stationary Auto-Tuning. When you can operate the motor with a light load attached after Stationary Auto-Tuning is complete, enable this parameter. **Note:** You must first set *T1-10 [Motor Rated Slip Frequency]* = 0 Hz to enable this parameter. 0 : No 1 : Yes	0 (0, 1)
T1-13 (0BDC)	No-load voltage	Sets the no-load voltage of the motor. If you know the no-load voltage at the rated speed in a test report, set that voltage value. If you do not know the no-load voltage, do not change from the initial value. **Note:** • To get the same qualities as a Yaskawa 1000-series drive or previous models, set this parameter = *T1-03 [Motor Rated Voltage]* value. • The default value is different for different models. –2004 - 2008, 4002 - 4004: T1-03 × 0.85 –2010 - 2415, 4005 - 4302: T1-03 × 0.90 –4371- 4720: T1-03 × 0.95	T1-03 × 0.85 (200 V Class: 0.0 - 255.0 V, 400 V Class: 0.0 - 510.0 V)

◆ 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) 3 : Z-Pulse Offset (Pole Position) 4 : Rotational (Ld, Lq, R, back-EMF) 5 : High Frequency Injection	0 (Determined by A1-02)
T2-02 (0751)	PM Motor Code Selection	If the drive is operating a Yaskawa PM motor from the SMRA, SSR1, or SST4 series, enter the PM motor code in accordance with 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, C6-01 (0.00 - 650.00 HP)
T2-05 (0732)	PM Motor Rated Voltage	Sets the rated voltage (V) of the motor.	200 V Class: 230.0 V, 400 V: 460.0 V (200 V Class: 0.0 - 255.0 V, 400 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 - 590.0 Hz)
T2-08 (0734)	Number of PM Motor Poles	Sets the number of motor poles.	4 (2 - 48)
T2-09 (0731)	PM Motor Base Speed	Sets the motor base speed (min^{-1} (r/min)).	1750 min^{-1} (r/min) (0 - 34500 min^{-1} (r/min))
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)

No. (Hex.)	Name	Description	Default (Range)
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%)
T2-16 (0738)	Encoder Pulse Count (PPR)	Sets the number of PG (pulse generator, encoder) pulses.	1024 ppr (1 - 15000 ppr)
T2-17 (0757)	Encoder Z-Pulse Offset	Sets the encoder Z-pulse offset (Δθ) (pulse generator, encoder) that is listed on the motor nameplate.	0.0 ° (-180.0 - +180.0°)

◆ T3: ASR and Inertia Tuning

No. (Hex.)	Name	Description	Default (Range)
T3-00 (1198)	Control Loop Tuning Selection	Sets the type of Control Auto-Tuning. 0 : Inertia Tuning 1 : ASR (Speed Regulator) 2 : Deceleration Rate Tuning 3 : KEB Tuning **Note:** Settings *0 and 1* are available only when *A1-02 = 3, 7 [Control Method Selection = CLV, CLV/PM]*.	0 (0 - 3)
T3-01 (0760)	Test Signal Frequency	Sets the frequency of the test signal applied to the motor during Inertia Tuning. Usually it is not necessary to change this setting.	3.0 Hz (0.1 - 20.0 Hz)
T3-02 (0761)	Test Signal Amplitude	Sets the amplitude of the test signal applied to the motor during Inertia Tuning. Usually it is not necessary to change this setting.	0.5 rad (0.1 - 10.0 rad)
T3-03 (0762)	Motor Inertia	Sets the inertia of the motor. This value uses the test signal response to calculate the load inertia. **Note:** The display units for the default setting and setting range are different for different models: • 0.0001 kgm² units (setting range: 0.0001 kgm² to 6.0000 kgm²): 2004 to 2021, 4002 to 4012 • 0.001 kgm² units (setting range: 0.001 kgm² to 60.000 kgm²): 2030 to 2211, 4018 to 4103 • 0.01 kgm² units (setting range: 0.01 kgm² to 600.00 kgm²): 2257 to 2415, 4140 to 4720	Determined by o2-04, C6-01, and E5-01 (0.0001 - 600.00 kgm²)
T3-04 (0763)	System Response Frequency	This parameter uses the load inertia value from the Inertia Tuning process to automatically calculate and set *C5-01 [ASR Proportional Gain 1]*.	10.0 Hz (0.1 - 50.0 Hz)

◆ 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)
T4-04 (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.	200 V Class: 230.0 V, 400 V: 460.0 V (200 V Class: 0.0 - 255.0 V,400 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, C6-01 (10% to 200% of the drive rated current)

No. (Hex.)	Name	Description	Default (Range)
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)

3.17 U: Monitors

◆ U1: Operation Status Monitors

No. (Hex.)	Name	Description	MFAO Signal Level
U1-01 (0040)	Frequency reference	Shows the actual frequency reference value. Parameter *o1-03 [Keypad Display Unit Selection]* sets the display units. Unit: 0.01 Hz	10 V = Maximum frequency (-10 V to +10 V)
U1-02 (0041)	Output Frequency	Shows the actual output frequency. Parameter *o1-03 [Keypad Display Unit Selection]* sets the display units. Unit: 0.01 Hz	10 V = Maximum frequency (-10 V to +10 V)
U1-03 (0042)	Output Current	Shows the actual output current. The keypad shows the value of *U1-03* in amperes (A). When looking at the monitor through MEMOBUS/Modbus communications, the current is "8192 = drive rated current (A)." Calculate the current from the monitor value that is in at MEMOBUS/Modbus communications using "Numerals being displayed / 8192 × drive rated current (A)." Unit: Determined by the drive model. • 0.01 A: 2004 to 2042, 4002 to 4023 • 0.1 A: 2056 to 2415, 4031 to 4720	10 V = Drive rated current
U1-04 (0043)	Control Method	Shows the drive control method. 0 : V/f Control 1 : V/f Control with Encoder 2 : Open Loop Vector 3 : Closed Loop Vector 4 : Advanced Open Loop Vector 5 : PM Open Loop Vector 6 : PM Advanced Open Loop Vector 7 : PM Closed Loop Vector 8 : EZ Vector Control	No signal output available
U1-05 (0044)	Motor Speed	Shows the actual detected motor speed. Parameter *o1-03 [Keypad Display Unit Selection]* sets the display units. Unit: 0.01 Hz	10 V = Maximum frequency (-10 V to +10 V)
U1-06 (0045)	Output Voltage Ref	Shows the output voltage reference. Unit: 0.1 V	200 V class: 10 V = 200 Vrms 400 V class: 10 V = 400 Vrms
U1-07 (0046)	DC Bus Voltage	Shows the DC bus voltage. Unit: 1 V	200 V class: 10 V = 400 V 400 V class: 10 V = 800 V
U1-08 (0047)	Output Power	Shows the internally-calculated output power. Changing the setting of *A1-02 [Control Method Selection]* also changes the signal level of the analog output. • A1-02 = 0, 1: Drive capacity (kW) • A1-02 = 2, 3, 4: *Motor Rated Power [E2-11]* (kW) • A1-02 = 5, 6, 7: *PM Motor Rated Power [E5-02]* (kW) • A1-02 = 8: *Motor Rated Power [E9-07]* (kW) Unit: The display units are different for different models: • 0.01 kW: 2004 to 2042, 4002 to 4023 • 0.1 kW: 2056 to 2415, 4031 to 4720	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 (-10 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. bit 0 : Terminal S1 (MFDI 1) bit 1 : Terminal S2 (MFDI 2) bit 2 : Terminal S3 (MFDI 3) bit 3 : Terminal S4 (MFDI 4) bit 4 : Terminal S5 (MFDI 5) bit 5 : Terminal S6 (MFDI 6) bit 6 : Terminal S7 (MFDI 7) bit 7 : Terminal S8 (MFDI 8)	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 19F [Inverse Output of Function]*, the value before inversion is displayed. 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. bit 0 : During Run bit 1 : During zero-speed bit 2 : During reverse bit 3 : During fault reset signal input bit 4 : During speed agreement bit 5 : Drive ready bit 6 : During minor fault detection bit 7 : 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% (-10 V to +10 V)
U1-14 (004F)	Terminal A2 Level	Shows the signal level of terminal A2. Unit: 0.1%	10 V = 100% (-10 V to +10 V)
U1-15 (0050)	Terminal A3 Level	Shows the signal level of terminal A3. Unit: 0.1%	0 V = 100% (-10 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 (-10 V to +10 V)
U1-17 (0058)	DI-A3 Input Status	Shows the reference value input from DI-A3 option. Shows the input signal for DI-A3 in hexadecimal as set in *F3-01 [Digital Input Function Selection]*. 3FFFF: Set (1 bit) + Sign (1 bit) + 16 bit	No signal output available
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 a CRC error occurs. bit 0 : CRC Error bit 1 : Data Length Error bit 2 : Not used (normal value of 0). bit 3 : Parity Error bit 4 : Overrun Error bit 5 : Framing Error bit 6 : Timed Out bit 7 : Not used (normal value of 0).	No signal output available
U1-21 (0077)	AI-A3 Term V1 Level	Shows the analog reference of terminal V1 on analog input option card AI-A3. Unit: 0.1%	10 V = 100% (-10 V to +10 V)
U1-22 (072A)	AI-A3 Term V2 Level	Shows the analog reference of terminal V2 on analog input option card AI-A3. Unit: 0.1%	10 V = 100% (-10 V to +10 V)
U1-23 (072B)	AI-A3 Term V3 Level	Shows the analog reference of terminal V3 on analog input option card AI-A3. Unit: 0.1%	10 V = 100% (-10 V to +10 V)
U1-24 (007D)	Input Pulse Monitor	Shows the frequency to pulse train input terminal RP. Unit: 1 Hz	Determined by H6-02
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

No. (Hex.)	Name	Description	MFAO Signal Level
U1-50 (1199) Expert	Virtual Analog Input	Shows the virtual analog input value.	Determined by H7-40
U1-91 (154E) Expert	Output Voltage	Shows the drive internal output voltage reference. Unit: 0.1 V	200 V class: 10 V = 200 Vrms 400 V class: 10 V = 400 Vrms

◆ 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 actual 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 actual output current. The keypad shows the value of *U1-03* in amperes (A). When looking at the monitor through MEMOBUS/Modbus communications, the current is "8192 = drive rated current (A)". Calculate the current from the monitor value that is in at MEMOBUS/Modbus communications using "Numerals being displayed / 8192 × drive rated current (A)". Unit: Determined by the drive model. • 0.01 A: 2004 to 2042, 4002 to 4023 • 0.1 A: 2056 to 2415, 4031 to 4720	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 actual 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 actual 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 actual 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 actual 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 actual 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 actual 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 : Terminal S8	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 actual 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 actual MFDO terminal status. bit 0 : During Run bit 1 : During zero-speed bit 2 : During reverse bit 3 : During fault reset signal input bit 4 : During speed agreement bit 5 : Drive ready bit 6 : During minor fault detection bit 7 : 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 actual 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 actual 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 actual 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 actual d-Axis current of the motor. Unit: 0.1 %	No signal output available
U2-19 (07E4)	ControlDeviation@Flt	Shows the amount of control axis deviation (Δθ) at the fault that occurred most recently. Use *U6-10 [ContAxisDeviation Δθ]* to monitor the actual amount of control axis deviation (Δθ). 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 actual 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 displayed as ON or OFF. bit 0 : Excessive current bit 1 : Induced voltage deviation bit 2 : d-axis current deviation bit 3 : Motor lock at startup bit 4 : Acceleration stall continue bit 5 : Acceleration stall repeat bit 6 : Not used (normal value of 0). bit 7 : Not used (normal value of 0).	No signal output available

◆ U3: Fault History

No. (Hex.)	Name	Description	MFAO Signal Level
U3-01 to U3-04 (0090 - 0093) (0800 - 0803)	1st to 4th MostRecent Fault	Shows the fault history of the first to fourth most recent faults. **Note:** The drive saves the *U3-01 to U3-04 [1st to 4th MostRecent Fault]* fault histories to two types of registers at the same time for the MEMOBUS/Modbus communications.	No signal output available
U3-05 to U3-10 (0804 - 0809)	5th to 10th MostRecent Fault	Shows the fault history of the fifth to tenth most recent faults.	No signal output available

No. (Hex.)	Name	Description	MFAO Signal Level
U3-11 to U3-14 (0094 - 0097) (080A - 080D)	ElapsedTime@1st to 4thFault	Shows the cumulative operation time when the first to fourth most recent faults occurred. Unit: 1 h **Note:** The drive saves the *U3-11 to U3-14 [ElapsedTime@1st to 4thFault]* the cumulative operation time to two types of registers at the same time for the MEMOBUS/Modbus communications.	No signal output available
U3-15 to U3-20 (080E - 0813)	ElapsedTime@5th to 10thFault	Shows the cumulative operation time when the fifth to tenth most recent faults occurred. Unit: 1 h	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. **Note:** A damaged LED Status Ring board will prevent an accurate estimate of the internal status of the drive. Do not use only the LED Status Ring to estimate the status of the drive and motors. 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	Displays 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 looking at the monitor through MEMOBUS/Modbus communications, the current is "8192 = drive rated current (A)." Calculate the current from the monitor value that is in at MEMOBUS/Modbus communications using "Numerals being displayed / 8192 × drive rated current (A). Unit: Determined by the drive model. • 0.01 A: 2004 to 2042, 4002 to 4023 • 0.1 A: 2056 to 2415, 4031 to 4720	No signal output available
U4-14 (07D0)	PeakHold Output Freq	Displays 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: *External Reference 1/2 Selection [H1-xx = 2]* selection status • 1: *b1-01 [Frequency Reference Selection 1]* • 2: *b1-15 [Frequency Reference Selection 2]* 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 • 1-03: MFAI terminal A3 • 2-02 to 2-17: Multi-step speed reference (*d1-02 to d1-17 [Reference 2 to 16, Jog Reference]*) • 3-01: MEMOBUS/Modbus communications • 4-01: Communication option card • 5-01: Pulse train input • 7-01: DriveWorksEZ • 9-01: Up/Down command	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 (-10 V to +10 V)

No. (Hex.)	Name	Description	MFAO Signal Level
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 (-10 V to +10 V)
U4-21 (07DD)	Run Command Source	Shows the selected Run command source. The keypad shows the Run command source as “XY-nn” as specified by these rules: X: *External Reference 1/2 Selection [H1-xx = 2]* selection status • 1: *b1-02 [Run Command Selection 1]* • 2: *b1-16 [Run Command Selection 2]* Y: Run command source • 0: Keypad • 1: Control circuit terminal • 3: MEMOBUS/Modbus communications • 4: Communication option card • 7: DriveWorksEZ nn: Run command limit status data • 00: No limit status. • 01: The Run command was left ON when the drive stopped in the Programming Mode. • 02: The Run command was left ON when switching from LOCAL Mode to REMOTE 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: Restart after run stop is prohibited. • 05: Fast stop has been executed using the MFDI terminal. Or, the motor has ramped to stop by pressing the STOP key on the keypad. • 06: *b1-17 = 0 [Run Command at Power Up = Disregard Existing RUN Command]* is set. • 07: During baseblock while coast to stop with timer. • 08: Frequency reference is below *E1-09 [Minimum Output Frequency]* during baseblock. • 09: Waiting for the Enter command from PLC.	No signal output The keypad shows the Run command source as "XY-nn" as specified by these rules: 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 : Multi-function input 8 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 : Multi-function input 8 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 appears as 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 appears as 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	Displays the torque reference given to the drive via a serial communication option card or via MEMOBUS/Modbus communications as a decimal number. Unit: 0.1%	10 V = 100% (-10 V to +10 V)

◆ U5: PID Monitors

No. (Hex.)	Name	Description	MFAO Signal Level
U5-01 (0057)	PID Feedback	Shows the PID control feedback value. Parameter *b5-20 [PID Unit Selection]* sets the display units. Unit: 0.01%	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 (-10 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 (-10 V to +10 V)
U5-04 (0065)	PID Setpoint	Shows the PID setpoint. Parameter *b5-20 [PID Unit Selection]* sets the display units. Unit: 0.01%	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, H3-10, or H3-06 = 16 [MFAI Function Selection = Differential PID Feedback]*. Unit: 0.01%	10 V = Maximum frequency (-10 V to +10 V)
U5-06 (07D3)	PID Fdbk-Diff PID Fdbk	Shows the difference from calculating *U5-05 - U5-01 [PID DifferentialFdbk] - [PID Feedback]*. Unit: 0.01% **Note:** *U5-01 [PID Feedback] = U5-06* when *H3-02, H3-10, or H3-06 ≠ 16 [MFAI Function Selection ≠ Differential PID Feedback]*.	10 V = Maximum frequency (-10 V to +10 V)
U5-21 (0872) Expert	Energy Save Coeff Ki	Shows the energy-saving coefficient Ki value for PM. Unit: 0.01	No signal output available
U5-22 (0873) Expert	Energy Save Coeff Kt	Shows the energy-saving coefficient Kt value for PM. Unit: 0.01	No signal output available
U5-99 (1599)	PID Setpoint Command	Shows the PID setpoint command. Parameter *b5-20 [PID Unit Selection]* sets the display units. Unit: 0.01%	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 (-10 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 (-10 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 (-10 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 (-10 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	200 V class: 10 V = 200 Vrms 400 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	200 V class: 10 V = 200 Vrms 400 V class: 10 V = 400 Vrms (-10 V to +10 V)
U6-07 (005F) Expert	q-Axis ACR Output	Shows the output value for current control related to motor secondary current (q axis). Unit: 0.1%	200 V class: 10 V = 200 Vrms 400 V class: 10 V = 400 Vrms (-10 V to +10 V)
U6-08 (0060) Expert	d-Axis ACR Output	Shows the output value for current control related to motor excitation current (d axis). Unit: 0.1%	200 V class: 10 V = 200 Vrms 400 V class: 10 V = 400 Vrms (-10 V to +10 V)
U6-09 (07C0) Expert	AdvPhase Compen Δθcmp	Displays the data on forward phase compensation for the calculation results of the amount of control axis deviation. Unit: 1 °	10 V: 180 ° (-10 V to +10 V)
U6-10 (07C1) Expert	ContAxisDeviation Δθ	Shows the deviation between the γδ-Axis used for motor control and the dq-Axis. Unit: 0.1 °	10 V: 180 ° (-10 V to +10 V)
U6-13 (07CA) Expert	MagPolePosition(Enc)	Shows the value of the flux position detection. Unit: 0.1 °	10 V: 180° (-10 V to +10 V)
U6-14 (07CB) Expert	MagPolePosition(Obs)	Shows the value of the flux position estimation. Unit: 0.1 °	10 V: 180 ° (-10 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
U6-18 (07CD)	Enc 1 Pulse Counter	Shows the number of pulses for speed detection (PG1). Unit: 1 pulse	10 V: 65536
U6-19 (07E5)	Enc 2 Pulse Counter	Shows the number of pulses for speed detection (PG2). Unit: 1 pulse	10 V: 65536
U6-20 (07D4)	UP/DOWN 2 Bias Value	Shows the bias value used to adjust the frequency reference. Unit: 0.1%	10 V: Maximum Frequency
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
U6-22 (0062)	ZeroServo Pulse Move	Shows the distance that the rotor moved from its last position when Zero Servo is available. The value shown in this monitor = 4 X [No. of PG pulses]. Unit: 1 pulse	10 V = Number of pulses per revolution (-10 V to +10 V)

No. (Hex.)	Name	Description	MFAO Signal Level
U6-25 (006B) Expert	ASR Output Level	Shows the primary delay filter input value of the ASR (speed control loop). Unit: 0.01%	10 V = Motor secondary rated current (-10 V to +10 V)
U6-26 (006C) Expert	Feed Fwd Cont Output	Shows the Feed Forward control output. Unit: 0.01%	10 V = Motor secondary rated current (-10 V to +10 V)
U6-27 (006D) Expert	FeedFwd Estimate Spd	Shows the feed forward estimated speed. Unit: 0.01%	10 V = Maximum frequency (-10 V to +10 V)
U6-31 (007B)	TorqueDetect Monitor	Monitors the torque reference or the output current after applying the filter set to *L6-07 [Torque Detection Filter Time]*. Unit: 0.1%	10 V:100%
U6-36 (0720) Expert	Comm Errors-Host	Shows the number of inter-CPU communication errors. De-energizing the drive sets this number to 0.	No signal output available
U6-37 (0721) Expert	Comm Errors-Sensor	Shows the number of inter-CPU communication errors. De-energizing the drive sets this number to 0.	No signal output available
U6-48 (072E) Expert	ASIC Comm Errors	Counts the number of inter-ASIC communication errors detected by the ASIC. This count is reset to 0 when the power to the drive is turned off.	No signal output available
U6-57 (07C4)	PolePolarityDeterVal	Shows the change from the integrated current when finding 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 to U6-83 (07B0 - 07B3)	Option IP Address 1 to 4	Shows the currently available local IP Address. • *U6-80*: 1st octet • *U6-81*: 2nd octet • *U6-82*: 3rd octet • *U6-83*: 4th octet	No signal output available
U6-84 to U6-87 (07B4 - 07B7)	Online Subnets 1 to 4	Shows the currently available subnet mask. • *U6-84*: 1st octet • *U6-85*: 2nd octet • *U6-86*: 3rd octet • *U6-87*: 4th octet	No signal output available
U6-88 to U6-91 (07B8, 07B9, 07F0, 07F1)	Online Gateways 1 to 4	Shows the currently available gateway address. • *U6-88*: 1st octet • *U6-89*: 2nd octet • *U6-90*: 3rd octet • *U6-91*: 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 (DeviceNet, Modbus TCP/IP, EtherNet/IP).	No signal output available
U6-99 (07F9)	Current Fault	Shows the contents of current fault from communication options (DeviceNet, Modbus TCP/IP, EtherNet/IP).	No signal output available

◆ U8: DriveWorksEZ Monitors

No. (Hex.)	Name	Description	MFAO Signal Level
U8-01 to U8-10 (1950 - 1959)	DWEZ Monitors 1 to 10	Shows DriveWorks EZ Monitors 1 to 10. Unit: 0.01%	10 V = 100%
U8-11 (195A)	DWEZ Version 1	Displays the upper three digits of the user ID. When you open the setting screen by clicking the setting button on the PC tool title bar, the user ID can be confirmed with the ID display of the primary user.	No signal output available
U8-12 (195B)	DWEZ Version 2	Displays the lower five digits of the user ID. When you open the setting screen by clicking the setting button on the PC tool title bar, the user ID can be confirmed with the ID display of the primary user.	No signal output available
U8-13 (195C)	DWEZ Version 3	Displays the software ID.	No signal output available
U8-18 (1961)	DWEZ Platform Ver	Shows the DriveWorksEZ platform version.	No signal output available
U8-21 to U8-25 (1964 - 1968)	DWEZ Monitors 21 to 25	Shows DriveWorks EZ Monitors 21 to 25. Unit: 0.01%	10 V = 100%
U8-31 to U8-40 (196E - 1977)	DWEZ Monitors 31 to 40	Shows DriveWorks EZ Monitors 31 to 40. Unit: 0.01%	10 V = 100%
U8-51 to U8-55 (1982 - 1986)	DWEZ Monitors 51 to 55	Shows DriveWorks EZ Monitors 51 to 55. Unit: 0.01%	10 V = 100%

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

The values for the parameters in these tables change when *A1-02* changes. Changing the setting for *A1-02* will change the default settings.

◆ A1-02 = 0 to 4 [Induction Motor Control Methods]

No.	Name	Range	Unit	Control Method (A1-02 Setting)				
				V/f (0)	CL-V/f (1)	OLV (2)	CLV (3)	AOLV (4)
b2-01	DC Injection/Zero SpeedThreshold	0.0 - 10.0	0.1 Hz	0.5	0.5	0.5	0.5	0.5
b2-04	DC Inject Braking Time at Stop	0.00 - 10.00	0.01 s	0.50	0.50	0.50	0.50	0.50
b3-01	Speed Search at Start Selection	0 - 1	1	0	1	0	-	0
b3-02	SpeedSearch Deactivation Current	0 - 200	1%	120	-	100	-	-
b3-08	Speed Estimation ACR P Gain	0.00 - 6.00	0.01	0.50 *1	0.50 *1	0.50 *1	0.50 *1	0.50 *1
b3-09	Speed Estimation ACR I Time	0.0 - 1000.0	0.1 ms	2.0	2.0	2.0	2.0	2.0
b3-14	Bi-directional Speed Search	0 - 1	1	0	0	0	-	1
b5-15	PID Sleep Function Start Level	0.0 - 400.0	0.1 Hz	0.0	0.0	0.0	0.0	0.0
b6-01	Dwell Reference at Start	0.0 - 400.0	0.1 Hz	0.0	0.0	0.0	0.0	0.0
b6-03	Dwell Reference at Stop	0.0 - 400.0	0.1 Hz	0.0	0.0	0.0	0.0	0.0
b8-02	Energy Saving Gain	0.0 - 10.0	0.1	-	-	0.7	1.0	1.0
b8-03	Energy Saving Filter Time	0.00 - 10.00	0.01 s	-	-	0.50 *2	0.01 *2	0.01 *2
b8-19	E-Save Search Injection Freq	10 - 300	1 Hz	-	-	-	-	-
C1-11	Accel/Decel Time Switchover Freq	0.0 - 400.0	0.1 Hz	0.0	0.0	0.0	0.0	0.0
C2-01	S-Curve Time @ Start of Accel	0.00 - 10.00	0.01 s	0.20	0.20	0.20	0.20	0.20
C3-01	Slip Compensation Gain	0.0 - 2.5	0.1	0.0	-	1.0	1.0	0.0
C3-02	Slip Compensation Delay Time	0 - 10000	1 ms	2000	-	200	-	-
C4-01	Torque Compensation Gain	0.00 - 2.50	0.01	1.00	1.00	1.00	-	-
C4-02	Torque Compensation Delay Time	0 - 60000	1 ms	200	200	20	-	-
C5-01	ASR Proportional Gain 1	0.00 - 300.00	0.01	-	0.20	-	20.00	10.00
C5-02	ASR Integral Time 1	0.000 - 60.000	0.001 s	-	0.200	-	0.500	0.500
C5-03	ASR Proportional Gain 2	0.00 - 300.00	0.01	-	0.02	-	20.00	20.00
C5-04	ASR Integral Time 2	0.000 - 60.000	0.001 s	-	0.050	-	0.500	0.500

No.	Name	Range	Unit	Control Method (A1-02 Setting)				
				V/f (0)	CL-V/f (1)	OLV (2)	CLV (3)	AOLV (4)
C5-06	ASR Delay Time	0.000 - 0.500	0.001 s	-	-	-	0.004	0.004
C5-07	ASR Gain Switchover Frequency	0.0 - 400.0	0.1 Hz	-	-	-	0.0	0.0
C6-02	Carrier Frequency Selection	1 - F	1	1 *3	1 *3	1 *3	1	1
d3-01	Jump Frequency 1	0.0 - 400.0	0.1 Hz	0.0	0.0	0.0	0.0	0.0
d3-02	Jump Frequency 2	0.0 - 400.0	0.1 Hz	0.0	0.0	0.0	0.0	0.0
d3-03	Jump Frequency 3	0.0 - 400.0	0.1 Hz	0.0	0.0	0.0	0.0	0.0
d3-04	Jump Frequency Width	0.0 - 20.0	0.1 Hz	1.0	1.0	1.0	1.0	1.0
d5-02	Torque Reference Delay Time	0 - 1000	1 ms	-	-	-	0	0
E1-04	Maximum Output Frequency	40.0 - 400.0 *3 *4	0.1 Hz	60.0 *5	60.0 *5	60.0	60.0	60.0
E1-05	Maximum Output Voltage	0.0 - 255.0 *6	0.1 V	200.0 *5	200.0 *5	200.0	200.0	200.0
E1-06	Base Frequency	0.0 - 400.0 *4	0.1 Hz	60.0 *5	60.0 *5	60.0	60.0	60.0
E1-07	Mid Point A Frequency	0.0 - 400.0 *4	0.1 Hz	3.0 *5	3.0 *5	3.0	-	0.0
E1-08	Mid Point A Voltage	0.0 - 255.0 *6	0.1 V	15.0 *5	15.0 *5	11.0	-	0.0
E1-09	Minimum Output Frequency	0.0 - 400.0 *4	0.1 Hz	1.5 *5	1.5 *5	0.5	0.0	0.0
E1-10	Minimum Output Voltage	0.0 - 255.0 *6	0.1 V	9.0 *5	9.0 *5	2.0	-	0.0
F1-01	Encoder 1 Pulse Count (PPR)	0 - 60000	1 ppr	-	600	-	600	600
F1-05	Encoder 1 Rotation Selection	0 - 1	1	-	0	-	0	0
F1-09	Overspeed Detection Delay Time	0.0 - 2.0	0.1 s	-	1.0	-	0.0	0.1
L1-01	Motor Overload (oL1) Protection	0 - 6	1	1	1	1	1	1
L2-31	KEB Start Voltage Offset Level	0 - 100 *6	1 V	0	0	0	0	0
L3-05	Stall Prevention during RUN	0 - 3	1	2	2	-	-	-
L3-20	DC Bus Voltage Adjustment Gain	0.00 - 5.00	0.01	1.00	1.00	0.30	0.30	0.30
L3-21	OVSuppression Accel/Decel P Gain	0.10 - 10.00	0.01	1.00	1.00	1.00	1.00	1.00
L3-36	Current Suppression Gain@Accel	0.0 - 100.0	0.1	10.0	10.0	20.0	-	-
L4-01	Speed Agree Detection Level	0.0 - 400.0 *7	0.1	0.0 Hz	0.0 Hz	0.0 Hz	0.0 Hz	0.0 Hz
L4-02	Speed Agree Detection Width	0.0 - 20.0	0.1	2.0 Hz	2.0 Hz	2.0 Hz	2.0 Hz	2.0 Hz
L4-03	Speed Agree Detection Level (+/-)	-400.0 - +400.0 *8	0.1	0.0 Hz	0.0 Hz	0.0 Hz	0.0 Hz	0.0 Hz
L4-04	Speed Agree Detection Width (+/-)	0.0 - 20.0	0.1	2.0 Hz	2.0 Hz	2.0 Hz	2.0 Hz	2.0 Hz

No.	Name	Range	Unit	Control Method (A1-02 Setting)				
				V/f (0)	CL-V/f (1)	OLV (2)	CLV (3)	AOLV (4)
L8-38	Carrier Frequency Reduction	0 - 2	1	*3	*3	*3	*3	-
L8-40	Carrier Freq Reduction Off-Delay	0.00 - 2.00	0.01 s	0.50	0.50	0.50	0.50	-
L8-90	STPo Detection Level (Low Speed)	0 - 5000	1	-	-	-	-	-
n1-15	PWM Voltage Offset Calibration	0 - 2	1	1	1	1	1	2
n5-04	Speed Response Frequency	0.00 - 500.00	0.01 Hz	-	-	-	50.00	50.00
n8-35	Initial Pole Detection Method	0 - 2	1	-	-	-	-	-
n8-51	Pull-in Current @ Acceleration	0 - 200	1%	-	-	-	-	-
o1-03	Frequency Display Unit Selection	0 - 3	1	0	0	0	0	0
o1-04	V/f Pattern Display Unit	0 - 1	1	-	-	-	0	0

*1 Depends on the setting of *o2-04 [Drive Model (KVA) Selection]*.
*2 Drive models 2211 to 2415 and 4103 to 4720 use these default settings when *C6-01 = 1 [Normal / Heavy Duty Selection = Normal Duty Rating]*. Drive models 2257 to 2415, 4140 to 4720 use these default settings when *C6-01 = 0 [Heavy Duty Rating]*.

- *A1-02 = 2 [Open Loop Vector]*: 2.00
- *A1-02 = 3, 4 [Closed Loop Vector, Advanced Open Loop Vector]*: 0.05

*3 The default setting changes when *C6-01 [Normal / Heavy Duty Selection]* changes.
*4 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]*.
*5 The default setting changes when the drive model and setting for *E1-03 [V/f Pattern Selection]* change.
*6 This is the value for 200 V class drives. Double the value for 400 V class drives.
*7 The maximum value within the setting range is 100.0 when *A1-02 = 5 or 7 [Control Method Selection = PM Open Loop Vector or PM Closed Loop Vector]*.
*8 The setting range is -100.0 to 100.0 when *A1-02 = 5 or 7 [Control Method Selection = PM Open Loop Vector or PM Closed Loop Vector]*.

◆ A1-02 = 5 to 8 [Control Method for PM Motors and EZ Vector Control]

No.	Name	Range	Unit	Control Method (A1-02 Setting)			
				OLV/PM (5)	AOLV/PM (6)	CLV/PM (7)	EZOLV (8)
b2-01	DC Injection/Zero SpeedThreshold	0.0 - 10.0	0.1	0.5 Hz	1.0%	0.5%	0.5 Hz
b2-04	DC Inject Braking Time at Stop	0.00 - 10.00	0.01 s	0.00	0.00	0.00	0.00
b3-01	Speed Search at Start Selection	0 - 1	1	0	0	-	0
b3-02	SpeedSearch Deactivation Current	0 - 200	1%	-	-	-	-
b3-08	Speed Estimation ACR P Gain	0.00 - 6.00	0.01	0.50 *1	0.50 *1	-	0.60 *2
b3-09	Speed Estimation ACR I Time	0.0 - 1000.0	0.1 ms	2.0	4.0	-	10.0
b3-14	Bi-directional Speed Search	0 - 1	1	-	-	-	0
b5-15	PID Sleep Function Start Level	0.0 - 400.0 *3	0.1	0.0 Hz	0.0%	0.0%	0.0 Hz
b6-01	Dwell Reference at Start	0.0 - 400.0 *3	0.1	0.0 Hz	0.0%	0.0%	0.0 Hz

No.	Name	Range	Unit	Control Method (A1-02 Setting)			
				OLV/PM (5)	AOLV/PM (6)	CLV/PM (7)	EZOLV (8)
b6-03	Dwell Reference at Stop	0.0 - 400.0 *3	0.1	0.0 Hz	0.0%	0.0%	0.0 Hz
b8-02	Energy Saving Gain	0.0 - 10.0	0.1	-	-	-	-
b8-03	Energy Saving Filter Time	0.00 - 10.00	0.01 s	-	-	-	-
b8-19	E-Save Search Injection Freq	10 - 300	1 Hz	-	100	100	20
C1-11	Accel/Decel Time Switchover Freq	0.0 - 400.0 *3	0.1	0.0 Hz	0.0%	0.0%	0.0 Hz
C2-01	S-Curve Time @ Start of Accel	0.00 - 10.00	0.01 s	1.00	0.20	0.20	1.00
C3-01	Slip Compensation Gain	0.0 - 2.5	0.1	-	-	-	0.0
C3-02	Slip Compensation Delay Time	0 - 10000	1 ms	-	-	-	200
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	20.00	10.00
C5-02	ASR Integral Time 1	0.000 - 60.000	0.001 s	-	0.500	0.500	0.500
C5-03	ASR Proportional Gain 2	0.00 - 300.00	0.01	-	10.00	20.00	10.00
C5-04	ASR Integral Time 2	0.000 - 60.000	0.001 s	-	0.500	0.500	0.500
C5-06	ASR Delay Time	0.000 - 0.500	0.001 s	-	0.016	0.004	0.004
C5-07	ASR Gain Switchover Frequency	0.0 - 400.0 *3	0.1	-	0.0%	0.0%	0.0 Hz
C6-02	Carrier Frequency Selection	1 - F	1	2	2	2	2
d3-01	Jump Frequency 1	0.0 - 400.0 *3	0.1	0.0 Hz	0.0%	0.0%	0.0 Hz
d3-02	Jump Frequency 2	0.0 - 400.0 *3	0.1	0.0 Hz	0.0%	0.0%	0.0 Hz
d3-03	Jump Frequency 3	0.0 - 400.0 *3	0.1	0.0 Hz	0.0%	0.0%	0.0 Hz
d3-04	Jump Frequency Width	0.0 - 20.0 *4	0.1	1.0 Hz	1.0%	1.0%	1.0 Hz
d5-02	Torque Reference Delay Time	0 - 1000	1 ms	-	0	0	-
E1-04	Maximum Output Frequency	40.0 - 400.0 *5	0.1 Hz	Determined by E5-01	Determined by E5-01	Determined by E5-01	-
E1-05	Maximum Output Voltage	0.0 - 255.0 *6	0.1 V	Determined by E5-01	Determined by E5-01	Determined by E5-01	-
E1-06	Base Frequency	0.0 - 400.0	0.1 Hz	Determined by E5-01	Determined by E5-01	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 *6	0.1 V	-	-	-	-
E1-09	Minimum Output Frequency	0.0 - 400.0	0.1 Hz	Determined by E5-01	Determined by E5-01	Determined by E5-01	-
E1-10	Minimum Output Voltage	0.0 - 255.0 *6	0.1 V	-	-	-	-
F1-01	Encoder 1 Pulse Count (PPR)	0 - 60000	1 ppr	-	-	1024	-
F1-05	Encoder 1 Rotation Selection	0 - 1	1	-	-	1	-
F1-09	Overspeed Detection Delay Time	0.0 - 2.0	0.1 s	-	0.0	0.0	0.0
L1-01	Motor Overload (oL1) Protection	0 - 6	1	4	4	5	1

No.	Name	Range	Unit	Control Method (A1-02 Setting)			
				OLV/PM (5)	AOLV/PM (6)	CLV/PM (7)	EZOLV (8)
L2-31	KEB Start Voltage Offset Level	0 - 100 *6	1 V	50	50	50	50
L3-05	Stall Prevention during RUN	0 - 3	1	1	-	-	3
L3-20	DC Bus Voltage Adjustment Gain	0.00 - 5.00	0.01	0.65	0.65	0.65	0.65
L3-21	OVSuppression Accel/ Decel P Gain	0.10 - 10.00	0.01	1.00	1.00	1.00	1.00
L3-36	Current Suppression Gain@Accel	0.0 - 100.0	0.1	-	-	-	-
L4-01	Speed Agree Detection Level	0.0 - 400.0 *3	0.1	0.0 Hz	0.0%	0.0%	0.0 Hz
L4-02	Speed Agree Detection Width	0.0 - 20.0 *4	0.1	2.0 Hz	4.0%	4.0%	2.0 Hz
L4-03	Speed Agree Detection Level(+/-)	-400.0 - +400.0 *7	0.1	0.0 Hz	0.0%	0.0%	0.0 Hz
L4-04	Speed Agree Detection Width(+/-)	0.0 - 20.0 *4	0.1	2.0 Hz	4.0%	4.0%	2.0 Hz
L8-38	Carrier Frequency Reduction	0 - 2	1	0	-	0	0
L8-40	Carrier Freq Reduction Off-Delay	0.00 - 2.00	0.01 s	0.00	-	0.00	0.00
L8-90	STPo Detection Level (Low Speed)	0 - 5000	1	0	80	-	0
n1-15	PWM Voltage Offset Calibration	0 - 2	1	1	1	1	1
n5-04	Speed Response Frequency	0.00 - 500.00	0.01 Hz	-	20.00	50.00	-
n8-35	Initial Pole Detection Method	0 - 2	1	0	1	1	-
n8-51	Pull-in Current @ Acceleration	0 - 200	1%	50%	-	-	80%
o1-03	Frequency Display Unit Selection	0 - 3	1	2	2	2	0 *8
o1-04	V/f Pattern Display Unit	0 - 1	1	-	1	1	0 *8

*1 Depends on the setting of o2-04.
*2 The default settings are different for different drive models.

- 2138 - 2415, 4089 - 4720: 0.30

*3 The setting range is 0.0 to 100.0 when *A1-02 = 6 or 7 [PM Advanced Open Loop Vector or PM Closed Loop Vector]*.
*4 The setting range is 0.0 to 40.0 when *A1-02 = 6 or 7 [PM Advanced Open Loop Vector or PM Closed Loop Vector]*.
*5 The default setting changes when the setting for *C6-01 [Normal / Heavy Duty Selection]* changes.
*6 This is the value for 200 V class drives. Double the value for 400 V class drives.
*7 The setting range is -100.0 to +100.0 when *A1-02 = 6 or 7 [PM Advanced Open Loop Vector or PM Closed Loop Vector]*.
*8 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

3.19 Parameters that Change from the Default Settings with E3-01 [Motor 2 Control Mode Selection]

The values for the parameters in these tables depend on the values for parameter *E3-01*. When you change the setting for *E3-01*, the default settings will change.

No.	Name	Range	Unit	Motor 2 Control Method (setting value of E3-01)			
				V/f (0)	CL-V/f (1)	OLV (2)	CLV (3)
C3-21	Motor 2 Slip Compensation Gain	0.0 - 2.50	0.1	0.0	-	1.0	1.0
C3-22	Motor 2 Slip Comp Delay Time	0 - 10000	1 ms	2000	-	200	-
C5-21	Motor 2 ASR Proportional Gain 1 (P)	0.00 - 300.00	0.01	-	0.20	-	20.00
C5-22	Motor 2 ASR Integral Time 1 (I)	0.000 - 10.000	0.001 s	-	0.200	-	0.500
C5-23	Motor 2 ASR Proportional Gain 2 (P)	0.00 - 300.00	0.01	-	0.02	-	20.00
C5-24	Motor 2 ASR Integral Time 2 (I)	0.000 - 10.000	0.001 s	-	0.050	-	0.500
C5-26	Motor 2 ASR Delay Time	0.000 - 0.500	0.001 s	-	-	-	0.004
E3-04	Motor 2 Maximum Output Frequency	40.0 - 590.0	0.1 Hz	60.0	60.0	60.0	60.0
E3-05	Motor 2 Maximum Output Voltage	0.0 - 255.0 *1	0.1 V	200.0	200.0	200.0	200.0
E3-06	Motor 2 Base Frequency	0.0 - 590.0	0.1 Hz	60.0	60.0	60.0	60.0
E3-07	Motor 2 Mid Point A Frequency	0.0 - 590.0	0.1 Hz	3.0	3.0	3.0	-
E3-08	Motor 2 Mid Point A Voltage	0.0 - 255.0 *1	0.1 V	15.0	15.0	11.0	-
E3-09	Motor 2 Minimum Output Frequency	0.0 - 590.0	0.1 Hz	1.5	1.5	0.5	0.0
E3-10	Motor 2 Minimum Output Voltage	0.0 - 255.0 *1	0.1 V	9.0	9.0	2.0	-
E3-11	Motor 2 Mid Point B Frequency	0.0 - 590.0	Determined by o1-04	0.0	0.0	0.0	0.0
E3-12	Motor 2 Mid Point B Voltage	0.0 - 255.0 *1	0.1 V	0.0	0.0	0.0	0.0
E3-13	Motor 2 Base Voltage	0.0 - 255.0 *1	0.1 V	0.0	0.0	0.0	0.0

*1 This is the value for 200 V class drives. Double the value for 400 V class drives.

3.20 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]* changes the default settings for the parameters in these tables:

Table 3.1 Parameters Changed by E1-03 (2004 to 2021 and 4002 to 4012)

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 (2)	CLV (3)	OLV/PM (5)	AOL-V/PM (6)	CLV/PM (7)
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	60.0	60.0	*2	*2	*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	230.0	230.0	*2	*2	*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	60.0	60.0	*2	*2	*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	3.0 *1	3.0	0.0	-	-	-
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	17.3 *1	13.8	0.0	-	-	-
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	0.5	0.0	*2	*2	0.0
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	2.9	0.0	-	-	-

*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 200 V class drives. Double the value for 400 V class drives.

Table 3.2 Parameters Changed by E1-03 (2030 to 2211 and 4018 to 4103)

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 (2)	CLV (3)	OLV/PM (5)	AOL-V/PM (6)	CLV/PM (7)
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	60.0	60.0	*2	*2	*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	230.0	230.0	*2	*2	*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	60.0	60.0	*2	*2	*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	3.0 *1	3.0	0.0	-	-	-
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	16.1 *1	12.7	0.0	-	-	-
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	0.5	0.0	*2	*2	0.0
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	2.3	0.0	-	-	-

*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 200 V class drives. Double the value for 400 V class drives.

Table 3.3 Parameters Changed by E1-03 (2257 to 2415 and 4140 to 4720)

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 (2)	CLV (3)	OLV/PM (5)	AOL-V/PM (6)	CLV/PM (7)
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	60.0	60.0	*2	*2	*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	230.0	230.0	*2	*2	*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	60.0	60.0	*2	*2	*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	3.0 *1	3.0	0.0	-	-	-
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	13.8 *1	12.7	0.0	-	-	-
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	0.5	0.0	*2	*2	0.0
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	2.3	0.0	-	-	-

*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 200 V class drives. Double the value for 400 V class drives.

3.21 Defaults by Drive Model and Duty Rating ND/HD

The values for the parameters in these tables depend on the values for parameters *o2-04* and *C6-01*. Changing the settings for *o2-04* and *C6-01* will change the default settings.

◆ 200 V class

No. *1	Name	Unit	Default							
-	Drive Model	-	2004		2006		2008		2010	
C6-01	Normal / Heavy Duty Selection	-	HD	ND	HD	ND	HD	ND	HD	ND
			0	1	0	1	0	1	0	1
o2-04	Drive Model (KVA) Selection	Hex.	62		63		64		65	
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	0.75 (0.55)	1 (0.75)	1 (0.75)	1.5 (1.1)	1.5 (1.1)	2 (1.5)	2 (1.5)	3 (2.2)
b3-04	V/f Gain during Speed Search	%	100	100	100	100	100	100	100	100
b3-06	Speed Estimation Current Level 1	-	1	1	0.5	0.5	0.5	0.5	0.5	0.5
b3-08	Speed Estimation ACR P Gain	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
b3-26	Direction Determination Level	-	1000	1000	1000	1000	1000	1000	1000	1000
b8-03	Energy Saving Filter Time	s	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
b8-04	Energy Saving Coefficient Value	-	288.2	223.7	223.7	196.6	196.6	169.4	169.4	156.8
C5-17 (C5-37)	Motor Inertia	kgm^2	0.0015	0.0028	0.0028	0.0068	0.0068	0.0068	0.0068	0.0088
C6-02	Carrier Frequency Selection	-	1	7	1	7	1	7	1	7
E2-01 (E4-01)	Motor Rated Current (FLA)	A	1.9	3.3	3.3	4.9	4.9	6.2	6.2	8.5
E2-02 (E4-02)	Motor Rated Slip	Hz	2.9	2.5	2.5	2.6	2.6	2.6	2.6	2.9
E2-03 (E4-03)	Motor No-Load Current	A	1.2	1.8	1.8	2.3	2.3	2.8	2.8	3
E2-05 (E4-05)	Motor Line-to-Line Resistance	Ω	9.842	5.156	5.156	3.577	3.577	1.997	1.997	1.601
E2-06 (E4-06)	Motor Leakage Inductance	%	18.2	13.8	13.8	18.5	18.5	18.5	18.5	18.4
E2-10 (E4-10)	Motor Iron Loss	W	14	26	26	38	38	53	53	77
E5-01	PM Motor Code Selection	-	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
L2-02	Power Loss Ride Through Time	s	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.3
L2-03	Minimum Baseblock Time	s	0.2	0.3	0.3	0.4	0.4	0.4	0.4	0.5

No. *1	Name	Unit	Default							
-	Drive Model	-	2004		2006		2008		2010	
C6-01	Normal / Heavy Duty Selection	-	HD	ND	HD	ND	HD	ND	HD	ND
			0	1	0	1	0	1	0	1
o2-04	Drive Model (KVA) Selection	Hex.	62		63		64		65	
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	0.75 (0.55)	1 (0.75)	1 (0.75)	1.5 (1.1)	1.5 (1.1)	2 (1.5)	2 (1.5)	3 (2.2)
L2-04	Powerloss V/f Recovery Ramp Time	s	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
L2-05	Undervoltage Detection Lvl (Uv1)	-	190	190	190	190	190	190	190	190
L3-24	Motor Accel Time for Inertia Cal	s	0.178	0.142	0.142	0.142	0.142	0.166	0.166	0.145
L8-02	Overheat Alarm Level	°C	115	115	115	115	115	115	115	115
L8-09	Output Ground Fault Detection	-	1	1	1	1	1	1	1	1
L8-38	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
n5-02	Motor Inertia Acceleration Time	s	0.178	0.142	0.142	0.142	0.142	0.166	0.166	0.145

*1 Parameters within parentheses are for motor 2.

No. *1	Name	Unit	Default							
-	Drive Model	-	2012		2018		2021		2030	
C6-01	Normal / Heavy Duty Selection	-	HD	ND	HD	ND	HD	ND	HD	ND
			0	1	0	1	0	1	0	1
o2-04	Drive Model (KVA) Selection	Hex.	66		67		68		6A	
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	3 (2.2)	4 (3.0)	4 (3.0)	5 (3.7)	5 (3.7)	7.5 (5.5)	7.5 (5.5)	10 (7.5)
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	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
b3-26	Direction Determination Level	-	1000	1000	1000	1000	1000	1000	1000	1000
b8-03	Energy Saving Filter Time	s	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
b8-04	Energy Saving Coefficient Value	-	156.8	136.4	136.4	122.9	122.9	94.75	94.75	72.69

No. *1	Name	Unit	Default							
-	Drive Model	-	2012		2018		2021		2030	
C6-01	Normal / Heavy Duty Selection	-	HD	ND	HD	ND	HD	ND	HD	ND
			0	1	0	1	0	1	0	1
o2-04	Drive Model (KVA) Selection	Hex.	66		67		68		6A	
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	3 (2.2)	4 (3.0)	4 (3.0)	5 (3.7)	5 (3.7)	7.5 (5.5)	7.5 (5.5)	10 (7.5)
C5-17 (C5-37)	Motor Inertia	kgm^2	0.0088	0.0158	0.0158	0.0158	0.0158	0.0255	0.026	0.037
C6-02	Carrier Frequency Selection	-	1	7	1	7	1	7	1	7
E2-01 (E4-01)	Motor Rated Current (FLA)	A	8.5	11.4	11.4	14	14	19.6	19.6	26.6
E2-02 (E4-02)	Motor Rated Slip	Hz	2.9	2.7	2.7	2.73	2.73	1.5	1.5	1.3
E2-03 (E4-03)	Motor No-Load Current	A	3	3.7	3.7	4.5	4.5	5.1	5.1	8
E2-05 (E4-05)	Motor Line-to-Line Resistance	Ω	1.601	1.034	1.034	0.771	0.771	0.399	0.399	0.288
E2-06 (E4-06)	Motor Leakage Inductance	%	18.4	19	19	19.6	19.6	18.2	18.2	15.5
E2-10 (E4-10)	Motor Iron Loss	W	77	91	91	112	112	172	172	262
E5-01	PM Motor Code Selection	-	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
L2-02	Power Loss Ride Through Time	s	0.5	0.5	1	1	1	1	1	1
L2-03	Minimum Baseblock Time	s	0.5	0.5	0.5	0.6	0.6	0.7	0.7	0.8
L2-04	Powerloss V/f Recovery Ramp Time	s	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
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	0.145	0.145	0.154	0.154	0.168	0.168	0.175
L8-02	Overheat Alarm Level	°C	124	124	110	110	110	110	110	110
L8-09	Output Ground Fault Detection	-	1	1	1	1	1	1	1	1
L8-38	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
n5-02	Motor Inertia Acceleration Time	s	0.145	0.145	0.145	0.154	0.154	0.168	0.168	0.175

*1 Parameters within parentheses are for motor 2.

No.	Name	Unit	Default							
-	Drive Model	-	2042		2056		2070		2082	
C6-01	Normal / Heavy Duty Selection	-	HD	ND	HD	ND	HD	ND	HD	ND
			0	1	0	1	0	1	0	1
o2-04	Drive Model (KVA) Selection	Hex.	6B		6D		6E		6F	
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	10 (7.5)	15 (11)	15 (11)	20 (15)	20 (15)	25 (18.5)	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	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
b3-26	Direction Determination Level	-	1000	1000	1000	1000	1000	1000	1000	1000
b8-03	Energy Saving Filter Time	s	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
b8-04	Energy Saving Coefficient Value	-	72.69	70.44	70.44	63.13	63.13	57.87	57.87	51.79
C5-17 (C5-37)	Motor Inertia	kgm^2	0.037	0.053	0.053	0.076	0.076	0.138	0.138	0.165
C6-02	Carrier Frequency Selection	-	1	7	1	7	1	7	1	7
E2-01 (E4-01)	Motor Rated Current (FLA)	A	26.6	39.7	39.7	53	53	65.8	65.8	77.2
E2-02 (E4-02)	Motor Rated Slip	Hz	1.3	1.7	1.7	1.6	1.6	1.67	1.67	1.7
E2-03 (E4-03)	Motor No-Load Current	A	8	11.2	11.2	15.2	15.2	15.7	15.7	18.5
E2-05 (E4-05)	Motor Line-to-Line Resistance	Ω	0.288	0.23	0.23	0.138	0.138	0.101	0.101	0.079
E2-06 (E4-06)	Motor Leakage Inductance	%	15.5	19.5	19.5	17.2	17.2	15.7	20.1	19.5
E2-10 (E4-10)	Motor Iron Loss	W	262	245	245	272	272	505	505	538
E5-01	PM Motor Code Selection	-	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
L2-02	Power Loss Ride Through Time	s	1	1	2	2	2	2	2	2
L2-03	Minimum Baseblock Time	s	0.8	0.9	0.9	1	1	1	1	1
L2-04	Powerloss V/f Recovery Ramp Time	s	0.3	0.3	0.3	0.6	0.6	0.6	0.6	0.6
L2-05	Undervoltage Detection Lvl (Uv1)	-	190	190	190	190	190	190	190	190
L3-24	Motor Accel Time for Inertia Cal	s	0.175	0.265	0.265	0.244	0.244	0.317	0.317	0.355
L8-02	Overheat Alarm Level	°C	110	110	115	115	120	120	133	130

No.	Name	Unit	Default							
-	Drive Model	-	2042		2056		2070		2082	
C6-01	Normal / Heavy Duty Selection	-	HD	ND	HD	ND	HD	ND	HD	ND
			0	1	0	1	0	1	0	1
o2-04	Drive Model (KVA) Selection	Hex.	6B		6D		6E		6F	
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	10 (7.5)	15 (11)	15 (11)	20 (15)	20 (15)	25 (18.5)	25 (18.5)	30 (22)
L8-09	Output Ground Fault Detection	-	1	1	1	1	1	1	1	1
L8-38	Carrier Frequency Reduction	-	2	2	2	2	2	2	2	2
n1-01	Hunting Prevention Selection	-	1	1	2	2	2	2	2	2
n1-03	Hunting Prevention Time Constant	ms	10	10	10	10	10	10	10	10
n5-02	Motor Inertia Acceleration Time	s	0.175	0.265	0.265	0.244	0.244	0.317	0.317	0.355

*1 Parameters within parentheses are for motor 2.

No. *1	Name	Unit	Default							
-	Drive Model	-	2110		2138		2169		2211	
C6-01	Normal / Heavy Duty Selection	-	HD	ND	HD	ND	HD	ND	HD	ND
			0	1	0	1	0	1	0	1
o2-04	Drive Model (KVA) Selection	Hex.	70		72		73		74	
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	30 (22)	40 (30)	40 (30)	50 (37)	50 (37)	60 (45)	60 (45)	75 (55)
b3-04	V/f Gain during Speed Search	%	100	80	80	80	80	80	80	80
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	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
b3-26	Direction Determination Level	-	1000	1000	1000	1000	1000	1000	1000	1000
b8-03	Energy Saving Filter Time	s	0.50	0.50	0.50	0.50	0.50	0.50	0.50	2.00
b8-04	Energy Saving Coefficient Value	-	51.79	46.27	46.27	38.16	38.16	35.78	35.78	31.35
C5-17 (C5-37)	Motor Inertia	kgm^2	0.165	0.220	0.220	0.273	0.273	0.333	0.333	0.490
C6-02	Carrier Frequency Selection	-	1	7	1	7	1	7	1	7
E2-01 (E4-01)	Motor Rated Current (FLA)	A	77.2	105	105	131	131	160	160	190
E2-02 (E4-02)	Motor Rated Slip	Hz	1.7	1.8	1.8	1.33	1.33	1.6	1.6	1.43

No. *1	Name	Unit	Default							
-	Drive Model	-	2110		2138		2169		2211	
C6-01	Normal / Heavy Duty Selection	-	HD	ND	HD	ND	HD	ND	HD	ND
			0	1	0	1	0	1	0	1
o2-04	Drive Model (KVA) Selection	Hex.	70		72		73		74	
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	30 (22)	40 (30)	40 (30)	50 (37)	50 (37)	60 (45)	60 (45)	75 (55)
E2-03 (E4-03)	Motor No-Load Current	A	18.5	21.9	21.9	38.2	38.2	44	44	45.6
E2-05 (E4-05)	Motor Line-to-Line Resistance	Ω	0.079	0.064	0.064	0.039	0.039	0.03	0.03	0.022
E2-06 (E4-06)	Motor Leakage Inductance	%	19.5	20.8	20.8	18.8	18.8	20.2	20.2	20.5
E2-10 (E4-10)	Motor Iron Loss	W	538	699	699	823	823	852	852	960
E5-01	PM Motor Code Selection	-	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
L2-02	Power Loss Ride Through Time	s	2	2	2	2	2	2	2	2
L2-03	Minimum Baseblock Time	s	1	1.1	1.1	1.1	1.1	1.2	1.2	1.3
L2-04	Powerloss V/f Recovery Ramp Time	s	0.6	0.6	0.6	0.6	0.6	1	1	1
L2-05	Undervoltage Detection Lvl (Uv1)	-	190	190	190	190	190	190	190	190
L3-24	Motor Accel Time for Inertia Cal	s	0.355	0.323	0.323	0.32	0.32	0.387	0.387	0.317
L8-02	Overheat Alarm Level	°C	105	105	115	115	105	105	105	105
L8-09	Output Ground Fault Detection	-	1	1	1	1	1	1	1	1
L8-38	Carrier Frequency Reduction	-	2	2	2	2	2	2	2	2
n1-01	Hunting Prevention Selection	-	2	2	2	2	2	2	2	2
n1-03	Hunting Prevention Time Constant	ms	10	10	10	10	10	10	10	10
n5-02	Motor Inertia Acceleration Time	s	0.355	0.323	0.323	0.32	0.32	0.387	0.387	0.317

*1 Parameters within parentheses are for motor 2.

No.	Name	Unit	Default							
-	Drive Model	-	2257		2313		2360		2415	
C6-01	Normal / Heavy Duty Selection	-	HD	ND	HD	ND	HD	ND	HD	ND
			0	1	0	1	0	1	0	1
o2-04	Drive Model (KVA) Selection	Hex.	75		76		77		78	
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	75 (55)	100 (75)	100 (75)	125 (90)	125 (90)	150 (110)	150 (110)	150 (110)
b3-04	V/f Gain during Speed Search	%	80	80	80	80	80	80	80	80
b3-06	Speed Estimation Current Level 1	-	0.5	0.7	0.7	0.7	0.7	0.7	0.7	0.7
b3-08	Speed Estimation ACR P Gain	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
b3-26	Direction Determination Level	-	1000	1000	1000	1000	1000	1000	1000	1000
b8-03	Energy Saving Filter Time	s	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
b8-04	Energy Saving Coefficient Value	-	31.35	23.1	23.1	20.65	20.65	18.12	18.12	18.12
C5-17 (C5-37)	Motor Inertia	kgm^2	0.49	0.90	0.90	1.10	1.10	1.90	1.90	1.90
C6-02	Carrier Frequency Selection	-	1	7	1	7	1	7	1	7
E2-01 (E4-01)	Motor Rated Current (FLA)	A	190	260	260	260	260	260	260	260
E2-02 (E4-02)	Motor Rated Slip	Hz	1.43	1.39	1.39	1.39	1.39	1.39	1.39	1.39
E2-03 (E4-03)	Motor No-Load Current	A	45.6	72	72	72	72	72	72	72
E2-05 (E4-05)	Motor Line-to-Line Resistance	Ω	0.022	0.023	0.023	0.023	0.023	0.023	0.023	0.023
E2-06 (E4-06)	Motor Leakage Inductance	%	20.5	20	20	20	20	20	20	20
E2-10 (E4-10)	Motor Iron Loss	W	960	1200	1200	1200	1200	1200	1200	1200
E5-01	PM Motor Code Selection	-	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
L2-02	Power Loss Ride Through Time	s	2	2	2	2	2	2	2	2
L2-03	Minimum Baseblock Time	s	1.3	1.5	1.5	1.5	1.5	1.7	1.7	1.7
L2-04	Powerloss V/f Recovery Ramp Time	s	1	1	1	1	1	1	1	1
L2-05	Undervoltage Detection Lvl (Uv1)	-	190	190	190	190	190	190	190	190
L3-24	Motor Accel Time for Inertia Cal	s	0.317	0.533	0.533	0.592	0.592	0.646	0.646	0.646
L8-02	Overheat Alarm Level	°C	105	105	105	105	105	105	105	105

No.	Name	Unit	Default							
-	Drive Model	-	2257		2313		2360		2415	
C6-01	Normal / Heavy Duty Selection	-	HD	ND	HD	ND	HD	ND	HD	ND
			0	1	0	1	0	1	0	1
o2-04	Drive Model (KVA) Selection	Hex.	75		76		77		78	
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	75 (55)	100 (75)	100 (75)	125 (90)	125 (90)	150 (110)	150 (110)	150 (110)
L8-09	Output Ground Fault Detection	-	1	1	1	1	1	1	1	1
L8-38	Carrier Frequency Reduction	-	2	2	2	2	2	2	2	2
n1-01	Hunting Prevention Selection	-	2	2	2	2	2	2	2	2
n1-03	Hunting Prevention Time Constant	ms	10	10	10	10	100	100	100	100
n5-02	Motor Inertia Acceleration Time	s	0.317	0.533	0.533	0.592	0.592	0.646	0.646	0.646

*1 Parameters within parentheses are for motor 2.

◆ 400 V Class

No. *1	Name	Unit	Default							
-	Drive Model	-	4002		4004		4005		4007	
C6-01	Normal / Heavy Duty Selection	-	HD	ND	HD	ND	HD	ND	HD	ND
			0	1	0	1	0	1	0	1
o2-04	Drive Model (KVA) Selection	Hex.	92		93		94		95	
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	0.75 (0.4)	1 (0.75)	1 (1.1)	2 (1.5)	2 (1.5)	3 (2.2)	3 (2.2)	4 (3.0)
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	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
b3-26	Direction Determination Level	-	1000	1000	1000	1000	1000	1000	1000	1000
b8-03	Energy Saving Filter Time	s	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
b8-04	Energy Saving Coefficient Value	-	576.4	447.4	447.4	338.8	338.8	313.6	313.6	265.7
C5-17 (C5-37)	Motor Inertia	kgm^2	0.0015	0.0028	0.0028	0.0068	0.0068	0.0088	0.0088	0.0158
C6-02	Carrier Frequency Selection	-	1	7	1	7	1	7	1	7
E2-01 (E4-01)	Motor Rated Current (FLA)	A	1	1.6	1.6	3.1	3.1	4.2	4.2	5.7

No. *1	Name	Unit	Default							
-	Drive Model	-	4002		4004		4005		4007	
C6-01	Normal / Heavy Duty Selection	-	HD	ND	HD	ND	HD	ND	HD	ND
			0	1	0	1	0	1	0	1
o2-04	Drive Model (KVA) Selection	Hex.	92		93		94		95	
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	0.75 (0.4)	1 (0.75)	1 (1.1)	2 (1.5)	2 (1.5)	3 (2.2)	3 (2.2)	4 (3.0)
E2-02 (E4-02)	Motor Rated Slip	Hz	2.9	2.6	2.6	2.5	2.5	3	3	2.7
E2-03 (E4-03)	Motor No-Load Current	A	0.6	0.8	0.8	1.4	1.4	1.5	1.5	1.9
E2-05 (E4-05)	Motor Line-to-Line Resistance	Ω	38.198	22.459	22.459	10.1	10.1	6.495	6.495	4.360
E2-06 (E4-06)	Motor Leakage Inductance	%	18.2	14.3	14.3	18.3	18.3	18.7	18.7	19
E2-10 (E4-10)	Motor Iron Loss	W	14	26	26	53	53	77	77	105
E5-01	PM Motor Code Selection	-	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
L2-02	Power Loss Ride Through Time	s	0.1	0.1	0.2	0.2	0.3	0.3	0.5	0.5
L2-03	Minimum Baseblock Time	s	0.2	0.3	0.3	0.4	0.4	0.5	0.5	0.5
L2-04	Powerloss V/f Recovery Ramp Time	s	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
L2-05	Undervoltage Detection Lvl (Uv1)	-	380	380	380	380	380	380	380	380
L3-24	Motor Accel Time for Inertia Cal	s	0.178	0.142	0.142	0.166	0.166	0.145	0.145	0.145
L8-02	Overheat Alarm Level	°C	100	100	105	105	112	112	100	100
L8-09	Output Ground Fault Detection	-	1	1	1	1	1	1	1	1
L8-38	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
n5-02	Motor Inertia Acceleration Time	s	0.178	0.142	0.142	0.166	0.166	0.145	0.145	0.145

*1 Parameters within parentheses are for motor 2.

No. *1	Name	Unit	Default							
-	Drive Model	-	4009		4012		4018		4023	
C6-01	Normal / Heavy Duty Selection	-	HD	ND	HD	ND	HD	ND	HD	ND
			0	1	0	1	0	1	0	1
o2-04	Drive Model (KVA) Selection	Hex.	96		97		99		9A	
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	4 (3.0)	5 (4.0)	5 (4.0)	7.5 (5.5)	7.5 (5.5)	10 (7.5)	10 (7.5)	15 (11)
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	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
b3-26	Direction Determination Level	-	1000	1000	1000	1000	1000	1000	1000	1000
b8-03	Energy Saving Filter Time	s	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
b8-04	Energy Saving Coefficient Value	-	265.7	245.8	245.8	189.5	189.5	145.38	145.38	140.88
C5-17 (C5-37)	Motor Inertia	kgm^2	0.0158	0.0158	0.0158	0.0255	0.026	0.037	0.037	0.053
C6-02	Carrier Frequency Selection	-	1	7	1	7	1	7	1	7
E2-01 (E4-01)	Motor Rated Current (FLA)	A	5.7	7	7	9.8	9.8	13.3	13.3	19.9
E2-02 (E4-02)	Motor Rated Slip	Hz	2.7	2.7	2.7	1.5	1.5	1.3	1.3	1.7
E2-03 (E4-03)	Motor No-Load Current	A	1.9	2.3	2.3	2.6	2.6	4	4	5.6
E2-05 (E4-05)	Motor Line-to-Line Resistance	Ω	4.360	3.333	3.333	1.595	1.595	1.152	1.152	0.922
E2-06 (E4-06)	Motor Leakage Inductance	%	19	19.3	19.3	18.2	18.2	15.5	15.5	19.6
E2-10 (E4-10)	Motor Iron Loss	W	105	130	130	193	193	263	263	385
E5-01	PM Motor Code Selection	-	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
L2-02	Power Loss Ride Through Time	s	0.5	0.5	0.5	0.5	0.8	0.8	1	1
L2-03	Minimum Baseblock Time	s	0.5	0.6	0.6	0.7	0.7	0.8	0.8	0.9
L2-04	Powerloss V/f Recovery Ramp Time	s	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
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	0.154	0.168	0.168	0.175	0.175	0.265
L8-02	Overheat Alarm Level	°C	100	100	100	100	105	105	105	105

No. *1	Name	Unit	Default							
-	Drive Model	-	4009		4012		4018		4023	
C6-01	Normal / Heavy Duty Selection	-	HD	ND	HD	ND	HD	ND	HD	ND
			0	1	0	1	0	1	0	1
o2-04	Drive Model (KVA) Selection	Hex.	96		97		99		9A	
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	4 (3.0)	5 (4.0)	5 (4.0)	7.5 (5.5)	7.5 (5.5)	10 (7.5)	10 (7.5)	15 (11)
L8-09	Output Ground Fault Detection	-	1	1	1	1	1	1	1	1
L8-38	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
n5-02	Motor Inertia Acceleration Time	s	0.145	0.154	0.154	0.168	0.168	0.175	0.175	0.265

*1 Parameters within parentheses are for motor 2.

No.	Name	Unit	Default							
-	Drive Model	-	4031		4038		4044		4060	
C6-01	Normal / Heavy Duty Selection	-	HD	ND	HD	ND	HD	ND	HD	ND
			0	1	0	1	0	1	0	1
o2-04	Drive Model (KVA) Selection	Hex.	9C		9D		9E		9F	
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	15 (11)	20 (15)	20 (15)	25 (18.5)	25 (18.5)	30 (22)	30 (22)	40 (30)
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	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
b3-26	Direction Determination Level	-	1000	1000	1000	1000	1000	1000	1000	1000
b8-03	Energy Saving Filter Time	s	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
b8-04	Energy Saving Coefficient Value	-	140.88	126.26	126.26	115.74	115.74	103.58	103.58	92.54
C5-17 (C5-37)	Motor Inertia	kgm^2	0.053	0.076	0.076	0.138	0.138	0.165	0.165	0.220
C6-02	Carrier Frequency Selection	-	1	7	1	7	1	7	1	7
E2-01 (E4-01)	Motor Rated Current (FLA)	A	19.9	26.5	26.5	32.9	32.9	38.6	38.6	52.3
E2-02 (E4-02)	Motor Rated Slip	Hz	1.7	1.6	1.6	1.67	1.67	1.7	1.7	1.8

No.	Name	Unit	Default							
-	Drive Model	-	4031		4038		4044		4060	
C6-01	Normal / Heavy Duty Selection	-	HD	ND	HD	ND	HD	ND	HD	ND
			0	1	0	1	0	1	0	1
o2-04	Drive Model (KVA) Selection	Hex.	9C		9D		9E		9F	
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	15 (11)	20 (15)	20 (15)	25 (18.5)	25 (18.5)	30 (22)	30 (22)	40 (30)
E2-03 (E4-03)	Motor No-Load Current	A	5.6	7.6	7.6	7.8	7.8	9.2	9.2	10.9
E2-05 (E4-05)	Motor Line-to-Line Resistance	Ω	0.922	0.55	0.55	0.403	0.403	0.316	0.316	0.269
E2-06 (E4-06)	Motor Leakage Inductance	%	19.6	17.2	17.2	20.1	20.1	23.5	23.5	20.7
E2-10 (E4-10)	Motor Iron Loss	W	385	440	440	508	508	586	586	750
E5-01	PM Motor Code Selection	-	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
L2-02	Power Loss Ride Through Time	s	2	2	2	2	2	2	2	2
L2-03	Minimum Baseblock Time	s	0.9	1	1	1	1	1	1	1.1
L2-04	Powerloss V/f Recovery Ramp Time	s	0.3	0.6	0.6	0.6	0.6	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	0.265	0.244	0.244	0.317	0.317	0.355	0.355	0.323
L8-02	Overheat Alarm Level	°C	115	115	120	120	120	120	130	137
L8-09	Output Ground Fault Detection	-	1	1	1	1	1	1	1	1
L8-38	Carrier Frequency Reduction	-	2	2	2	2	2	2	2	2
n1-01	Hunting Prevention Selection	-	2	2	2	2	2	2	2	2
n1-03	Hunting Prevention Time Constant	ms	10	10	10	10	10	10	10	10
n5-02	Motor Inertia Acceleration Time	s	0.265	0.244	0.244	0.317	0.317	0.355	0.355	0.323

*1 Parameters within parentheses are for motor 2.

No.	Name	Unit	Default							
-	Drive Model	-	4075		4089		4103		4140	
C6-01	Normal / Heavy Duty Selection	-	HD	ND	HD	ND	HD	ND	HD	ND
			0	1	0	1	0	1	0	1
o2-04	Drive Model (KVA) Selection	Hex.	A1		A2		A3		A4	
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	40 (30)	50 (37)	50 (37)	60 (45)	60 (45)	75 (55)	75 (55)	100 (75)
b3-04	V/f Gain during Speed Search	%	100	100	100	100	100	80	80	60
b3-06	Speed Estimation Current Level 1	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.7
b3-08	Speed Estimation ACR P Gain	-	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.8
b3-26	Direction Determination Level	-	1000	1000	1000	1000	1000	1000	1000	1000
b8-03	Energy Saving Filter Time	s	0.50	0.50	0.50	0.50	0.50	2.00	2.00	2.00
b8-04	Energy Saving Coefficient Value	-	92.54	76.32	76.32	71.56	71.56	67.2	67.2	46.2
C5-17 (C5-37)	Motor Inertia	kgm^2	0.220	0.273	0.273	0.333	0.333	0.490	0.49	0.90
C6-02	Carrier Frequency Selection	-	1	7	1	7	1	7	1	7
E2-01 (E4-01)	Motor Rated Current (FLA)	A	52.3	65.6	65.6	79.7	79.7	95	95	130
E2-02 (E4-02)	Motor Rated Slip	Hz	1.8	1.33	1.33	1.6	1.6	1.46	1.46	1.39
E2-03 (E4-03)	Motor No-Load Current	A	10.9	19.1	19.1	22	22	24	24	36
E2-05 (E4-05)	Motor Line-to-Line Resistance	Ω	0.269	0.155	0.155	0.122	0.122	0.088	0.088	0.092
E2-06 (E4-06)	Motor Leakage Inductance	%	20.7	18.8	18.8	19.9	19.9	20	20	20
E2-10 (E4-10)	Motor Iron Loss	W	750	925	925	1125	1125	1260	1260	1600
E5-01	PM Motor Code Selection	-	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
L2-02	Power Loss Ride Through Time	s	2	2	2	2	2	2	2	2
L2-03	Minimum Baseblock Time	s	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.3
L2-04	Powerloss V/f Recovery Ramp Time	s	0.6	0.6	0.6	0.6	0.6	1	1	1
L2-05	Undervoltage Detection Lvl (Uv1)	-	380	380	380	380	380	380	380	380
L3-24	Motor Accel Time for Inertia Cal	s	0.323	0.32	0.32	0.387	0.387	0.317	0.317	0.533
L8-02	Overheat Alarm Level	°C	120	120	115	115	126	120	120	120

No.	Name	Unit	Default							
-	Drive Model	-	4075		4089		4103		4140	
C6-01	Normal / Heavy Duty Selection	-	HD	ND	HD	ND	HD	ND	HD	ND
			0	1	0	1	0	1	0	1
o2-04	Drive Model (KVA) Selection	Hex.	A1		A2		A3		A4	
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	40 (30)	50 (37)	50 (37)	60 (45)	60 (45)	75 (55)	75 (55)	100 (75)
L8-09	Output Ground Fault Detection	-	1	1	1	1	1	1	1	1
L8-38	Carrier Frequency Reduction	-	2	2	2	2	2	2	2	2
n1-01	Hunting Prevention Selection	-	2	2	2	2	2	2	2	2
n1-03	Hunting Prevention Time Constant	ms	10	10	10	10	10	10	30	30
n5-02	Motor Inertia Acceleration Time	s	0.323	0.32	0.32	0.387	0.387	0.317	0.317	0.533

*1 Parameters within parentheses are for motor 2.

No.	Name	Unit	Default							
-	Drive Model	-	4168		4208		4250		4302	
C6-01	Normal / Heavy Duty Selection	-	HD	ND	HD	ND	HD	ND	HD	ND
			0	1	0	1	0	1	0	1
o2-04	Drive Model (KVA) Selection	Hex.	A5		A6		A7		A8	
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	100 (75)	125 (90)	125 (90)	150 (110)	150 (110)	200 (150)	200 (150)	250 (185)
b3-04	V/f Gain during Speed Search	%	60	60	60	60	60	60	60	60
b3-06	Speed Estimation Current Level 1	-	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
b3-08	Speed Estimation ACR P Gain	-	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
b3-26	Direction Determination Level	-	1000	1000	1000	1000	1000	1000	1000	1000
b8-03	Energy Saving Filter Time	s	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
b8-04	Energy Saving Coefficient Value	-	46.2	38.91	38.91	36.23	36.23	32.79	32.79	30.13
C5-17 (C5-37)	Motor Inertia	kgm^2	0.90	1.10	1.10	1.90	1.90	2.10	2.10	3.30
C6-02	Carrier Frequency Selection	-	1	7	1	7	1	7	1	7
E2-01 (E4-01)	Motor Rated Current (FLA)	A	130	156	156	190	190	223	223	270
E2-02 (E4-02)	Motor Rated Slip	Hz	1.39	1.4	1.4	1.4	1.4	1.38	1.38	1.35

No.	Name	Unit	Default							
-	Drive Model	-	4168		4208		4250		4302	
C6-01	Normal / Heavy Duty Selection	-	HD	ND	HD	ND	HD	ND	HD	ND
			0	1	0	1	0	1	0	1
o2-04	Drive Model (KVA) Selection	Hex.	A5		A6		A7		A8	
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	100 (75)	125 (90)	125 (90)	150 (110)	150 (110)	200 (150)	200 (150)	250 (185)
E2-03 (E4-03)	Motor No-Load Current	A	36	40	40	49	49	58	58	70
E2-05 (E4-05)	Motor Line-to-Line Resistance	Ω	0.092	0.056	0.056	0.046	0.046	0.035	0.035	0.029
E2-06 (E4-06)	Motor Leakage Inductance	%	20	20	20	20	20	20	20	20
E2-10 (E4-10)	Motor Iron Loss	W	1600	1760	1760	2150	2150	2350	2350	2850
E5-01	PM Motor Code Selection	-	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
L2-02	Power Loss Ride Through Time	s	2	2	2	2	2	2	2	2
L2-03	Minimum Baseblock Time	s	1.3	1.5	1.5	1.7	1.7	1.7	1.7	1.8
L2-04	Powerloss V/f Recovery Ramp Time	s	1	1	1	1	1	1	1	1
L2-05	Undervoltage Detection Lvl (Uv1)	-	380	380	380	380	380	380	380	380
L3-24	Motor Accel Time for Inertia Cal	s	0.533	0.592	0.592	0.646	0.646	0.673	0.673	0.777
L8-02	Overheat Alarm Level	°C	110	110	105	105	120	120	120	120
L8-09	Output Ground Fault Detection	-	1	1	1	1	1	1	1	1
L8-38	Carrier Frequency Reduction	-	2	2	2	2	2	2	2	2
n1-01	Hunting Prevention Selection	-	2	2	2	2	2	2	2	2
n1-03	Hunting Prevention Time Constant	ms	30	30	30	30	30	30	30	30
n5-02	Motor Inertia Acceleration Time	s	0.533	0.592	0.592	0.646	0.646	0.673	0.673	0.777

*1 Parameters within parentheses are for motor 2.

No.	Name	Unit	Default							
-	Drive Model	-	4371		4414		4477		4568	
C6-01	Normal / Heavy Duty Selection	-	HD	ND	HD	ND	HD	ND	HD	ND
			0	1	0	1	0	1	0	1
o2-04	Drive Model (KVA) Selection	Hex.	A9		AA		AC		AD	
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	250 (185)	300 (220)	300 (220)	350 (260)	350 (260)	400 (300)	400 (300)	450 (335)
b3-04	V/f Gain during Speed Search	%	60	60	60	60	60	60	60	60
b3-06	Speed Estimation Current Level 1	-	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
b3-08	Speed Estimation ACR P Gain	-	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
b3-26	Direction Determination Level	-	1000	1000	1000	1000	1000	1000	1000	1000
b8-03	Energy Saving Filter Time	s	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
b8-04	Energy Saving Coefficient Value	-	30.13	30.57	30.57	27.13	27.13	21.76	21.76	21.76
C5-17 (C5-37)	Motor Inertia	kgm^2	3.30	3.60	3.60	4.10	4.10	6.50	6.50	11.00
C6-02	Carrier Frequency Selection	-	1	7	1	7	1	7	1	7
E2-01 (E4-01)	Motor Rated Current (FLA)	A	270	310	310	370	370	500	500	500
E2-02 (E4-02)	Motor Rated Slip	Hz	1.35	1.3	1.3	1.3	1.3	1.25	1.25	1.25
E2-03 (E4-03)	Motor No-Load Current	A	70	81	81	96	96	130	130	130
E2-05 (E4-05)	Motor Line-to-Line Resistance	Ω	0.029	0.025	0.025	0.02	0.02	0.014	0.014	0.014
E2-06 (E4-06)	Motor Leakage Inductance	%	20	20	20	20	20	20	20	20
E2-10 (E4-10)	Motor Iron Loss	W	2850	3200	3200	3700	3700	4700	4700	4700
E5-01	PM Motor Code Selection	-	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF	FFFF
L2-02	Power Loss Ride Through Time	s	2	2	2	2	2	2	2	2
L2-03	Minimum Baseblock Time	s	1.8	1.9	1.9	2	2	2.1	2.1	2.1
L2-04	Powerloss V/f Recovery Ramp Time	s	1	1	1.8	1.8	1.8	2	2	2
L2-05	Undervoltage Detection Lvl (Uv1)	-	380	380	380	380	380	380	380	380
L3-24	Motor Accel Time for Inertia Cal	s	0.777	0.864	0.864	0.91	0.91	1.392	1.392	1.392
L8-02	Overheat Alarm Level	°C	125	125	125	125	110	110	125	115

No.	Name	Unit	Default							
-	Drive Model	-	4371		4414		4477		4568	
C6-01	Normal / Heavy Duty Selection	-	HD	ND	HD	ND	HD	ND	HD	ND
			0	1	0	1	0	1	0	1
o2-04	Drive Model (KVA) Selection	Hex.	A9		AA		AC		AD	
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	250 (185)	300 (220)	300 (220)	350 (260)	350 (260)	400 (300)	400 (300)	450 (335)
L8-09	Output Ground Fault Detection	-	1	1	1	1	1	1	1	1
L8-38	Carrier Frequency Reduction	-	2	2	2	2	2	2	2	2
n1-01	Hunting Prevention Selection	-	2	2	2	2	2	2	2	2
n1-03	Hunting Prevention Time Constant	ms	30	30	100	100	100	100	100	100
n5-02	Motor Inertia Acceleration Time	s	0.777	0.864	0.864	0.91	0.91	1.392	1.392	1.392

*1 Parameters within parentheses are for motor 2.

No.	Name	Unit	Default			
-	Drive Model	-	4605		4720	
C6-01	Normal / Heavy Duty Selection	-	HD	ND	HD	ND
			0	1	0	1
o2-04	Drive Model (KVA) Selection	Hex.	AE		AF	
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	450 (335)	500 (370)	500 (370)	600 (450)
b3-04	V/f Gain during Speed Search	%	60	60	60	60
b3-06	Speed Estimation Current Level 1	-	0.7	0.7	0.7	0.7
b3-08	Speed Estimation ACR P Gain	-	0.8	0.8	0.8	0.8
b3-26	Direction Determination Level	-	1000	1000	1000	1000
b8-03	Energy Saving Filter Time	s	2.00	2.00	2.00	2.00
b8-04	Energy Saving Coefficient Value	-	21.76	23.84	21.76	23.84
C5-17 (C5-37)	Motor Inertia	kgm^2	11.00	12.00	11.00	12.00
C6-02	Carrier Frequency Selection	-	1	7	1	7
E2-01 (E4-01)	Motor Rated Current (FLA)	A	500	650	500	650
E2-02 (E4-02)	Motor Rated Slip	Hz	1.25	1	1.25	1
E2-03 (E4-03)	Motor No-Load Current	A	130	130	130	130
E2-05 (E4-05)	Motor Line-to-Line Resistance	Ω	0.014	0.012	0.014	0.012

No.	Name	Unit	Default			
-	Drive Model	-	4605		4720	
C6-01	Normal / Heavy Duty Selection	-	HD	ND	HD	ND
			0	1	0	1
o2-04	Drive Model (KVA) Selection	Hex.	AE		AF	
E2-11 (E4-11, E5-02)	Motor Rated Power	HP (kW)	450 (335)	500 (370)	500 (370)	600 (450)
E2-06 (E4-06)	Motor Leakage Inductance	%	20	20	20	20
E2-10 (E4-10)	Motor Iron Loss	W	4700	5560	4700	5560
E5-01	PM Motor Code Selection	-	FFFF	FFFF	FFFF	FFFF
L2-02	Power Loss Ride Through Time	s	2	2	2	2
L2-03	Minimum Baseblock Time	s	2.1	2.3	2.1	2.3
L2-04	Powerloss V/f Recovery Ramp Time	s	2	2.2	2	2.2
L2-05	Undervoltage Detection Lvl (Uv1)	-	380	380	380	380
L3-24	Motor Accel Time for Inertia Cal	s	1.392	1.667	1.392	1.667
L8-02	Overheat Alarm Level	°C	133	133	125	125
L8-09	Output Ground Fault Detection	-	1	1	1	1
L8-38	Carrier Frequency Reduction	-	2	2	2	2
n1-01	Hunting Prevention Selection	-	2	2	2	2
n1-03	Hunting Prevention Time Constant	ms	100	100	100	100
n5-02	Motor Inertia Acceleration Time	s	1.392	1.667	1.392	1.667

*1 Parameters within parentheses are for motor 2.

3.22 Parameters Changed by PM Motor Code Selection

Note:
The motor codes listed in these tables are the only correct setting values.

◆ Yaskawa SMRA Series SPM Motors

Table 3.4 SMRA series motor code setting for specification of 200 V at 1800 min^{-1} (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)				
E5-01	PM Motor Code Selection	-	0002	0003	0005	0006	0008
	Voltage Class	V	200	200	200	200	200
	Capacity	kW	0.4	0.75	1.5	2.2	3.7
	Motor Rotation Speed	min^{-1}	1800	1800	1800	1800	1800
E5-02	PM Motor Rated Power	kW	0.4	0.75	1.5	2.2	3.7
E5-03	PM Motor Rated Current (FLA)	A	2.1	4.0	6.9	10.8	17.4
E5-04	PM Motor Pole Count	-	8	8	8	8	8
E5-05	PM Motor Resistance (ohms/phase)	Ω	2.47	1.02	0.679	0.291	0.169
E5-06	PM d-axis Inductance (mH/phase)	mH	12.7	4.8	3.9	3.6	2.5
E5-07	PM q-axis Inductance (mH/phase)	mH	12.7	4.8	3.9	3.6	2.5
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	0	0	0	0	0
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min^{-1}	62.0	64.1	73.4	69.6	72.2
E1-04	Maximum Output Frequency	Hz	120	120	120	120	120
E1-05	Maximum Output Voltage	V	200.0	200.0	200.0	200.0	200.0
E1-06	Base Frequency	Hz	120	120	120	120	120
E1-09	Minimum Output Frequency	Hz	6	6	6	6	6
C5-17	Motor Inertia	kgm^2	0.0007	0.0014	0.0021	0.0032	0.0046
L3-24	Motor Accel Time @ Rated Torque	s	0.064	0.066	0.049	0.051	0.044
n5-02	Motor Inertia Acceleration Time	s	0.064	0.066	0.049	0.051	0.044
n8-49	Heavy Load Id Current	%	0	0	0	0	0

Table 3.5 SMRA Series Motor Code Setting for Specification of 200 V at 3600 min^{-1} (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)			
E5-01	PM Motor Code Selection	-	0103	0105	0106	0108
	Voltage Class	V	200	200	200	200
	Capacity	kW	0.75	1.5	2.2	3.7
	Motor Rotation Speed	min^{-1}	3600	3600	3600	3600
E5-02	PM Motor Rated Power	kW	0.75	1.5	2.2	3.7
E5-03	PM Motor Rated Current (FLA)	A	4.1	8.0	10.5	16.5
E5-04	PM Motor Pole Count	-	8	8	8	8
E5-05	PM Motor Resistance (ohms/phase)	Ω	0.538	0.20	0.15	0.097
E5-06	PM d-axis Inductance (mH/phase)	mH	3.2	1.3	1.1	1.1
E5-07	PM q-axis Inductance (mH/phase)	mH	3.2	1.3	1.1	1.1

No.	Name	Unit	Motor Code (setting value of E5-01)			
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	0	0	0	0
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min^{-1}	32.4	32.7	36.7	39.7
E1-04	Maximum Output Frequency	Hz	240	240	240	240
E1-05	Maximum Output Voltage	V	200.0	200.0	200.0	200.0
E1-06	Base Frequency	Hz	240	240	240	240
E1-09	Minimum Output Frequency	Hz	12	12	12	12
C5-17	Motor Inertia	kgm^2	0.0007	0.0014	0.0021	0.0032
L3-24	Motor Accel Time @ Rated Torque	s	0.137	0.132	0.132	0.122
n5-02	Motor Inertia Acceleration Time	s	0.137	0.132	0.132	0.122
n8-49	Heavy Load Id Current	%	0	0	0	0

◆ Yaskawa SSR1 Series IPM Motors (Derated Torque)

Table 3.6 SSR1 Series Motor Code Setting for Specification of 200 V at 1750 min^{-1} (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)							
E5-01	PM Motor Code Selection	-	1202	1203	1205	1206	1208	120A	120B	120D
	Voltage Class	V	200	200	200	200	200	200	200	200
	Capacity	kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11
	Motor Rotation Speed	min^{-1}	1750	1750	1750	1750	1750	1750	1750	1750
E5-02	PM Motor Rated Power	kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11.0
E5-03	PM Motor Rated Current (FLA)	A	1.77	3.13	5.73	8.44	13.96	20.63	28.13	41.4
E5-04	PM Motor Pole Count	-	6	6	6	6	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	8.233	2.284	1.470	0.827	0.455	0.246	0.198	0.094
E5-06	PM d-axis Inductance (mH/phase)	mH	54.84	23.02	17.22	8.61	7.20	4.86	4.15	3.40
E5-07	PM q-axis Inductance (mH/phase)	mH	64.10	29.89	20.41	13.50	10.02	7.43	5.91	3.91
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	223.7	220.3	240.8	238.0	238.7	239.6	258.2	239.3
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min^{-1}	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E1-04	Maximum Output Frequency	Hz	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5
E1-05	Maximum Output Voltage	V	190.0	190.0	190.0	190.0	190.0	190.0	190.0	190.0
E1-06	Base Frequency	Hz	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5
E1-09	Minimum Output Frequency	Hz	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
C5-17	Motor Inertia	kgm^2	0.0011	0.0017	0.0023	0.0043	0.0083	0.014	0.017	0.027
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.092	0.076	0.051	0.066	0.075	0.083	0.077	0.084
n5-02	Motor Inertia Acceleration Time	s	0.092	0.076	0.051	0.066	0.075	0.083	0.077	0.084
n8-49	Heavy Load Id Current	%	-7.6	-11.5	-9.1	-19.0	-18.7	-23.4	-18.5	-10.9

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.7 SSR1 Series Motor Code Setting for Specification of 200 V at 1750 min^{-1} (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)							
E5-01	PM Motor Code Selection	-	120E	120F	1210	1212	1213	1214	1215	1216
	Voltage Class	V	200	200	200	200	200	200	200	200
	Capacity	kW	15	18	22	30	37	45	55	75
	Motor Rotation Speed	min^{-1}	1750	1750	1750	1750	1750	1750	1750	1750
E5-02	PM Motor Rated Power	kW	15.00	18.50	22.00	30.00	37.00	45.00	55.00	75.00
E5-03	PM Motor Rated Current (FLA)	A	55.4	68.2	80.6	105.2	131.3	153.1	185.4	257.3
E5-04	PM Motor Pole Count	-	6	6	6	6	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	0.066	0.051	0.037	0.030	0.020	0.014	0.012	0.006
E5-06	PM d-axis Inductance (mH/phase)	mH	2.45	2.18	1.71	1.35	0.99	0.83	0.79	0.44
E5-07	PM q-axis Inductance (mH/phase)	mH	3.11	2.55	2.05	1.82	1.28	1.01	0.97	0.56
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	248.1	253.6	250.0	280.9	264.2	280.4	311.9	268.0
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min^{-1}	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E1-04	Maximum Output Frequency	Hz	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5
E1-05	Maximum Output Voltage	V	190.0	190.0	190.0	190.0	190.0	190.0	190.0	190.0
E1-06	Base Frequency	Hz	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5
E1-09	Minimum Output Frequency	Hz	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
C5-17	Motor Inertia	kgm^2	0.046	0.055	0.064	0.116	0.140	0.259	0.31	0.42
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.102	0.101	0.098	0.130	0.127	0.193	0.191	0.187
n5-02	Motor Inertia Acceleration Time	s	0.102	0.101	0.098	0.130	0.127	0.193	0.191	0.187
n8-49	Heavy Load Id Current	%	-16.5	-11.3	-12.8	-16.8	-15.6	-10.7	-9.6	-13.3

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.8 SSR1 Series Motor Code Setting for Specification of 400 V at 1750 min^{-1} (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)							
E5-01	PM Motor Code Selection	-	1232	1233	1235	1236	1238	123A	123B	123D
	Voltage Class	V	400	400	400	400	400	400	400	400
	Capacity	kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11
	Motor Rotation Speed	min^{-1}	1750	1750	1750	1750	1750	1750	1750	1750
E5-02	PM Motor Rated Power	kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11.0
E5-03	PM Motor Rated Current (FLA)	A	0.89	1.56	2.81	4.27	7.08	10.31	13.65	20.7
E5-04	PM Motor Pole Count	-	6	6	6	6	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	25.370	9.136	6.010	3.297	1.798	0.982	0.786	0.349
E5-06	PM d-axis Inductance (mH/phase)	mH	169.00	92.08	67.71	34.40	32.93	22.7	16.49	13.17
E5-07	PM q-axis Inductance (mH/phase)	mH	197.50	119.56	81.71	54.00	37.70	26.80	23.46	15.60
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	392.6	440.6	478.3	466.3	478.8	478.1	520.0	481.5

No.	Name	Unit	Motor Code (setting value of E5-01)							
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min^{-1}	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E1-04	Maximum Output Frequency	Hz	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5
E1-05	Maximum Output Voltage	V	380.0	380.0	380.0	380.0	380.0	380.0	380.0	380.0
E1-06	Base Frequency	Hz	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5
E1-09	Minimum Output Frequency	Hz	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
C5-17	Motor Inertia	kgm^2	0.0011	0.0017	0.0023	0.0043	0.0083	0.014	0.017	0.027
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.092	0.076	0.051	0.066	0.075	0.083	0.077	0.084
n5-02	Motor Inertia Acceleration Time	s	0.092	0.076	0.051	0.066	0.075	0.083	0.077	0.084
n8-49	Heavy Load Id Current	%	-8.6	-11.5	-10.3	-19.8	-8.5	-11.0	-18.6	-12.5

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.9 SSR1 Series Motor Code Setting for Specification of 400 V at 1750 min^{-1} (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)							
E5-01	PM Motor Code Selection	-	123E	123F	1240	1242	1243	1244	1245	1246
	Voltage Class	V	400	400	400	400	400	400	400	400
	Capacity	kW	15	18	22	30	37	45	55	75
	Motor Rotation Speed	min^{-1}	1750	1750	1750	1750	1750	1750	1750	1750
E5-02	PM Motor Rated Power	kW	15	18.50	22.00	30.00	37.00	45.00	55.00	75.00
E5-03	PM Motor Rated Current (FLA)	A	27.5	33.4	39.8	52.0	65.8	77.5	92.7	126.6
E5-04	PM Motor Pole Count	-	6	6	6	6	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	0.272	0.207	0.148	0.235	0.079	0.054	0.049	0.029
E5-06	PM d-axis Inductance (mH/phase)	mH	10.30	8.72	6.81	5.4	4.08	3.36	3.16	2.12
E5-07	PM q-axis Inductance (mH/phase)	mH	12.77	11.22	8.47	7.26	5.12	3.94	3.88	2.61
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	498.8	509.5	503.9	561.7	528.5	558.1	623.8	594.5
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min^{-1}	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E1-04	Maximum Output Frequency	Hz	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5
E1-05	Maximum Output Voltage	V	380.0	380.0	380.0	380.0	380.0	380.0	380.0	380.0
E1-06	Base Frequency	Hz	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5
E1-09	Minimum Output Frequency	Hz	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
C5-17	Motor Inertia	kgm^2	0.046	0.055	0.064	0.116	0.140	0.259	0.31	0.42
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.102	0.101	0.098	0.130	0.127	0.193	0.191	0.187
n5-02	Motor Inertia Acceleration Time	s	0.102	0.101	0.098	0.130	0.127	0.193	0.191	0.187
n8-49	Heavy Load Id Current	%	-15.5	-17.9	-15.1	-16.8	-14.1	-8.8	-9.6	-10.3

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.10 SSR1 Series Motor Code Setting for Specification of 400 V at 1750 min^{-1} (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)			
E5-01	PM Motor Code Selection	-	1247	1248	1249	124A
	Voltage Class	V	400	400	400	400
	Capacity	kW	90	110	132	160
	Motor Rotation Speed	min^{-1}	1750	1750	1750	1750
E5-02	PM Motor Rated Power	kW	90.00	110.00	132.00	160.00
E5-03	PM Motor Rated Current (FLA)	A	160.4	183.3	222.9	267.7
E5-04	PM Motor Pole Count	-	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	0.019	0.017	0.012	0.008
E5-06	PM d-axis Inductance (mH/phase)	mH	1.54	1.44	1.21	0.97
E5-07	PM q-axis Inductance (mH/phase)	mH	2.06	2.21	1.46	1.28
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	524.1	583.7	563.6	601.2
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min^{-1}	0.0	0.0	0.0	0.0
E1-04	Maximum Output Frequency	Hz	87.5	87.5	87.5	87.5
E1-05	Maximum Output Voltage	V	380.0	380.0	380.0	380.0
E1-06	Base Frequency	Hz	87.5	87.5	87.5	87.5
E1-09	Minimum Output Frequency	Hz	4.4	4.4	4.4	4.4
C5-17	Motor Inertia	kgm^2	0.56	0.83	0.96	1.61
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.208	0.254	0.243	0.338
n5-02	Motor Inertia Acceleration Time	s	0.208	0.254	0.243	0.338
n8-49	Heavy Load Id Current	%	-17.0	-21.7	-10.9	-13.2

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.11 SSR1 Series Motor Code Setting for Specification of 200 V at 1450 min^{-1} (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)							
E5-01	PM Motor Code Selection	-	1302	1303	1305	1306	1308	130A	130B	130D
	Voltage Class	V	200	200	200	200	200	200	200	200
	Capacity	kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11
	Motor Rotation Speed	min^{-1}	1450	1450	1450	1450	1450	1450	1450	1450
E5-02	PM Motor Rated Power	kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11.0
E5-03	PM Motor Rated Current (FLA)	A	1.88	3.13	5.63	8.33	14.17	20.63	27.71	39.6
E5-04	PM Motor Pole Count	-	6	6	6	6	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	3.190	1.940	1.206	0.665	0.341	0.252	0.184	0.099
E5-06	PM d-axis Inductance (mH/phase)	mH	32.15	26.12	14.72	12.27	8.27	6.49	6.91	4.07
E5-07	PM q-axis Inductance (mH/phase)	mH	41.74	34.30	20.15	14.77	9.81	7.74	7.66	4.65
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	264.3	269.6	284.3	287.1	284.5	298.0	335.0	303.9
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min^{-1}	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E1-04	Maximum Output Frequency	Hz	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
E1-05	Maximum Output Voltage	V	190.0	190.0	190.0	190.0	190.0	190.0	190.0	190.0
E1-06	Base Frequency	Hz	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5

No.	Name	Unit	Motor Code (setting value of E5-01)							
E1-09	Minimum Output Frequency	Hz	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
C5-17	Motor Inertia	kgm²	0.0017	0.0023	0.0043	0.0083	0.0136	0.017	0.027	0.046
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.098	0.071	0.066	0.087	0.085	0.072	0.084	0.096
n5-02	Motor Inertia Acceleration Time	s	0.098	0.071	0.066	0.087	0.085	0.072	0.084	0.096
n8-49	Heavy Load Id Current	%	-6.6	-10.9	-13.5	-9.0	-9.5	-10.1	-6.0	-9.3

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.12 SSR1 Series Motor Code Setting for Specification of 200 V at 1450 min-1 (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)						
E5-01	PM Motor Code Selection	-	130E	130F	1310	1312	1313	1314	1315
	Voltage Class	V	200	200	200	200	200	200	200
	Capacity	kW	15	18	22	30	37	45	55
	Motor Rotation Speed	min-1	1450	1450	1450	1450	1450	1450	1450
E5-02	PM Motor Rated Power	kW	15.00	18.50	22.00	30.00	37.00	45.00	55.00
E5-03	PM Motor Rated Current (FLA)	A	55.5	65.6	75.1	105.2	126.0	153.1	186.5
E5-04	PM Motor Pole Count	-	6	6	6	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	0.075	0.057	0.041	0.034	0.023	0.015	0.012
E5-06	PM d-axis Inductance (mH/phase)	mH	3.29	2.53	1.98	1.75	1.48	1.04	0.87
E5-07	PM q-axis Inductance (mH/phase)	mH	3.84	3.01	2.60	2.17	1.70	1.31	1.10
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	311.2	300.9	327.7	354.2	369.6	351.6	374.7
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E1-04	Maximum Output Frequency	Hz	72.5	72.5	72.5	72.5	72.5	72.5	72.5
E1-05	Maximum Output Voltage	V	190.0	190.0	190.0	190.0	190.0	190.0	190.0
E1-06	Base Frequency	Hz	72.5	72.5	72.5	72.5	72.5	72.5	72.5
E1-09	Minimum Output Frequency	Hz	3.6	3.6	3.6	3.6	3.6	3.6	3.6
C5-17	Motor Inertia	kgm²	0.055	0.064	0.116	0.140	0.259	0.312	0.42
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.085	0.080	0.122	0.108	0.161	0.160	0.175
n5-02	Motor Inertia Acceleration Time	s	0.085	0.080	0.122	0.108	0.161	0.160	0.175
n8-49	Heavy Load Id Current	%	-10.7	-13.2	-15.7	-11.5	-7.0	-11.8	-10.2

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.13 SSR1 Series Motor Code Setting for Specification of 400 V at 1450 min-1 (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)							
E5-01	PM Motor Code Selection	-	1332	1333	1335	1336	1338	133A	133B	133D
	Voltage Class	V	400	400	400	400	400	400	400	400
	Capacity	kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11
	Motor Rotation Speed	min-1	1450	1450	1450	1450	1450	1450	1450	1450
E5-02	PM Motor Rated Power	kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11.0

No.	Name	Unit	Motor Code (setting value of E5-01)							
E5-03	PM Motor Rated Current (FLA)	A	0.94	1.56	2.81	4.27	6.98	10.21	13.85	19.5
E5-04	PM Motor Pole Count	-	6	6	6	6	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	12.760	7.421	4.825	2.656	1.353	0.999	0.713	0.393
E5-06	PM d-axis Inductance (mH/phase)	mH	128.60	85.11	58.87	46.42	31.73	26.20	27.06	15.51
E5-07	PM q-axis Inductance (mH/phase)	mH	166.96	113.19	80.59	60.32	40.45	30.94	33.45	19.63
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	528.6	544.2	568.5	572.8	562.9	587.6	670.1	612.7
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min^{-1}	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E1-04	Maximum Output Frequency	Hz	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
E1-05	Maximum Output Voltage	V	380.0	380.0	380.0	380.0	380.0	380.0	380.0	380.0
E1-06	Base Frequency	Hz	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
E1-09	Minimum Output Frequency	Hz	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
C5-17	Motor Inertia	kgm^2	0.0017	0.0023	0.0043	0.0083	0.0136	0.017	0.027	0.046
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.098	0.071	0.066	0.087	0.085	0.072	0.084	0.096
n5-02	Motor Inertia Acceleration Time	s	0.098	0.071	0.066	0.087	0.085	0.072	0.084	0.096
n8-49	Heavy Load Id Current	%	-6.6	-9.2	-13.5	-12.1	-13.7	-10.1	-12.2	-15.5

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.14 SSR1 Series Motor Code Setting for Specification of 400 V at 1450 min^{-1} (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)						
E5-01	PM Motor Code Selection	-	133E	133F	1340	1342	1343	1344	1345
	Voltage Class	V	400	400	400	400	400	400	400
	Capacity	kW	15	18	22	30	37	45	55
	Motor Rotation Speed	min^{-1}	1450	1450	1450	1450	1450	1450	1450
E5-02	PM Motor Rated Power	kW	15	18.50	22.00	30.00	37.00	45.00	55.00
E5-03	PM Motor Rated Current (FLA)	A	27.4	32.9	37.6	52.5	63.2	76.4	96.1
E5-04	PM Motor Pole Count	-	6	6	6	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	0.295	0.223	0.164	0.137	0.093	0.059	0.048
E5-06	PM d-axis Inductance (mH/phase)	mH	12.65	9.87	7.90	7.01	5.93	4.17	3.11
E5-07	PM q-axis Inductance (mH/phase)	mH	15.87	12.40	10.38	8.68	6.79	5.22	4.55
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	624.6	610.4	655.4	708.4	739.2	703.0	747.1
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min^{-1}	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E1-04	Maximum Output Frequency	Hz	72.5	72.5	72.5	72.5	72.5	72.5	72.5
E1-05	Maximum Output Voltage	V	380.0	380.0	380.0	380.0	380.0	380.0	380.0
E1-06	Base Frequency	Hz	72.5	72.5	72.5	72.5	72.5	72.5	72.5
E1-09	Minimum Output Frequency	Hz	3.6	3.6	3.6	3.6	3.6	3.6	3.6
C5-17	Motor Inertia	kgm^2	0.055	0.064	0.116	0.140	0.259	0.312	0.42

No.	Name	Unit	Motor Code (setting value of E5-01)						
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.085	0.080	0.122	0.108	0.161	0.160	0.175
n5-02	Motor Inertia Acceleration Time	s	0.085	0.080	0.122	0.108	0.161	0.160	0.175
n8-49	Heavy Load Id Current	%	-15.1	-16.0	-15.7	-11.5	-6.8	-11.5	-14.8

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.15 SSR1 Series Motor Code Setting for Specification of 400 V at 1450 min^{-1} (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)			
E5-01	PM Motor Code Selection	-	1346	1347	1348	1349
	Voltage Class	V	400	400	400	400
	Capacity	kW	75	90	110	132
	Motor Rotation Speed	min^{-1}	1450	1450	1450	1450
E5-02	PM Motor Rated Power	kW	75.00	90.00	110.00	132.00
E5-03	PM Motor Rated Current (FLA)	A	124.0	153.1	186.5	226.0
E5-04	PM Motor Pole Count	-	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	0.028	0.024	0.015	0.011
E5-06	PM d-axis Inductance (mH/phase)	mH	2.32	2.20	1.45	1.23
E5-07	PM q-axis Inductance (mH/phase)	mH	2.97	3.23	1.88	1.67
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	639.3	708.0	640.7	677.0
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min^{-1}	0.0	0.0	0.0	0.0
E1-04	Maximum Output Frequency	Hz	72.5	72.5	72.5	72.5
E1-05	Maximum Output Voltage	V	380.0	380.0	380.0	380.0
E1-06	Base Frequency	Hz	72.5	72.5	72.5	72.5
E1-09	Minimum Output Frequency	Hz	3.6	3.6	3.6	3.6
C5-17	Motor Inertia	kgm^2	0.56	0.83	0.96	1.61
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.171	0.213	0.201	0.281
n5-02	Motor Inertia Acceleration Time	s	0.171	0.213	0.201	0.281
n8-49	Heavy Load Id Current	%	-15.8	-19.6	-14.9	-15.1

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.16 SSR1 Series Motor Code Setting for Specification of 200 V at 1150 min^{-1} (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)							
E5-01	PM Motor Code Selection	-	1402	1403	1405	1406	1408	140A	140B	140D
	Voltage Class	V	200	200	200	200	200	200	200	200
	Capacity	kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11
	Motor Rotation Speed	min^{-1}	1150	1150	1150	1150	1150	1150	1150	1150
E5-02	PM Motor Rated Power	kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11.0
E5-03	PM Motor Rated Current (FLA)	A	1.88	3.02	6.00	8.85	14.27	20.21	26.67	39.9
E5-04	PM Motor Pole Count	-	6	6	6	6	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	4.832	2.704	1.114	0.511	0.412	0.303	0.165	0.113
E5-06	PM d-axis Inductance (mH/phase)	mH	48.68	32.31	19.22	12.15	7.94	11.13	6.59	4.96
E5-07	PM q-axis Inductance (mH/phase)	mH	63.21	40.24	24.38	15.35	11.86	14.06	8.55	6.12

No.	Name	Unit	Motor Code (setting value of E5-01)							
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	320.4	327.1	364.4	344.4	357.5	430.8	391.5	384.4
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min^{-1}	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E1-04	Maximum Output Frequency	Hz	57.5	57.5	57.5	57.5	57.5	57.5	57.5	57.5
E1-05	Maximum Output Voltage	V	190.0	190.0	190.0	190.0	190.0	190.0	190.0	190.0
E1-06	Base Frequency	Hz	57.5	57.5	57.5	57.5	57.5	57.5	57.5	57.5
E1-09	Minimum Output Frequency	Hz	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
C5-17	Motor Inertia	kgm^2	0.0017	0.0023	0.0083	0.0136	0.0171	0.027	0.046	0.055
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.062	0.044	0.080	0.090	0.067	0.072	0.088	0.073
n5-02	Motor Inertia Acceleration Time	s	0.062	0.044	0.080	0.090	0.067	0.072	0.088	0.073
n8-49	Heavy Load Id Current	%	-8.8	-9.9	-9.3	-10.0	-17.7	-12.3	-15.3	-13.9

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.17 SSR1 Series Motor Code Setting for Specification of 200 V at 1150 min^{-1} (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)					
E5-01	PM Motor Code Selection	-	140E	140F	1410	1412	1413	1414
	Voltage Class	V	200	200	200	200	200	200
	Capacity	kW	15	18	22	30	37	45
	Motor Rotation Speed	min^{-1}	1150	1150	1150	1150	1150	1150
E5-02	PM Motor Rated Power	kW	15	18.50	22.00	30.00	37.00	45.00
E5-03	PM Motor Rated Current (FLA)	A	55.6	63.5	74.4	104.2	129.6	154.2
E5-04	PM Motor Pole Count	-	6	6	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	0.084	0.066	0.048	0.035	0.023	0.016
E5-06	PM d-axis Inductance (mH/phase)	mH	3.83	3.33	2.38	2.04	1.53	1.16
E5-07	PM q-axis Inductance (mH/phase)	mH	4.65	4.50	3.15	2.86	2.27	1.54
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	372.1	421.3	410.9	436.1	428.8	433.3
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min^{-1}	0.0	0.0	0.0	0.0	0.0	0.0
E1-04	Maximum Output Frequency	Hz	57.5	57.5	57.5	57.5	57.5	57.5
E1-05	Maximum Output Voltage	V	190.0	190.0	190.0	190.0	190.0	190.0
E1-06	Base Frequency	Hz	57.5	57.5	57.5	57.5	57.5	57.5
E1-09	Minimum Output Frequency	Hz	2.9	2.9	2.9	2.9	2.9	2.9
C5-17	Motor Inertia	kgm^2	0.064	0.116	0.140	0.259	0.312	0.418
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.062	0.091	0.092	0.125	0.122	0.135
n5-02	Motor Inertia Acceleration Time	s	0.062	0.091	0.092	0.125	0.122	0.135
n8-49	Heavy Load Id Current	%	-14.4	-17.9	-15.9	-17.9	-20.1	-13.7

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.18 SSR1 Series Motor Code Setting for Specification of 400 V at 1150 min-1 (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)							
E5-01	PM Motor Code Selection	-	1432	1433	1435	1436	1438	143A	143B	143D
	Voltage Class	V	400	400	400	400	400	400	400	400
	Capacity	kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11
	Motor Rotation Speed	min-1	1150	1150	1150	1150	1150	1150	1150	1150
E5-02	PM Motor Rated Power	kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11.0
E5-03	PM Motor Rated Current (FLA)	A	0.94	1.51	3.00	4.43	7.08	10.10	13.33	19.9
E5-04	PM Motor Pole Count	-	6	6	6	6	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	19.320	10.800	4.456	2.044	1.483	1.215	0.660	0.443
E5-06	PM d-axis Inductance (mH/phase)	mH	194.70	129.20	76.88	48.60	37.58	44.54	26.36	19.10
E5-07	PM q-axis Inductance (mH/phase)	mH	252.84	160.90	97.52	61.40	47.65	56.26	34.20	24.67
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	640.9	654.1	728.8	688.9	702.0	861.5	783.0	762.2
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E1-04	Maximum Output Frequency	Hz	57.5	57.5	57.5	57.5	57.5	57.5	57.5	57.5
E1-05	Maximum Output Voltage	V	380.0	380.0	380.0	380.0	380.0	380.0	380.0	380.0
E1-06	Base Frequency	Hz	57.5	57.5	57.5	57.5	57.5	57.5	57.5	57.5
E1-09	Minimum Output Frequency	Hz	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
C5-17	Motor Inertia	kgm2	0.0017	0.0023	0.0083	0.0136	0.0171	0.027	0.046	0.055
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.062	0.044	0.080	0.090	0.067	0.072	0.088	0.073
n5-02	Motor Inertia Acceleration Time	s	0.062	0.044	0.080	0.090	0.067	0.072	0.088	0.073
n8-49	Heavy Load Id Current	%	-8.8	-9.9	-9.3	-10.0	-12.8	-12.3	-15.3	-16.7

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.19 SSR1 Series Motor Code Setting for Specification of 400 V at 1150 min-1 (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)					
E5-01	PM Motor Code Selection	-	143E	143F	1440	1442	1443	1444
	Voltage Class	V	400	400	400	400	400	400
	Capacity	kW	15	18	22	30	37	45
	Motor Rotation Speed	min-1	1150	1150	1150	1150	1150	1150
E5-02	PM Motor Rated Power	kW	15	18.50	22.00	30.00	37.00	45.00
E5-03	PM Motor Rated Current (FLA)	A	27.8	31.8	37.2	52.1	64.8	76.6
E5-04	PM Motor Pole Count	-	6	6	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	0.331	0.264	0.192	0.140	0.093	0.063
E5-06	PM d-axis Inductance (mH/phase)	mH	15.09	13.32	9.52	8.16	6.13	4.63
E5-07	PM q-axis Inductance (mH/phase)	mH	18.56	18.00	12.60	11.40	9.10	6.15
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	749.6	842.7	821.8	872.3	857.7	866.6
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min-1	0.0	0.0	0.0	0.0	0.0	0.0

No.	Name	Unit	Motor Code (setting value of E5-01)					
E1-04	Maximum Output Frequency	Hz	57.5	57.5	57.5	57.5	57.5	57.5
E1-05	Maximum Output Voltage	V	380.0	380.0	380.0	380.0	380.0	380.0
E1-06	Base Frequency	Hz	57.5	57.5	57.5	57.5	57.5	57.5
E1-09	Minimum Output Frequency	Hz	2.9	2.9	2.9	2.9	2.9	2.9
C5-17	Motor Inertia	kgm²	0.064	0.116	0.140	0.259	0.312	0.418
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.062	0.091	0.092	0.125	0.122	0.135
n5-02	Motor Inertia Acceleration Time	s	0.062	0.091	0.092	0.125	0.122	0.135
n8-49	Heavy Load Id Current	%	-14.9	-17.9	-15.9	-17.7	-20.1	-13.8

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.20 SSR1 Series Motor Code Setting for Specification of 400 V at 1150 min^{-1} (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)			
E5-01	PM Motor Code Selection	-	1445	1446	1447	1448
	Voltage Class	V	400	400	400	400
	Capacity	kW	55	75	90	110
	Motor Rotation Speed	min^{-1}	1150	1150	1150	1150
E5-02	PM Motor Rated Power	kW	55.00	75.00	90.00	110.00
E5-03	PM Motor Rated Current (FLA)	A	92.0	127.1	150.5	185.4
E5-04	PM Motor Pole Count	-	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	0.051	0.033	0.027	0.015
E5-06	PM d-axis Inductance (mH/phase)	mH	3.96	3.03	2.60	1.89
E5-07	PM q-axis Inductance (mH/phase)	mH	5.00	5.14	3.28	2.33
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	854.0	823.1	853.4	829.2
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min^{-1}	0.0	0.0	0.0	0.0
E1-04	Maximum Output Frequency	Hz	57.5	57.5	57.5	57.5
E1-05	Maximum Output Voltage	V	380.0	380.0	380.0	380.0
E1-06	Base Frequency	Hz	57.5	57.5	57.5	57.5
E1-09	Minimum Output Frequency	Hz	2.9	2.9	2.9	2.9
C5-17	Motor Inertia	kgm²	0.56	0.83	0.96	1.61
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.147	0.161	0.154	0.212
n5-02	Motor Inertia Acceleration Time	s	0.147	0.161	0.154	0.212
n8-49	Heavy Load Id Current	%	-12.5	-28.8	-13.3	-11.6

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

◆ Yaskawa SST4 Series IPM Motors (Constant Torque)

Table 3.21 SST4 series motor code setting for specification of 200 V at 1750 min-1 (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)							
E5-01	PM Motor Code Selection	-	2202	2203	2205	2206	2208	220A	220B	220D
	Voltage Class	V	200	200	200	200	200	200	200	200
	Capacity	kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11
	Motor Rotation Speed	min-1	1750	1750	1750	1750	1750	1750	1750	1750
E5-02	PM Motor Rated Power (kW)	kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11.0
E5-03	PM Motor Rated Current (FLA)	A	1.77	3.54	6.56	8.96	14.79	20.94	29.58	41.1
E5-04	PM Motor Pole Count	-	6	6	6	6	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	2.247	1.132	0.774	0.479	0.242	0.275	0.161	0.111
E5-06	PM d-axis Inductance (mH/phase)	mH	22.32	12.38	8.90	7.39	5.06	5.82	3.86	3.59
E5-07	PM q-axis Inductance (mH/phase)	mH	32.50	15.72	11.96	9.63	6.42	6.74	4.66	4.32
E5-09	PM Motor Induced Voltage Constant 1 (Ke)	mVs/rad	215.2	203.9	219.3	230.6	235.1	251.7	235.7	252.0
E5-24	PM Motor Induced Voltage Constant 2 (Ke)	mV/min-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E1-04	Maximum Output Frequency	Hz	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5
E1-05	Maximum Output Voltage	V	190.0	190.0	190.0	190.0	190.0	190.0	190.0	190.0
E1-06	Base Frequency	Hz	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5
E1-09	Minimum Output Frequency	Hz	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
C5-17	Motor Inertia	kgm2	0.0016	0.0022	0.0042	0.0081	0.0133	0.013	0.017	0.027
L3-24 *1	Motor Accel Time for Inertia Cal	s	0.134	0.099	0.094	0.124	0.121	0.081	0.075	0.082
n5-02	Motor Inertia Acceleration Time	s	0.134	0.099	0.094	0.124	0.121	0.081	0.075	0.082
n8-49	d-Axis Cur forHighEfficiencyCont	%	-9.3	-6.4	-10.0	-9.9	-9.7	-8.4	-11.5	-13.1

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.22 SST4 series motor code setting for specification of 200 V at 1750 min-1 (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)							
E5-01	PM Motor Code Selection	-	220E	220F	2210	2212	2213	2214	2215	2216
	Voltage Class	V	200	200	200	200	200	200	200	200
	Capacity	kW	15	18	22	30	37	45	55	75
	Motor Rotation Speed	min-1	1750	1750	1750	1750	1750	1750	1750	1750
E5-02	PM Motor Rated Power	kW	15	18.50	22.00	30.00	37.00	45.00	55.00	75.00
E5-03	PM Motor Rated Current (FLA)	A	54.2	68.2	78.6	104.2	129.2	153.1	205.2	260.4
E5-04	PM Motor Pole Count	-	6	6	6	6	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	0.071	0.049	0.040	0.030	0.020	0.013	0.009	0.006
E5-06	PM d-axis Inductance (mH/phase)	mH	2.67	1.98	1.69	1.31	0.88	0.77	0.55	0.40
E5-07	PM q-axis Inductance (mH/phase)	mH	3.10	2.41	2.12	1.61	1.14	1.04	0.69	0.50

No.	Name	Unit	Motor Code (setting value of E5-01)							
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	253.7	244.6	256.3	283.1	266.3	260.0	261.5	259.3
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min^{-1}	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E1-04	Maximum Output Frequency	Hz	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5
E1-05	Maximum Output Voltage	V	190.0	190.0	190.0	190.0	190.0	190.0	190.0	190.0
E1-06	Base Frequency	Hz	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5
E1-09	Minimum Output Frequency	Hz	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
C5-17	Motor Inertia	kgm^2	0.044	0.054	0.063	0.113	0.137	0.252	0.30	0.41
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.099	0.098	0.096	0.126	0.124	0.188	0.186	0.184
n5-02	Motor Inertia Acceleration Time	s	0.099	0.098	0.096	0.126	0.124	0.188	0.186	0.184
n8-49	Heavy Load Id Current	%	-10.9	-14.3	-15.1	-11.3	-14.1	-18.8	-11.4	-12.2

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.23 SST4 Series Motor Code Setting for Specification of 400 V at 1750 min^{-1} (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)							
E5-01	PM Motor Code Selection	-	2232	2233	2235	2236	2238	223A	223B	223D
	Voltage Class	V	400	400	400	400	400	400	400	400
	Capacity	kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11
	Motor Rotation Speed	min^{-1}	1750	1750	1750	1750	1750	1750	1750	1750
E5-02	PM Motor Rated Power	kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11.0
E5-03	PM Motor Rated Current (FLA)	A	0.92	1.77	3.33	4.48	7.50	10.42	14.27	20.5
E5-04	PM Motor Pole Count	-	6	6	6	6	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	8.935	4.570	3.096	1.906	0.972	1.103	0.630	0.429
E5-06	PM d-axis Inductance (mH/phase)	mH	80.14	48.04	35.60	30.31	20.03	23.41	14.86	14.34
E5-07	PM q-axis Inductance (mH/phase)	mH	110.76	64.88	47.84	38.36	24.97	28.70	17.25	17.25
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	416.5	399.4	438.5	475.5	463.7	485.8	470.4	513.4
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min^{-1}	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E1-04	Maximum Output Frequency	Hz	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5
E1-05	Maximum Output Voltage	V	380.0	380.0	380.0	380.0	380.0	380.0	380.0	380.0
E1-06	Base Frequency	Hz	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5
E1-09	Minimum Output Frequency	Hz	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
C5-17	Motor Inertia	kgm^2	0.0016	0.0022	0.0042	0.0081	0.0133	0.013	0.017	0.027
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.134	0.099	0.094	0.124	0.121	0.081	0.075	0.082
n5-02	Motor Inertia Acceleration Time	s	0.134	0.099	0.094	0.124	0.121	0.081	0.075	0.082
n8-49	Heavy Load Id Current	%	-7.5	-8.5	-9.8	-8.2	-9.1	-13.1	-9.2	-12.4

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.24 SST4 Series Motor Code Setting for Specification of 400 V at 1750 min-1 (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)							
E5-01	PM Motor Code Selection	-	223E	223F	2240	2242	2243	2244	2245	2246
	Voltage Class	V	400	400	400	400	400	400	400	400
	Capacity	kW	15	18	22	30	37	45	55	75
	Motor Rotation Speed	min-1	1750	1750	1750	1750	1750	1750	1750	1750
E5-02	PM Motor Rated Power	kW	15	18.50	22.00	30.00	37.00	45.00	55.00	75.00
E5-03	PM Motor Rated Current (FLA)	A	26.4	34.2	38.8	52.2	65.4	77.6	99.3	130.2
E5-04	PM Motor Pole Count	-	6	6	6	6	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	0.275	0.196	0.160	0.120	0.077	0.052	0.036	0.023
E5-06	PM d-axis Inductance (mH/phase)	mH	9.99	7.92	6.82	5.24	3.57	2.98	1.59	1.59
E5-07	PM q-axis Inductance (mH/phase)	mH	12.37	9.64	8.51	6.44	4.65	3.75	2.78	1.97
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	505.3	489.2	509.5	566.2	531.6	530.6	515.2	515.2
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E1-04	Maximum Output Frequency	Hz	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5
E1-05	Maximum Output Voltage	V	380.0	380.0	380.0	380.0	380.0	380.0	380.0	380.0
E1-06	Base Frequency	Hz	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5
E1-09	Minimum Output Frequency	Hz	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
C5-17	Motor Inertia	kgm2	0.044	0.054	0.063	0.113	0.137	0.252	0.30	0.41
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.099	0.098	0.096	0.126	0.124	0.188	0.186	0.184
n5-02	Motor Inertia Acceleration Time	s	0.099	0.098	0.096	0.126	0.124	0.188	0.186	0.184
n8-49	Heavy Load Id Current	%	-15.1	-14.3	-15.3	-11.3	-14.5	-13.2	-22.6	-11.9

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.25 SST4 Series Motor Code Setting for Specification of 400 V at 1750 min-1 (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)						
E5-01	PM Motor Code Selection	-	2247	2248	2249	224A	224C	224D	224E
	Voltage Class	V	400	400	400	400	400	400	400
	Capacity	kW	90	110	132	160	200	220	300
	Motor Rotation Speed	min-1	1750	1750	1750	1750	1750	1750	1750
E5-02	PM Motor Rated Power	kW	90.00	110.00	132.00	160.00	200.00	250.00	300.00
E5-03	PM Motor Rated Current (FLA)	A	153.1	184.4	229.2	269.8	346.9	421.9	520.8
E5-04	PM Motor Pole Count	-	6	6	6	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	0.019	0.017	0.012	0.008	0.005	0.004	0.002
E5-06	PM d-axis Inductance (mH/phase)	mH	1.51	1.43	1.13	0.96	0.65	0.67	0.40
E5-07	PM q-axis Inductance (mH/phase)	mH	1.76	1.92	1.54	1.26	0.88	0.74	0.52
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	538.3	590.9	548.2	603.9	556.8	593.1	495.4
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0

No.	Name	Unit	Motor Code (setting value of E5-01)						
E1-04	Maximum Output Frequency	Hz	87.5	87.5	87.5	87.5	87.5	87.5	87.5
E1-05	Maximum Output Voltage	V	380.0	380.0	380.0	380.0	380.0	380.0	380.0
E1-06	Base Frequency	Hz	87.5	87.5	87.5	87.5	87.5	87.5	87.5
E1-09	Minimum Output Frequency	Hz	4.4	4.4	4.4	4.4	4.4	4.4	4.4
C5-17	Motor Inertia	kgm²	0.55	0.82	0.96	1.60	1.95	2.82	3.70
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.205	0.250	0.244	0.336	0.327	0.379	0.414
n5-02	Motor Inertia Acceleration Time	s	0.205	0.250	0.244	0.336	0.327	0.379	0.414
n8-49	Heavy Load Id Current	%	-8.6	-14.8	-17.5	-12.5	-14.7	-5.1	-16.3

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.26 SST4 Series Motor Code Setting for Specification of 200 V at 1450 min-1 (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)							
E5-01	PM Motor Code Selection	-	2302	2303	2305	2306	2308	230A	230B	230D
	Voltage Class	V	200	200	200	200	200	200	200	200
	Capacity	kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11
	Motor Rotation Speed	min-1	1450	1450	1450	1450	1450	1450	1450	1450
E5-02	PM Motor Rated Power	kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11.0
E5-03	PM Motor Rated Current (FLA)	A	1.77	3.33	5.94	9.48	14.17	20.42	27.92	39.6
E5-04	PM Motor Pole Count	-	6	6	6	6	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	3.154	1.835	0.681	0.308	0.405	0.278	0.180	0.098
E5-06	PM d-axis Inductance (mH/phase)	mH	28.46	19.46	10.00	6.88	8.15	5.77	6.32	3.34
E5-07	PM q-axis Inductance (mH/phase)	mH	39.29	25.89	15.20	9.25	10.76	8.60	8.80	4.61
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	268.8	256.9	271.9	260.2	286.8	314.9	300.8	292.3
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E1-04	Maximum Output Frequency	Hz	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
E1-05	Maximum Output Voltage	V	190.0	190.0	190.0	190.0	190.0	190.0	190.0	190.0
E1-06	Base Frequency	Hz	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
E1-09	Minimum Output Frequency	Hz	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
C5-17	Motor Inertia	kgm²	0.0016	0.0022	0.0081	0.0133	0.0133	0.017	0.027	0.044
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.092	0.068	0.125	0.139	0.083	0.070	0.082	0.092
n5-02	Motor Inertia Acceleration Time	s	0.092	0.068	0.125	0.139	0.083	0.070	0.082	0.092
n8-49	Heavy Load Id Current	%	-7.5	-9.4	-13.9	-10.0	-15.0	-17.9	-22.7	-20.5

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.27 SST4 Series Motor Code Setting for Specification of 200 V at 1450 min^{-1} (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)							
E5-01	PM Motor Code Selection	-	230E	230F	2310	2312	2313	2314	2315	2316
	Voltage Class	V	200	200	200	200	200	200	200	200
	Capacity	kW	15	18	22	30	37	45	55	75
	Motor Rotation Speed	min^{-1}	1450	1450	1450	1450	1450	1450	1450	1450
E5-02	PM Motor Rated Power	kW	15.0	18.50	22.00	30.00	37.00	45.00	55.00	75.00
E5-03	PM Motor Rated Current (FLA)	A	54.2	68.3	75.2	102.0	131.3	160.4	191.7	257.3
E5-04	PM Motor Pole Count	-	6	6	6	6	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	0.073	0.055	0.048	0.034	0.023	0.016	0.012	0.007
E5-06	PM d-axis Inductance (mH/phase)	mH	2.94	2.23	2.08	1.67	1.39	0.94	0.82	0.56
E5-07	PM q-axis Inductance (mH/phase)	mH	3.65	2.85	2.66	2.04	1.73	1.22	1.06	0.76
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	305.1	297.6	355.8	355.4	324.0	302.4	337.2	323.4
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min^{-1}	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E1-04	Maximum Output Frequency	Hz	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
E1-05	Maximum Output Voltage	V	190.0	190.0	190.0	190.0	190.0	190.0	190.0	190.0
E1-06	Base Frequency	Hz	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
E1-09	Minimum Output Frequency	Hz	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
C5-17	Motor Inertia	kgm^2	0.054	0.063	0.113	0.137	0.252	0.304	0.41	0.55
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.083	0.079	0.118	0.105	0.157	0.156	0.172	0.169
n5-02	Motor Inertia Acceleration Time	s	0.083	0.079	0.118	0.105	0.157	0.156	0.172	0.169
n8-49	Heavy Load Id Current	%	-14.6	-16.4	-11.8	-10.5	-14.5	-17.4	-13.8	-17.5

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.28 SST4 Series Motor Code Setting for Specification of 400 V at 1450 min^{-1} (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)							
E5-01	PM Motor Code Selection	-	2332	2333	2335	2336	2338	233A	233B	233D
	Voltage Class	V	400	400	400	400	400	400	400	400
	Capacity	kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11
	Motor Rotation Speed	min^{-1}	1450	1450	1450	1450	1450	1450	1450	1450
E5-02	PM Motor Rated Power	kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11.0
E5-03	PM Motor Rated Current (FLA)	A	0.91	1.67	3.02	4.74	7.08	10.21	13.96	20.5
E5-04	PM Motor Pole Count	-	6	6	6	6	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	12.616	7.340	2.724	1.232	1.509	1.112	0.720	0.393
E5-06	PM d-axis Inductance (mH/phase)	mH	113.84	77.84	40.00	27.52	31.73	23.09	25.28	13.36
E5-07	PM q-axis Inductance (mH/phase)	mH	157.16	103.56	60.80	37.00	40.88	34.39	35.20	18.44
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	490.8	513.8	543.7	520.3	580.8	602.7	601.5	584.6

No.	Name	Unit	Motor Code (setting value of E5-01)							
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min^{-1}	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E1-04	Maximum Output Frequency	Hz	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
E1-05	Maximum Output Voltage	V	380.0	380.0	380.0	380.0	380.0	380.0	380.0	380.0
E1-06	Base Frequency	Hz	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
E1-09	Minimum Output Frequency	Hz	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
C5-17	Motor Inertia	kgm^2	0.0016	0.0022	0.0081	0.0133	0.0133	0.017	0.027	0.044
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.092	0.068	0.125	0.139	0.083	0.070	0.082	0.092
n5-02	Motor Inertia Acceleration Time	s	0.092	0.068	0.125	0.139	0.083	0.070	0.082	0.092
n8-49	Heavy Load Id Current	%	-9.5	-9.4	-13.7	-10.0	-12.9	-19.9	-22.8	-19.8

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.29 SST4 Series Motor Code Setting for Specification of 400 V at 1450 min^{-1} (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)							
E5-01	PM Motor Code Selection	-	233E	233F	2340	2342	2343	2344	2345	2346
	Voltage Class	V	400	400	400	400	400	400	400	400
	Capacity	kW	15	18	22	30	37	45	55	75
	Motor Rotation Speed	min^{-1}	1450	1450	1450	1450	1450	1450	1450	1450
E5-02	PM Motor Rated Power	kW	15	18.50	22.00	30.00	37.00	45.00	55.00	75.00
E5-03	PM Motor Rated Current (FLA)	A	27.1	34.2	37.6	50.9	65.4	80.2	96.1	129.2
E5-04	PM Motor Pole Count	-	6	6	6	6	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	0.291	0.220	0.192	0.136	0.091	0.064	0.048	0.028
E5-06	PM d-axis Inductance (mH/phase)	mH	11.77	8.94	8.32	6.68	5.30	3.76	3.09	2.24
E5-07	PM q-axis Inductance (mH/phase)	mH	14.60	11.40	10.64	8.16	6.80	4.88	4.75	3.03
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	610.3	595.2	711.6	710.8	652.7	604.8	669.1	646.8
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min^{-1}	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E1-04	Maximum Output Frequency	Hz	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
E1-05	Maximum Output Voltage	V	380.0	380.0	380.0	380.0	380.0	380.0	380.0	380.0
E1-06	Base Frequency	Hz	72.5	72.5	72.5	72.5	72.5	72.5	72.5	72.5
E1-09	Minimum Output Frequency	Hz	3.6	3.6	3.6	3.6	3.6	3.6	3.6	3.6
C5-17	Motor Inertia	kgm^2	0.054	0.063	0.113	0.137	0.252	0.304	0.41	0.55
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.083	0.079	0.118	0.105	0.157	0.156	0.172	0.169
n5-02	Motor Inertia Acceleration Time	s	0.083	0.079	0.118	0.105	0.157	0.156	0.172	0.169
n8-49	Heavy Load Id Current	%	-14.5	-16.1	-11.8	-10.5	-15.6	-17.4	-21.7	-17.3

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.30 SST4 Series Motor Code Setting for Specification of 400 V at 1450 min^{-1} (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)					
E5-01	PM Motor Code Selection	-	2347	2348	2349	234A	234C	234D
	Voltage Class	V	400	400	400	400	400	400
	Capacity	kW	90	110	132	160	200	250
	Motor Rotation Speed	min^{-1}	1450	1450	1450	1450	1450	1450
E5-02	PM Motor Rated Power	kW	90.00	110.00	132.00	160.00	200.00	250.00
E5-03	PM Motor Rated Current (FLA)	A	153.1	191.7	226.0	268.8	331.3	422.9
E5-04	PM Motor Pole Count	-	6	6	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	0.024	0.015	0.011	0.007	0.006	0.003
E5-06	PM d-axis Inductance (mH/phase)	mH	2.20	1.34	1.23	0.92	0.84	0.61
E5-07	PM q-axis Inductance (mH/phase)	mH	3.23	2.16	1.67	1.30	1.25	0.89
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	708.0	637.8	677.0	661.7	687.1	655.9
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min^{-1}	0.0	0.0	0.0	0.0	0	0.0
E1-04	Maximum Output Frequency	Hz	72.5	72.5	72.5	72.5	72.5	72.5
E1-05	Maximum Output Voltage	V	380.0	380.0	380.0	380.0	380.0	380.0
E1-06	Base Frequency	Hz	72.5	72.5	72.5	72.5	72.5	72.5
E1-09	Minimum Output Frequency	Hz	3.6	3.6	3.6	3.6	3.6	3.6
C5-17	Motor Inertia	kgm^2	0.82	0.96	1.60	1.95	2.82	3.70
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.210	0.201	0.279	0.281	0.325	0.341
n5-02	Motor Inertia Acceleration Time	s	0.210	0.201	0.279	0.281	0.325	0.341
n8-49	Heavy Load Id Current	%	-19.6	-24.1	-15.1	-17.0	-19.8	-19.3

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.31 SST4 Series Motor Code Setting for Specification of 200 V at 1150 min^{-1} (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)							
E5-01	PM Motor Code Selection	-	2402	2403	2405	2406	2408	240A	240B	240D
	Voltage Class	V	200	200	200	200	200	200	200	200
	Capacity	kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11
	Motor Rotation Speed	min^{-1}	1150	1150	1150	1150	1150	1150	1150	1150
E5-02	PM Motor Rated Power	kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11.0
E5-03	PM Motor Rated Current (FLA)	A	1.77	3.44	5.94	9.17	14.79	20.21	27.40	39.0
E5-04	PM Motor Pole Count	-	6	6	6	6	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	2.680	1.520	1.071	0.542	0.362	0.295	0.162	0.115
E5-06	PM d-axis Inductance (mH/phase)	mH	30.55	15.29	17.48	11.98	8.60	9.54	5.31	4.44
E5-07	PM q-axis Inductance (mH/phase)	mH	42.71	24.28	22.51	15.51	10.69	13.84	8.26	5.68
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	313.1	313.1	345.3	342.9	363.8	384.3	379.9	370.2

No.	Name	Unit	Motor Code (setting value of E5-01)							
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min^{-1}	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E1-04	Maximum Output Frequency	Hz	57.5	57.5	57.5	57.5	57.5	57.5	57.5	57.5
E1-05	Maximum Output Voltage	V	190.0	190.0	190.0	190.0	190.0	190.0	190.0	190.0
E1-06	Base Frequency	Hz	57.5	57.5	57.5	57.5	57.5	57.5	57.5	57.5
E1-09	Minimum Output Frequency	Hz	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
C5-17	Motor Inertia	kgm^2	0.0022	0.0042	0.0081	0.0133	0.0168	0.027	0.044	0.054
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.080	0.081	0.078	0.088	0.066	0.070	0.085	0.071
n5-02	Motor Inertia Acceleration Time	s	0.080	0.081	0.078	0.088	0.066	0.070	0.085	0.071
n8-49	Heavy Load Id Current	%	-8.4	-11.0	-10.7	-10.7	-9.4	-22.5	-22.2	-16.7

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.32 SST4 Series Motor Code Setting for Specification of 200 V at 1150 min^{-1} (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)							
E5-01	PM Motor Code Selection	-	240E	240F	2410	2412	2413	2414	2415	2416
	Voltage Class	V	200	200	200	200	200	200	200	200
	Capacity	kW	15	18	22	30	37	45	55	75
	Motor Rotation Speed	min^{-1}	1150	1150	1150	1150	1150	1150	1150	1150
E5-02	PM Motor Rated Power	kW	15	18.50	22.00	30.00	37.00	45.00	55.00	75.00
E5-03	PM Motor Rated Current (FLA)	A	55.9	65.4	77.0	103.5	126.0	153.1	188.5	260.4
E5-04	PM Motor Pole Count	-	6	6	6	6	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	0.083	0.065	0.052	0.035	0.026	0.019	0.013	0.009
E5-06	PM d-axis Inductance (mH/phase)	mH	3.50	2.92	2.55	2.03	1.59	1.24	0.98	0.70
E5-07	PM q-axis Inductance (mH/phase)	mH	4.23	3.79	3.22	2.46	1.92	1.64	1.37	0.97
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	364.5	404.5	445.1	444.4	447.3	470.8	422.4	418.3
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min^{-1}	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E1-04	Maximum Output Frequency	Hz	57.5	57.5	57.5	57.5	57.5	57.5	57.5	57.5
E1-05	Maximum Output Voltage	V	190.0	190.0	190.0	190.0	190.0	190.0	190.0	190.0
E1-06	Base Frequency	Hz	57.5	57.5	57.5	57.5	57.5	57.5	57.5	57.5
E1-09	Minimum Output Frequency	Hz	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
C5-17	Motor Inertia	kgm^2	0.063	0.113	0.137	0.252	0.304	0.410	0.55	0.82
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.061	0.089	0.090	0.122	0.119	0.132	0.145	0.159
n5-02	Motor Inertia Acceleration Time	s	0.061	0.089	0.090	0.122	0.119	0.132	0.145	0.159
n8-49	Heavy Load Id Current	%	-13.7	-15.2	-10.9	-9.8	-9.3	-11.5	-17.7	-17.1

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.33 SST4 Series Motor Code Setting for Specification of 400 V at 1150 min^{-1} (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)						
E5-01	PM Motor Code Selection	-	2432	2433	2435	2436	2438	243A	243B
	Voltage Class	V	400	400	400	400	400	400	400
	Capacity	kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5
	Motor Rotation Speed	min^{-1}	1150	1150	1150	1150	1150	1150	1150
E5-02	PM Motor Rated Power	kW	0.4	0.75	1.5	2.2	3.7	5.5	7.5
E5-03	PM Motor Rated Current (FLA)	A	0.89	1.72	3.02	4.58	7.40	10.21	13.75
E5-04	PM Motor Pole Count	-	6	6	6	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	10.720	6.080	4.336	2.143	1.428	1.199	0.648
E5-06	PM d-axis Inductance (mH/phase)	mH	122.20	61.16	70.24	46.20	33.87	41.67	21.24
E5-07	PM q-axis Inductance (mH/phase)	mH	170.80	97.12	90.04	60.28	42.98	69.15	33.04
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	626.1	626.1	703.1	727.6	699.0	861.5	759.7
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min^{-1}	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E1-04	Maximum Output Frequency	Hz	57.5	57.5	57.5	57.5	57.5	57.5	57.5
E1-05	Maximum Output Voltage	V	380.0	380.0	380.0	380.0	380.0	380.0	380.0
E1-06	Base Frequency	Hz	57.5	57.5	57.5	57.5	57.5	57.5	57.5
E1-09	Minimum Output Frequency	Hz	2.9	2.9	2.9	2.9	2.9	2.9	2.9
C5-17	Motor Inertia	kgm^2	0.0022	0.0042	0.0081	0.0133	0.0168	0.027	0.044
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.080	0.081	0.078	0.088	0.066	0.070	0.085
n5-02	Motor Inertia Acceleration Time	s	0.080	0.081	0.078	0.088	0.066	0.070	0.085
n8-49	Heavy Load Id Current	%	-8.4	-11.0	-9.9	-9.0	-11.4	-23.2	-22.1

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.34 SST4 Series Motor Code Setting for Specification of 400 V at 1150 min^{-1} (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)						
E5-01	PM Motor Code Selection	-	243D	243E	243F	2440	2442	2443	2444
	Voltage Class	V	400	400	400	400	400	400	400
	Capacity	kW	11	15	18	22	30	37	45
	Motor Rotation Speed	min^{-1}	1150	1150	1150	1150	1150	1150	1150
E5-02	PM Motor Rated Power	kW	11.0	15	18.50	22.00	30.00	37.00	45.00
E5-03	PM Motor Rated Current (FLA)	A	19.5	27.7	32.7	39.2	51.8	63.0	76.6
E5-04	PM Motor Pole Count	-	6	6	6	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	0.460	0.325	0.260	0.209	0.140	0.106	0.076
E5-06	PM d-axis Inductance (mH/phase)	mH	17.76	12.83	11.68	10.09	8.12	6.43	4.96
E5-07	PM q-axis Inductance (mH/phase)	mH	22.72	17.19	15.16	16.25	9.84	7.71	6.56
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	740.4	716.6	809.1	786.2	888.8	857.7	941.6

No.	Name	Unit	Motor Code (setting value of E5-01)						
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min^{-1}	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E1-04	Maximum Output Frequency	Hz	57.5	57.5	57.5	57.5	57.5	57.5	57.5
E1-05	Maximum Output Voltage	V	380.0	380.0	380.0	380.0	380.0	380.0	380.0
E1-06	Base Frequency	Hz	57.5	57.5	57.5	57.5	57.5	57.5	57.5
E1-09	Minimum Output Frequency	Hz	2.9	2.9	2.9	2.9	2.9	2.9	2.9
C5-17	Motor Inertia	kgm^2	0.054	0.063	0.113	0.137	0.252	0.304	0.410
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.071	0.061	0.089	0.090	0.122	0.119	0.132
n5-02	Motor Inertia Acceleration Time	s	0.071	0.061	0.089	0.090	0.122	0.119	0.132
n8-49	Heavy Load Id Current	%	-16.7	-20.2	-15.2	-27.7	-9.8	-10.2	-11.5

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

Table 3.35 SST4 Series Motor Code Setting for Specification of 400 V at 1150 min^{-1} (r/min)

No.	Name	Unit	Motor Code (setting value of E5-01)						
E5-01	PM Motor Code Selection	-	2445	2446	2447	2448	2449	244A	244C
	Voltage Class	V	400	400	400	400	400	400	400
	Capacity	kW	55	75	90	110	132	160	200
	Motor Rotation Speed	min^{-1}	1150	1150	1150	1150	1150	1150	1150
E5-02	PM Motor Rated Power	kW	55.00	75.00	90.00	110.00	132.00	160.00	200.00
E5-03	PM Motor Rated Current (FLA)	A	93.1	128.1	153.1	186.5	221.9	269.8	336.5
E5-04	PM Motor Pole Count	-	6	6	6	6	6	6	6
E5-05	PM Motor Resistance (ohms/phase)	Ω	0.051	0.032	0.026	0.015	0.012	0.009	0.007
E5-06	PM d-axis Inductance (mH/phase)	mH	3.99	2.97	2.44	1.87	1.49	1.41	1.22
E5-07	PM q-axis Inductance (mH/phase)	mH	5.39	3.90	3.23	2.46	2.08	1.88	1.51
E5-09	PM Back-EMF Vpeak (mV/(rad/s))	mVs/rad	853.8	829.6	835.6	833.4	848.6	889.1	915.0
E5-24	PM Back-EMF L-L Vrms (mV/rpm)	mV/min^{-1}	0.0	0.0	0.0	0.0	0.0	0.0	0.0
E1-04	Maximum Output Frequency	Hz	57.5	57.5	57.5	57.5	57.5	57.5	57.5
E1-05	Maximum Output Voltage	V	380.0	380.0	380.0	380.0	380.0	380.0	380.0
E1-06	Base Frequency	Hz	57.5	57.5	57.5	57.5	57.5	57.5	57.5
E1-09	Minimum Output Frequency	Hz	2.9	2.9	2.9	2.9	2.9	2.9	2.9
C5-17	Motor Inertia	kgm^2	0.55	0.82	0.96	1.60	1.95	2.82	3.70
L3-24 *1	Motor Accel Time @ Rated Torque	s	0.145	0.159	0.155	0.211	0.214	0.256	0.268
n5-02	Motor Inertia Acceleration Time	s	0.145	0.159	0.155	0.211	0.214	0.256	0.268
n8-49	Heavy Load Id Current	%	-15.9	-15.7	-15.7	-14.7	-16.5	-14.1	-10.3

*1 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

4

Mechanical and Electrical

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 270
4.2 Installation Environment 272
4.3 Removing/Reattaching Covers 273
4.4 Electrical Installation 278
4.5 Main Circuit Wiring 282
4.6 Control Circuit Wiring 289
4.7 Control I/O Connections 298
4.8 Connect the Drive to a PC 302
4.9 Protect the Drive during Failures 303

4.1 Section Safety

⚠WARNING

Electrical Shock Hazard

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

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.

When you install the drive in an enclosure, use a cooling fan or cooler to decrease the temperature around the drive. Make sure that the intake air temperature to the drive is 50 °C (122 °F) or less for IP20 open chassis type drives, and 40 °C (104 °F) or less for UL Type 1 enclosed wall-mounted drives.

If the air temperature is too hot, the drive can become too hot and cause a fire and serious injury or death.

Crush Hazard

Only approved personnel can operate a crane or hoist to move the drive.

If unapproved personnel operate a crane or hoist, it can cause serious injury or death from falling equipment.

Before you hang the drive vertically, use screws to correctly attach the drive front cover and other drive components.

If you do not secure the front cover, it can fall and cause minor injury.

When you use a crane or hoist to lift the drive during installation or removal, prevent more than 1.96 m/s² (0.2 G) vibration or impact.

Too much vibration or impact can cause serious injury or death from falling equipment.

When you lift the drive during installation or removal, do not try to turn the drive over and do not ignore the hanging drive.

If you move a hanging drive too much or if you ignore it, the drive can fall and 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.

⚠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

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.

Obey correct electrostatic discharge (ESD) procedures when you touch the drive.

Incorrect ESD procedures can cause damage to the drive circuitry.

NOTICE

Install vibration-proof rubber on the base of the motor or use the frequency jump function in the drive to prevent specific frequencies that vibrate the motor.

Motor or system resonant vibration can occur in fixed speed machines that are converted to variable speed. Too much vibration can cause damage to equipment.

You can use the drive with an explosion-proof motor, but the drive is not explosion-proof. Install the drive only in the environment shown on the nameplate.

If you install the drive in a dangerous environment, it can cause damage to the drive.

Do not lift the drive with the covers removed.

If the drive does not have covers, you can easily cause damage to the internal parts of the drive.

4.2 Installation Environment

The installation environment is important for the lifespan of the product and to make sure that the drive performance is correct. Make sure that the installation environment agrees with these specifications.

Environment	Conditions
Area of Use	Indoors
Power Supply	Overvoltage Category III
Ambient Temperature Setting	Open chassis type (IP20): -10°C to +50 °C (14 °F to 122 °F) Enclosed wall-mounted type (UL Type 1): -10 °C to +40 °C (14 °F to 104 °F) • Drive reliability is better in environments that do not have wide temperature fluctuations. • When installing 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 open-chassis type (IP20) drives at up to 60 °C (140 °F) by derating the output current. • You can use enclosed wall-mounted type (UL Type 1) drives at up to 50 °C (122 °F) by derating the output current.
Humidity	95%RH or less Do not let condensation form on the drive.
Storage Temperature	-20 °C to +70 °C (-4 °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 or flammable materials. • Harmful gas or fluids • Salt • Direct sunlight Keep wood and other flammable materials away from the drive.
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: • Installing the drive at 2000 m (6562 ft) or lower • Installing the drive between 2000 m to 4000m (6562 ft to 13123 ft) and grounding the neutral point on the power supply. Contact Yaskawa or your nearest sales representative when not grounding the neutral point.
Vibration	• 10 to 20 Hz: 1 G (9.8 m/s^2, 32.15 ft/s^2) • 20 Hz to 55 Hz: 2004 to 2211, 4002 to 4168: 0.6 G (5.9 m/s^2, 19.36 ft/s^2) 2257 to 2415, 4208 to 4720: 0.2 G (2.0 m/s^2, 6.56 ft/s^2)
Installation Orientation	Install the drive vertically for sufficient airflow to cool the drive.

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.*

Note:

Do not put drive peripheral devices, transformers, or other electronics near the drive. Shield the drive from electrical interference if components must be near the drive. The drive or the devices around the drive may malfunction due to electrical interference.

4.3 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 to Table 4.1 for more information.

Table 4.1 Procedures to Remove Covers by Drive Model

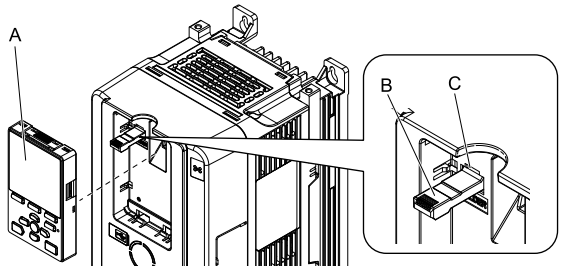
Model	Procedure	Reference
2004 - 2211 4002 - 4168	Procedure A	273
2257 - 2415 4208 - 4720	Procedure B	274

◆ 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. The drive has internal capacitors that stay charged after you de-energize the drive.*

■ Remove the Front Cover

1. Remove the keypad and the keypad connector, then insert the end of the keypad connector that has the tab into the keypad connector holder on the front cover.



A - Keypad
B - Keypad connector
C - Holder

Figure 4.1 Remove the Keypad and Keypad Connector

2. Loosen the front cover screws.

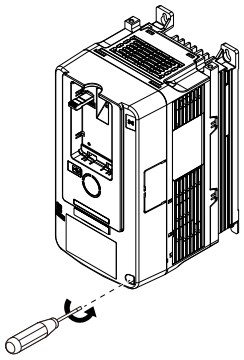


Figure 4.2 Loosen the Front Cover Screws

3. Push on the tab in the side of the front cover then pull the front cover forward to remove it from the drive.

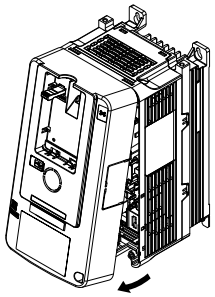


Figure 4.3 Remove the Front Cover

■ Reattach the Front Cover

1. Wire the drive and other peripheral devices.
2. Reverse the steps to reattach the cover.

Note:
- Wire the grounding terminals first, main circuit terminals next, and control circuit terminals last.
- Make sure that you do not pinch wires or signal lines between the front 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 lb.·in. to 11.77 lb.·in.).

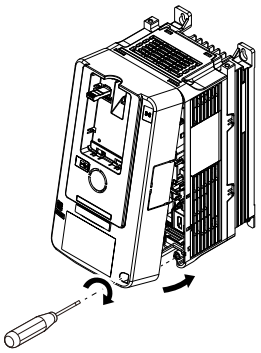


Figure 4.4 Reattach the Front Cover

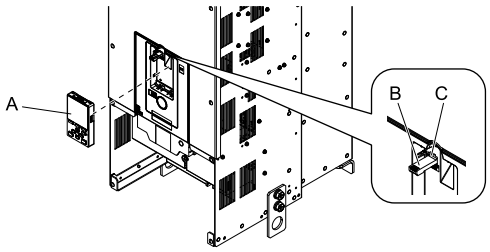
3. Reattach the keypad to the original position.

◆ 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. The drive has internal capacitors that stay charged after you de-energize the drive.*

■ Remove the Front Cover

1. Remove the terminal cover, keypad, and keypad connector, then insert the end of the keypad connector that has the tab into the keypad connector holder on the front cover.



A - Keypad
B - Keypad connector
C - Connector holder

Figure 4.5 Remove the Terminal Cover, Keypad, and Keypad Connector

2. Loosen the front cover screws.

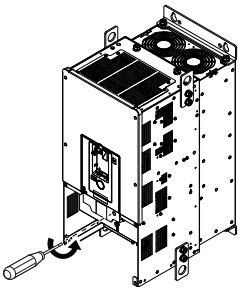
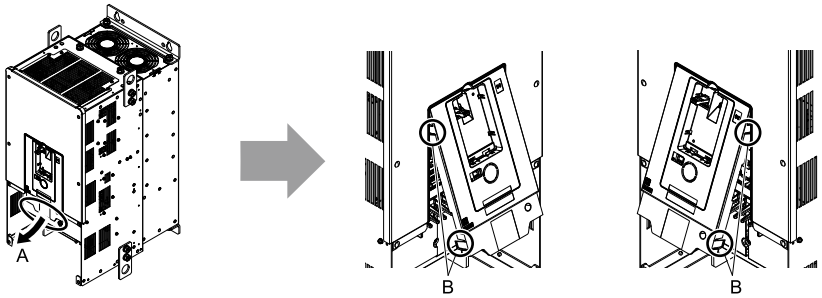


Figure 4.6 Loosen the Front Cover Screws

3. Push on the four tabs found on each side of the front cover, then pull the front cover forward to remove it from the drive.



A - Pull forward to remove the front cover.
B - Unhook the tabs found on the sides of the front cover.

Figure 4.7 Pull Forward to Remove the Front Cover

4. Remove the front cover from the drive.

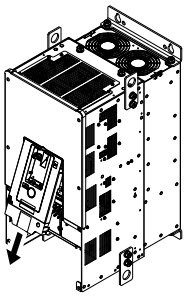


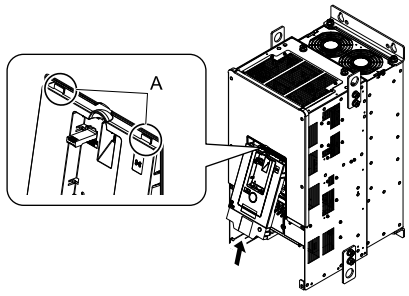
Figure 4.8 Remove the Front Cover

■ Reattach the Front Cover

Wire the drive and other peripheral devices then reattach the front cover.

Note:
Wire the grounding terminals first, main circuit terminals next, and control circuit terminals last.

1. Move the front cover to connect the hooks at the top of the front cover to the drive.



A - Hooks

Figure 4.9 Reattach the Front Cover

2. Move the front cover until it clicks into position while pushing on the hooks on the left and right sides of the front cover.

Note:
Make sure that you do not pinch wires or signal lines between the front cover and the drive before you reattach the cover.

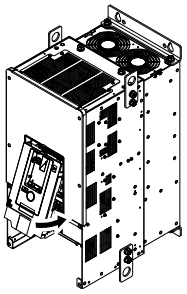


Figure 4.10 Reattach the Front Cover

3. Reattach the keypad to the original position.

■ 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.*

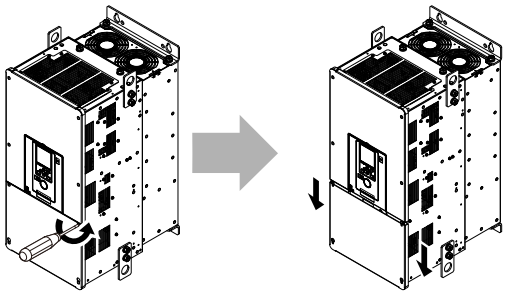


Figure 4.11 Loosen the Terminal Cover Mounting Screws

2. Pull the terminal cover away from the drive.

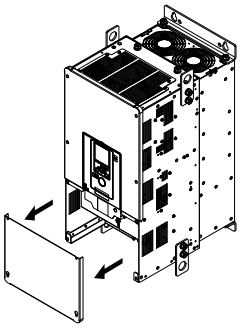


Figure 4.12 Remove the Terminal Cover

■ Reattach the Terminal Cover

Wire the drive and other peripheral devices then reattach the terminal cover.

Note:
- Wire the grounding terminals first, main circuit terminals next, and control circuit terminals last.
- 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).

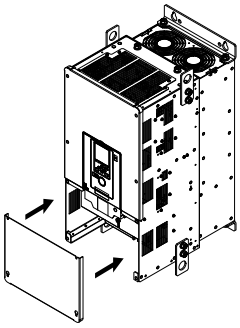


Figure 4.13 Reattach the Terminal Cover

4.4 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. The drive has internal capacitors that stay charged after you de-energize the drive.*

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. 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 4.14.

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] (default). 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 suited for circuits that supply not more than 100,000 RMS symmetrical amperes, 240 Vac maximum (200 V Class), 480 Vac maximum (400 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.

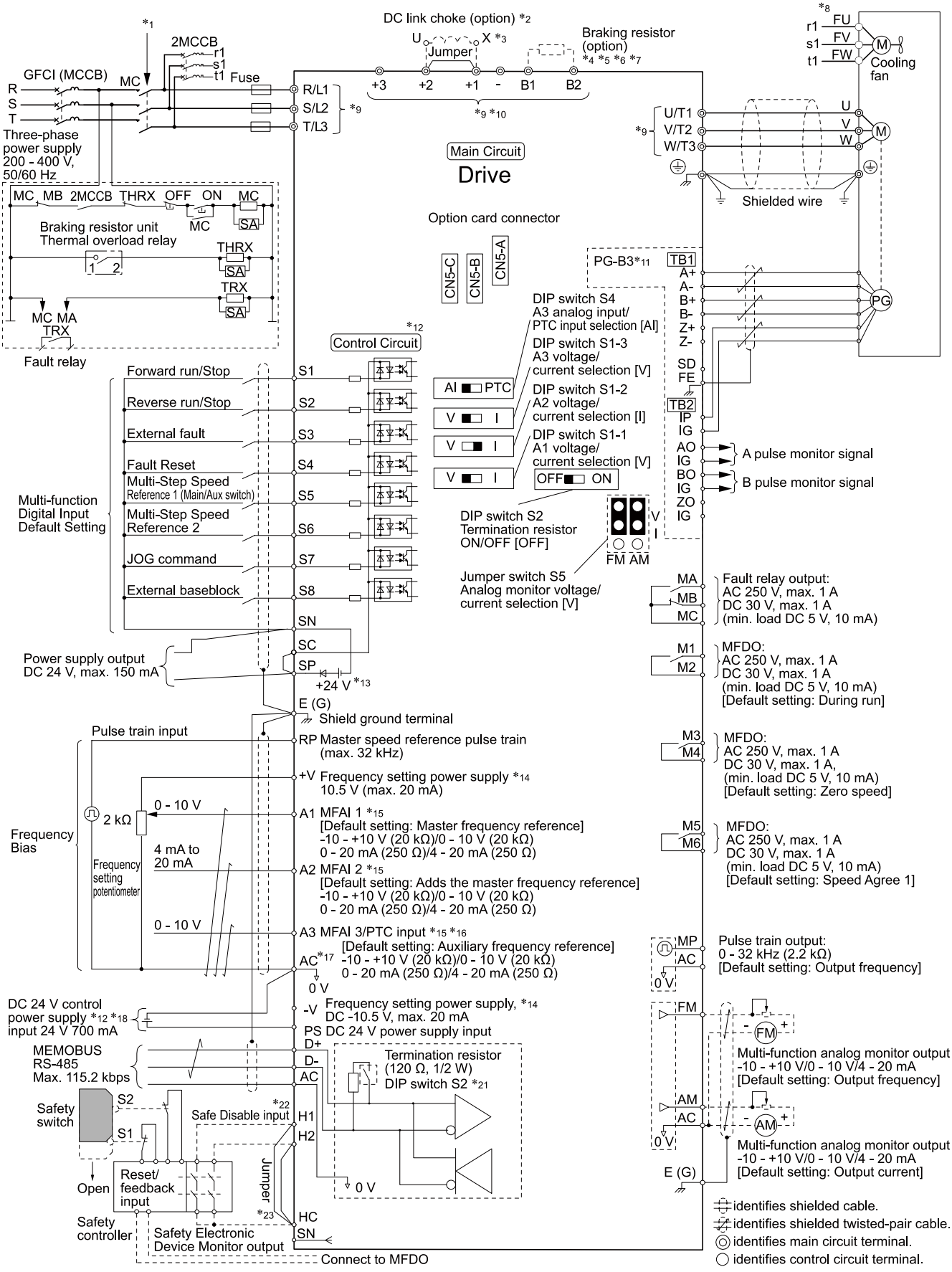


Figure 4.14 Standard Drive Connection Diagram

*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 When you install a DC link choke, you must remove the jumper between terminals +1 and +2.

*3 Models 2110 to 2415 and 4060 to 4720 have a DC link choke.

*4 When you use a regenerative converter, regenerative unit, or braking unit, set *L8-55 = 0 [Internal DB TransistorProtection = Disable]*. If *L8-55 = 1 [Protection Enabled]*, the drive will detect *rF [Braking Resistor Fault]*.

*5 When you use a regenerative converter, regenerative unit, braking unit, braking resistor, or braking resistor unit, set *L3-04 = 0 [Stall Prevention during Decel = Disabled]* If *L3-04 = 1 [General Purpose]*, the drive could possibly not stop in the specified deceleration time.

*6 When you use an ERF-type braking resistor, set *L8-01 = 1 [3% ERF DB Resistor Protection = Enabled]* and set a wiring sequence to de-energize the drive with the fault relay output.

*7 When you connect a braking unit (CDBR series) or a braking resistor unit (LKEB series) to drive models 2110, 2138, and 4103, make sure that you use wires that are in the range of the applicable gauges for the drive. A junction terminal is necessary to connect wires that are less than the applicable gauge to the drive. Contact Yaskawa or your nearest sales representative for more information about selection and installation of the junction terminal.

*8 Cooling fan wiring is not necessary for self-cooling motors.

*9 The number of terminals is different for different models.

- R/L1, S/L2, T/L3, U/T1, V/T2, W/T3: There are 2 screws for each terminal on models 4477 - 4720.
- +3: Models 2169 - 2415 and 4208 - 4720 only. There are 2 screws for this terminal on models 4477 - 4720.
- +2: Models 2004 - 2082 and 4002 - 4044 only.
- +1, -: There are 2 screws for each terminal on models 2169, 2211, 4140, 4168, and 4477 - 4720.
- B1, B2: Models 2004 - 2138 and 4002 - 4168 only.

*10 Connect peripheral options to terminals -, +1, +2, B1, and B2.

WARNING! *Fire Hazard. Only connect factory-recommended devices or circuits to drive terminals B1, B2, -, +1, +2, and +3 terminals. Do not connect AC power to these terminals. Incorrect wiring can cause damage to the drive and serious injury or death from fire.*

*11 Encoder circuit wiring (wiring to PG-B3 option) is not necessary for applications that do not use motor speed feedback.

*12 Connect a 24 V power supply to terminals PS-AC to operate the control circuit while the main circuit power supply is OFF.

*13 Install the jumpers between terminals SC-SP and SC-SN to set the MFDI power supply (sinking/sourcing mode or internal/external power supply).

NOTICE: *Do not close the circuit between terminals SP and SN. A closed circuit between these terminals will cause damage to the drive.*

- Sinking Mode: Install a jumper between terminals SC and SP.

  NOTICE: *Do not close the circuit between terminals SC and SN. A closed circuit between these terminals will cause damage to the drive.*

- Sourcing Mode: Install a jumper between terminals SC and SN.

  NOTICE: *Do not close the circuit between terminals SC and SP. A closed circuit between these terminals will cause damage to the drive.*

- External power supply: No jumper necessary between terminals SC-SN and terminals SC-SP.

*14 The maximum output current capacity for terminals +V and -V on the control circuit is 20 mA.

NOTICE: *Do not install a jumper between terminals +V, -V, and AC. A closed circuit between these terminals will cause damage to the drive.*

*15 DIP switches S1-1 to S1-3 set terminals A1 to A3 for voltage or current input. The default setting for S1-1 and S1-3 is voltage input (“V” side). The default setting for S1-2 is current input (“I” side).

*16 DIP switch S4 sets terminal A3 for analog or PTC input. Set DIP switch S1-3 to the “V” side, and set *H3-05 = 0 [Terminal A3 Signal Level Select = 0 to 10V (Lower Limit at 0)]* to set terminal A3 for PTC input with DIP switch S4.

*17 Do not ground the control circuit terminals AC or connect them to the drive.

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.*

*18 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.*

*19 Use multi-function analog monitor outputs with analog frequency meters, ammeters, voltmeters, and wattmeters. Do not use monitor outputs with feedback-type signal devices.

*20 Jumper switch S5 sets terminal FM and AM for voltage or current output. The default setting for S5 is voltage output (“V” side).

*21 Set DIP switch S2 to “ON” to enable the termination resistor in the last drive in a MEMOBUS/Modbus network.

*22 Use only SOURCE Mode for Safe Disable input.

*23 Disconnect the jumper between H1 and HC and H2 and HC to use the Safe Disable input.

4.5 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: *The drive can fail if users frequently turn the drive ON and OFF with the MC on the power source side to Run and Stop the drive. Incorrect operation can decrease the service life of the relay contacts and electrolytic capacitors. If you frequently use the magnetic contactor on the power source side to Run and Stop the drive, it can cause drive failure.*

Note:

Soldered wire connections can become loose over time and cause unsatisfactory drive performance.

◆ Main Circuit Terminal and Motor Wiring

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

WARNING! *Fire Hazard. Do not connect main power supply wiring to drive motor terminals U/T1, V/T2, and W/T3. Connect main power supply wiring to main circuit input terminals R/L1, S/L2, and T/L3. Incorrect wiring can cause serious injury or death from fire.*

WARNING! *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.*

NOTICE: *Do not connect phase-advancing capacitors, LC/RC noise filters, or leakage breakers (GFCI) to the motor circuit. If you connect these devices to the output circuits, it can cause damage to the drive and connected equipment.*

■ Cable Length Between Drive and Motor

When the wiring between the drive and the motor is too long, voltage drop along the motor cable can decrease motor torque, usually at low frequency output. If you connect motors in parallel with long motor cable, this is also a problem. Drive output current increases when the leakage current from the cable increases. An increase in leakage current can cause overcurrent and decrease the precision of the current detection.

Use the values in Table 4.2 to adjust the drive carrier frequency. When the system configuration makes the motor wiring distance more than 100 m (328 ft), do not use metal conduits or use isolated cables for each phase to decrease stray capacitance.

Table 4.2 Carrier Frequency against Cable Length Between Drive and Motor

Wiring distance between the drive and motor	50 m (164 ft) maximum	100 m (328 ft) maximum	More than 100 m (328 ft)
Carrier Frequency	15 kHz or less	5 kHz or less	2 kHz or less

Note:

- To set the carrier frequency in a drive that is operating more than one motor, calculate the cable length as the total distance of wiring to all connected motors.
- IN OLV/PM and AOLV/PM [*A1-02 = 5 and 6*], the maximum cable length is 100 m (328 ft).
- When you connect to a PM motor, it may be necessary to adjust the overcurrent detection *L8-27 [Overcurrent Detection Gain]*. For details, refer to *L8: Drive Protection on page 190*.

■ Ground Wiring

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

WARNING! *Electrical Shock Hazard. Make sure that the protective ground wire conforms to 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 10 mm² (copper wire) or 16 mm² (aluminum wire). If you do not obey the standards and regulations, it can cause serious injury or death. The leakage current of the drive will be more than 3.5 mA in drive models 4414 to 4720.*

WARNING! *Electrical Shock Hazard. Use a ground wire that complies with technical standards on electrical equipment and use the minimum length of ground wire. Incorrect equipment grounding can cause serious injury or death from dangerous electrical potentials on the equipment chassis.*

WARNING! *Electrical Shock Hazard.*
Correctly ground the ground terminals. Obey federal and local electrical wiring codes for correct grounding methods. The maximum grounding resistance is

- *200 V class: ground to 100 Ω or less*
- *400 V class: ground to 10 Ω or less*

If you touch electrical equipment that is not grounded, it can cause serious injury or death.

Note:

- Do not use the drive grounding wire for any other purposes than grounding the drive. Do not share the ground wire with other devices such as welding machines or large-current electrical equipment. Incorrect equipment grounding can cause incorrect operation of drives and equipment.
- To connect multiple drives to the same grounding circuit, follow the instructions in the instruction manual. Incorrect equipment grounding can cause incorrect operation of drives and equipment.

Refer to Figure 4.15 when installing multiple drives. Do not loop the grounding wire.

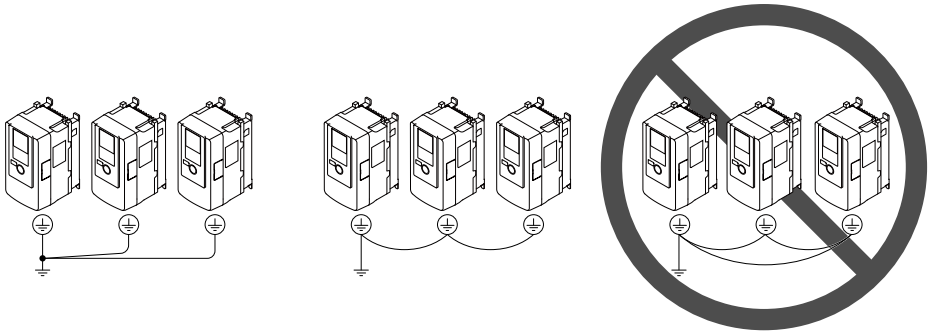


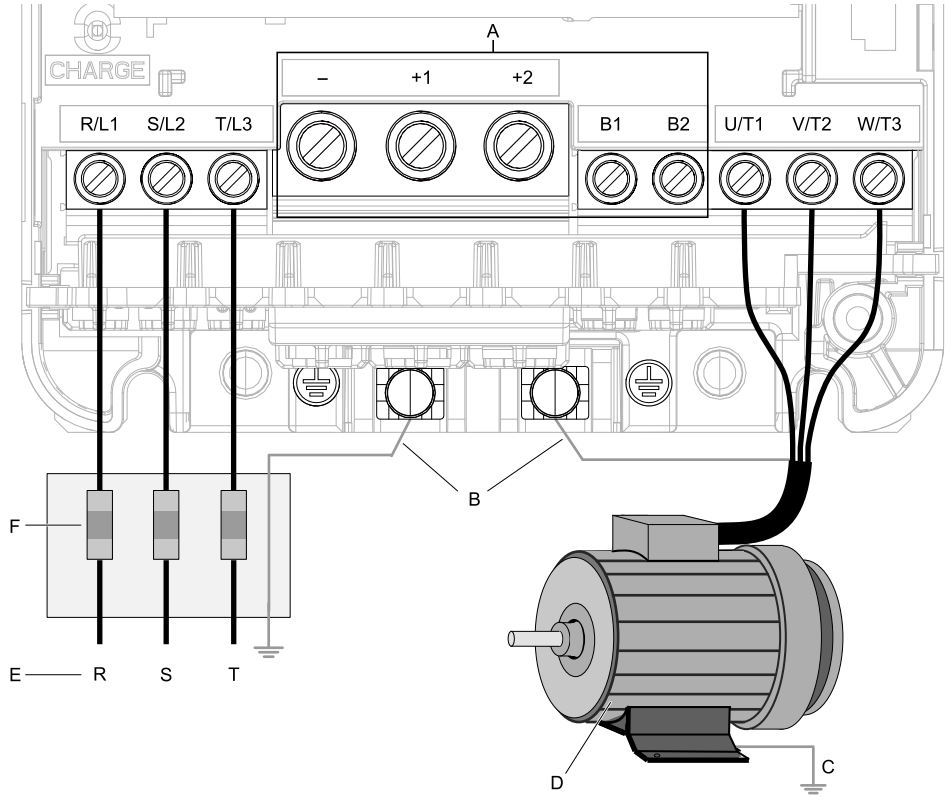
Figure 4.15 Wiring More than One Drive

■ Wiring the Main Circuit Terminal Block

WARNING! *Electrical Shock Hazard. Before you wire the main circuit terminals, make sure that MCCB and MC are OFF. If you touch electrical equipment when MCCB and MC are ON, it can cause serious injury or death.*

◆ 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, -, +1, +2, +3, B1, or B2 to the ground terminal. If you connect these terminals to earth ground, it can cause damage to the drive or serious injury or death.*



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)

Note:
The location of terminals are different for different drive models.

Figure 4.16 Wiring the Main Circuit and Motor

◆ Main Circuit Terminal Functions

Refer to Table 4.3 for the functions of drive main circuit terminals.

Table 4.3 Main Circuit Terminal Functions

Terminal	Name				Function
Model	2004 - 2082	2110 - 2138	2169 - 2415	-	
	4002 - 4044	4060 - 4168	4208 - 4414	4477 - 4720	
R/L1	Main circuit power supply input				To connect a commercial power supply.
S/L2					
T/L3					
U/T1	Drive output				To connect a motor.
V/T2					
W/T3					
B1	Braking resistor connection		-		To connect a braking resistor or braking resistor unit.
B2					

Terminal	Name				Function
Model	2004 - 2082	2110 - 2138	2169 - 2415	-	
	4002 - 4044	4060 - 4168	4208 - 4414	4477 - 4720	
+2	• DC power supply input (+1 and -) • DC reactor connection (+1 and +2)	-			To connect peripheral devices, for example: • DC power input • Braking unit • DC link choke **Note:** Remove the jumper between terminals +1 and +2 to connect a DC link choke.
+1		DC power supply input (+1 and -)			
-					
+3	-		• DC power supply input (+1 and -) • Braking unit connection (+3 and -)		
⏚	• 200 V: D class grounding (ground to 100 Ω or less) • 400 V: C class grounding (ground to 10 Ω or less)				To ground the drive.

Note:

Use terminals B1 and - to connect a CDBR-type control unit to drive models 2004 to 2138 and 4002 to 4168 that have built-in braking transistors.

◆ Main Circuit Terminal and Motor Wiring

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

WARNING! *Fire Hazard. Do not connect main power supply wiring to drive motor terminals U/T1, V/T2, and W/T3. Connect main power supply wiring to main circuit input terminals R/L1, S/L2, and T/L3. Incorrect wiring can cause serious injury or death from fire.*

WARNING! *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.*

NOTICE: *Do not connect phase-advancing capacitors, LC/RC noise filters, or leakage breakers (GFCI) to the motor circuit. If you connect these devices to the output circuits, it can cause damage to the drive and connected equipment.*

■ Cable Length Between Drive and Motor

When the wiring between the drive and the motor is too long, voltage drop along the motor cable can decrease motor torque, usually at low frequency output. If you connect motors in parallel with long motor cable, this is also a problem. Drive output current increases when the leakage current from the cable increases. An increase in leakage current can cause overcurrent and decrease the precision of the current detection.

Use the values in Table 4.4 to adjust the drive carrier frequency. When the system configuration makes the motor wiring distance more than 100 m (328 ft), do not use metal conduits or use isolated cables for each phase to decrease stray capacitance.

Table 4.4 Carrier Frequency against Cable Length Between Drive and Motor

Wiring distance between the drive and motor	50 m (164 ft) maximum	100 m (328 ft) maximum	More than 100 m (328 ft)
Carrier Frequency	15 kHz or less	5 kHz or less	2 kHz or less

Note:

- To set the carrier frequency in a drive that is operating more than one motor, calculate the cable length as the total distance of wiring to all connected motors.
- IN OLV/PM and AOLV/PM [*A1-02 = 5 and 6*], the maximum cable length is 100 m (328 ft).
- When you connect to a PM motor, it may be necessary to adjust the overcurrent detection *L8-27 [Overcurrent Detection Gain]*. For details, refer to *L8: Drive Protection on page 190*.

■ Ground Wiring

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

WARNING! *Electrical Shock Hazard. Make sure that the protective ground wire conforms to 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 10 mm² (copper wire) or 16 mm² (aluminum wire). If you do not obey the standards and regulations, it can cause serious injury or death. The leakage current of the drive will be more than 3.5 mA in drive models 4414 to 4720.*

WARNING! *Electrical Shock Hazard. Use a ground wire that complies with technical standards on electrical equipment and use the minimum length of ground wire. Incorrect equipment grounding can cause serious injury or death from dangerous electrical potentials on the equipment chassis.*

WARNING! *Electrical Shock Hazard.*
Correctly ground the ground terminals. Obey federal and local electrical wiring codes for correct grounding methods. The maximum grounding resistance is
- *200 V class: ground to 100 Ω or less*
- *400 V class: ground to 10 Ω or less*

If you touch electrical equipment that is not grounded, it can cause serious injury or death.

Note:
- Do not use the drive grounding wire for any other purposes than grounding the drive. Do not share the ground wire with other devices such as welding machines or large-current electrical equipment. Incorrect equipment grounding can cause incorrect operation of drives and equipment.
- To connect multiple drives to the same grounding circuit, follow the instructions in the instruction manual. Incorrect equipment grounding can cause incorrect operation of drives and equipment.

Refer to Figure 4.17 when installing multiple drives. Do not loop the grounding wire.

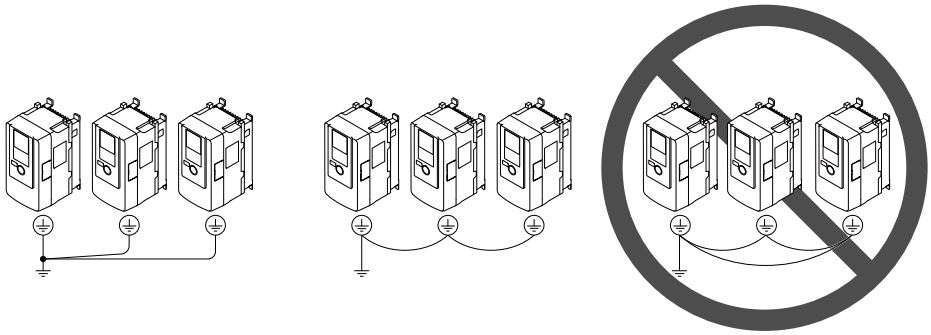


Figure 4.17 Wiring More than One Drive

■ Wiring the Main Circuit Terminal Block

WARNING! *Electrical Shock Hazard. Before you wire the main circuit terminals, make sure that MCCB and MC are OFF. If you touch electrical equipment when MCCB and MC are ON, it can cause serious injury or death.*

■ Main Circuit Configuration

The figures in this section show the different schematics of the drive main circuit The connections change when the drive capacity changes. The DC power supply for the main circuit also supplies power to the control circuit.

Note:

Drive models 2004A to 2415A and 4002A to 4720A do not have a built-in EMC filter.

WARNING! *Fire Hazard. Do not connect a braking resistor to terminals +1 or -. Use terminals B1 and B2 for the braking resistor connections. If you connect a braking resistor to the incorrect terminals, it can cause damage to the drive and braking circuit and serious injury or death.*

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

Model	Figure
2004 to 2082, 4002 to 4044	Figure 4.18
2110 to 2138, 4060 to 4168	Figure 4.19
2169 to 2415, 4208 to 4414	Figure 4.20
4477 - 4720	Figure 4.21

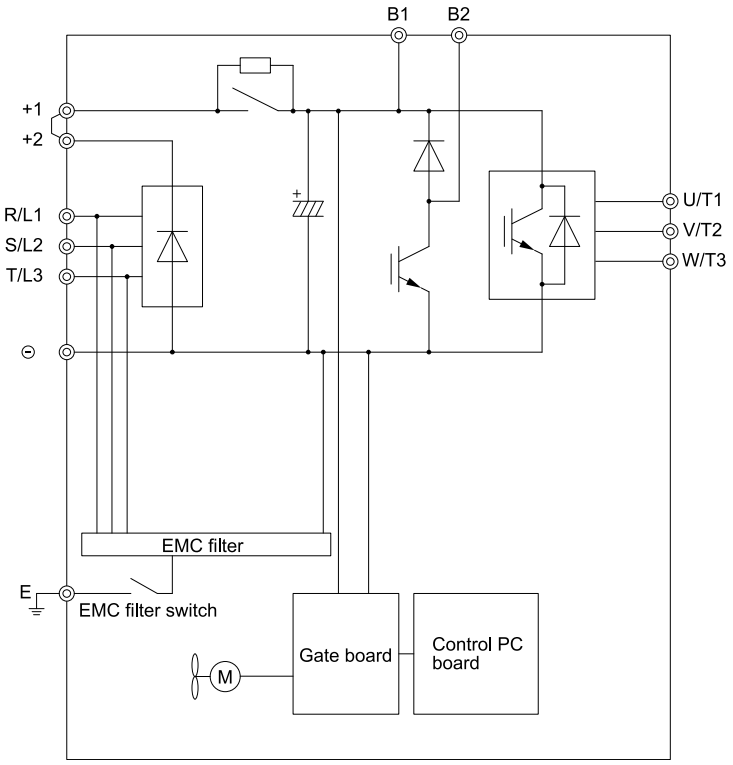


Figure 4.18 Drive Main Circuit Configuration

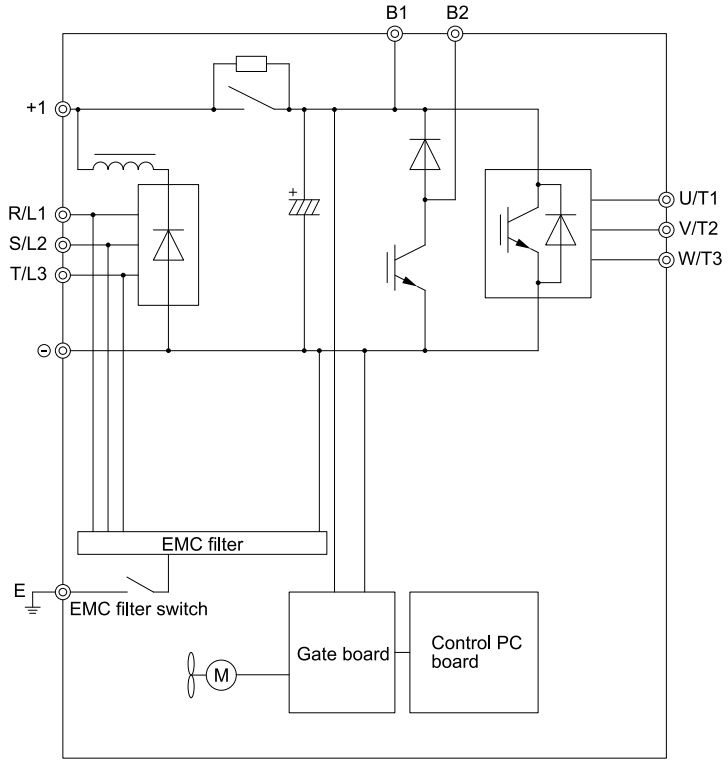


Figure 4.19 Drive Main Circuit Configuration

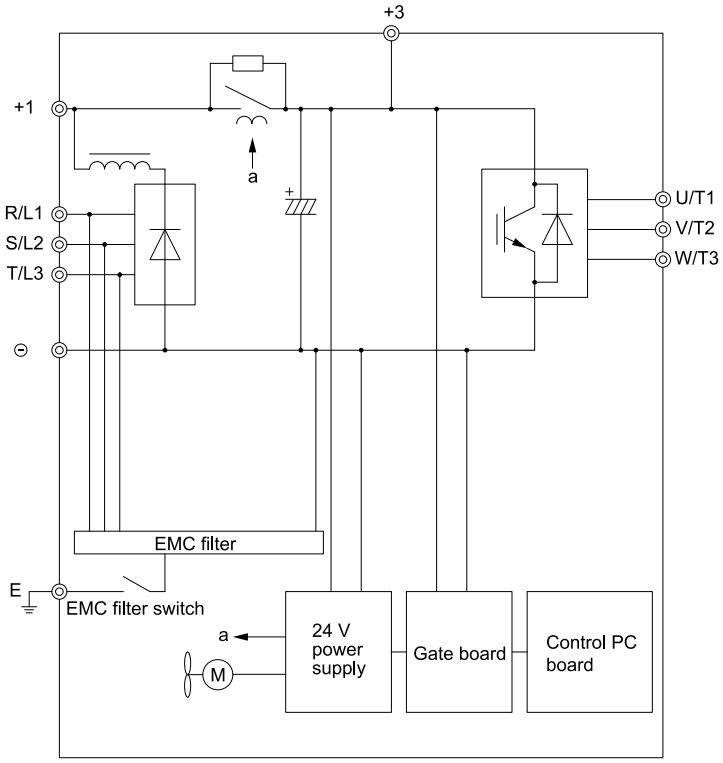


Figure 4.20 Drive Main Circuit Configuration

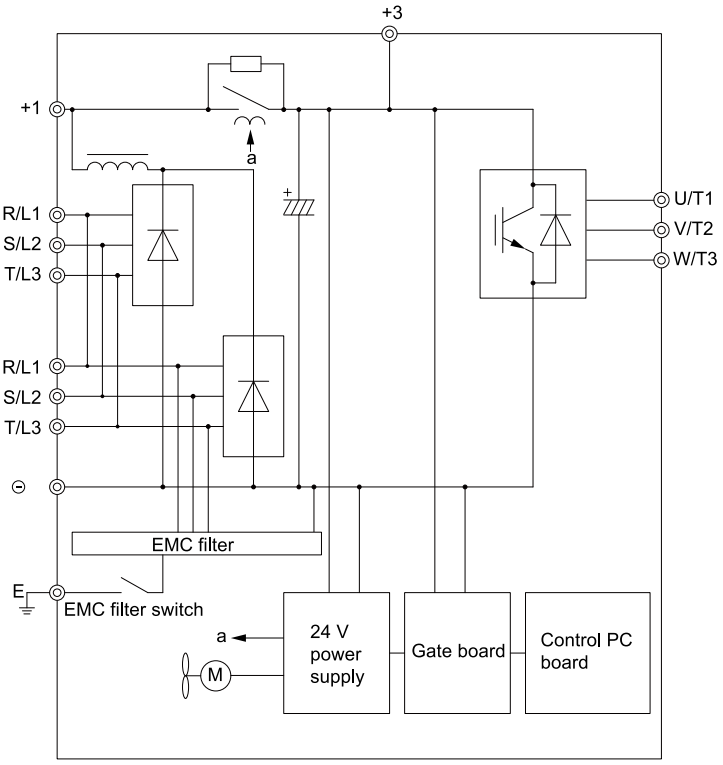


Figure 4.21 Drive Main Circuit Configuration

4.6 Control Circuit Wiring

This section gives information about wiring the control circuit.

◆ Control Circuit Connection Diagram

Wire the drive control circuit as shown in Figure 4.22.

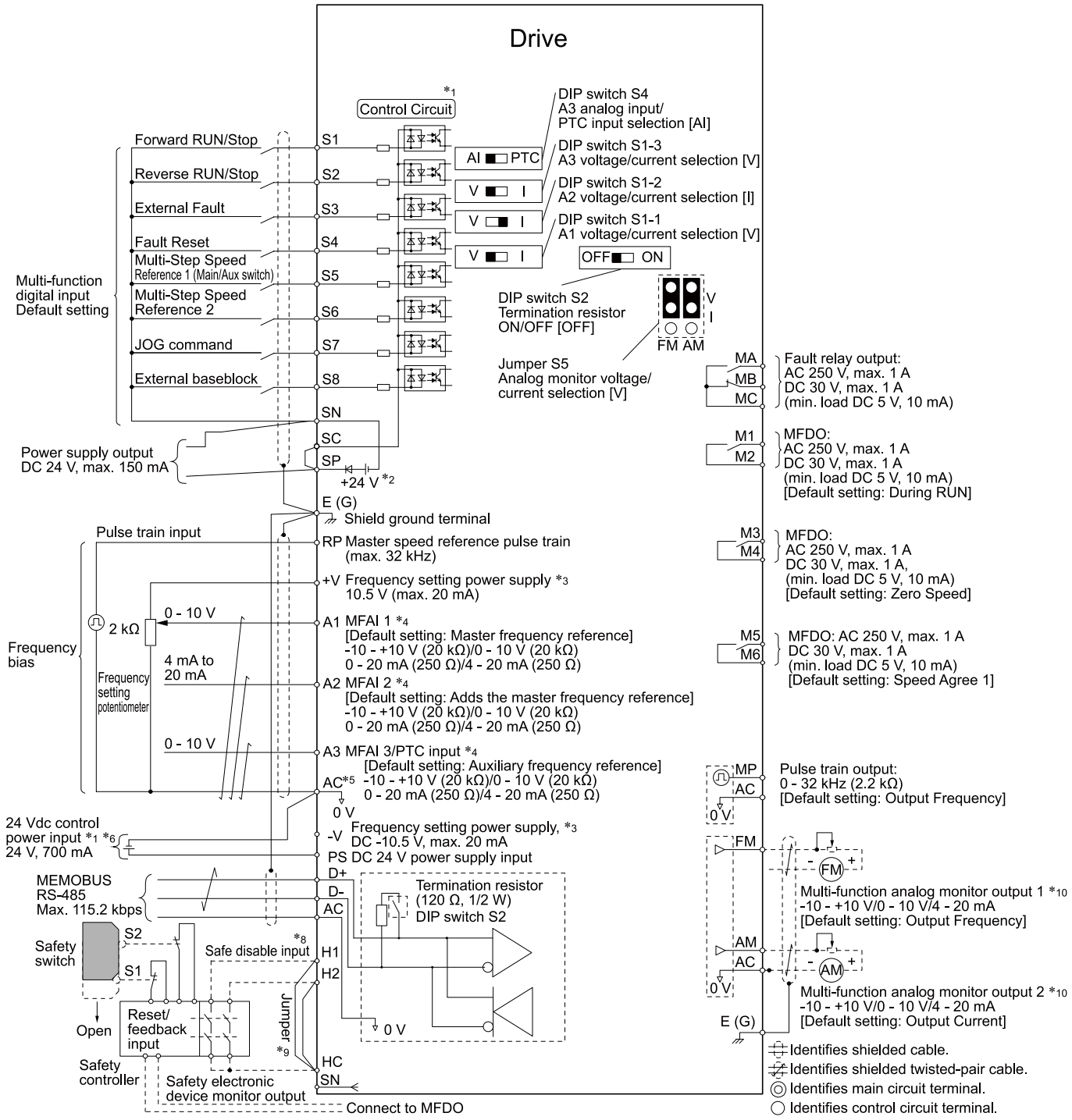


Figure 4.22 Control Circuit Connection Diagram

*1 To operate the control circuit while the main circuit power supply is OFF, connect a 24 V power supply input to terminal PS-AC.

*2 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).

NOTICE: *Do not close the circuit between terminals SP and SN. A closed circuit between these terminals will cause damage to the drive.*

- Sinking Mode: Install a jumper between terminals SC and SP.

  NOTICE: *Do not close the circuit between terminals SC and SN. A closed circuit between these terminals will cause damage to the drive.*

- Sourcing Mode: Install a jumper between terminals SC and SN.

  NOTICE: *Do not close the circuit between terminals SC and SP. A closed circuit between these terminals will cause damage to the drive.*

- External Power Supply: No jumper is necessary between terminals SC-SN and terminals SC-SP.

*3 The output current capacity of the +V and -V terminals on the control circuit is 20 mA.

NOTICE: *Do not install a jumper between terminals +V, -V, and AC. A closed circuit between these terminals will cause damage to the drive.*

*4 Set DIP switches S1-1 to S1-3 to select between a voltage or current input signal to terminals A1 to A3. The default setting for S1-1 and S1-3 is voltage input (“V” side). The default setting for S1-2 is current input (“I” side).

*5 Do not ground the control circuit terminals AC or connect them to the drive.

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 Do not connect terminals PS and AC inversely. Failure to obey will cause damage to the drive.

*7 Set DIP switch S2 to the ON position to enable the termination resistor in the last drive when you use MEMOBUS/Modbus communications.

*8 To use the internal power supply with the Safe Disable input, use sourcing mode.

*9 Disconnect the wire jumpers between H1 and HC and H2 and HC to use the Safe Disable input.

*10 Use multi-function analog monitor outputs with analog frequency meters, ammeters, voltmeters, and wattmeters. Do not use monitor outputs with feedback-type signal devices.

◆ 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: *The drive can fail if users frequently turn the drive ON and OFF with the MC on the power source side to Run and Stop the drive. Incorrect operation can decrease the service life of the relay contacts and electrolytic capacitors. If you frequently use the magnetic contactor on the power source side to Run and Stop the drive, it can cause drive failure.*

■ Input Terminals

Refer to Table 4.5 for a list of input terminals and functions.

Table 4.5 Multi-function Input Terminals

Type	Terminal	Name (Default)	Function (Signal Level)
Digital Inputs	S1	MFDI selection 1 (ON: Forward run OFF: Stop)	• 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:** *Do not close the circuit between terminals SC and SN. A closed circuit between these terminals will cause damage to the drive.* • Sourcing Mode: Install a jumper between terminals SC and SN. **NOTICE:** *Do not close the circuit between terminals SC and SP. A closed circuit between these terminals will cause damage to the drive.* • External power supply: No jumper necessary between terminals SC-SN and terminals SC-SP.
	S2	MFDI selection 2 (ON: Reverse run OFF: Stop)	
	S3	MFDI selection 3 (External fault (N.O.))	
	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 command)	
	S8	MFDI selection 8 (Baseblock command (N.O.))	
	SN	MFDI power supply 0 V	MFDI power supply, 24 V (maximum 150 mA) **NOTICE:** *Do not close the circuit between terminals SP and SN. A closed circuit between these terminals will cause damage to the drive.*
	SC	MFDI selection common	
	SP	MFDI power supply +24 Vdc	
Safe Disable Input	H1	Safe Disable input 1	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	RP	Master frequency reference pulse train input (Master frequency reference)	• Response frequency: 0 Hz to 32 kHz • H level duty: 30% to 70% • H level voltage: 3.5 V to 13.2 V • L level voltage: 0.0 V to 0.8 V • Input impedance: 3 kΩ
	+V	Power supply for frequency setting	10.5 V (allowable current 20 mA maximum)
	-V	Power supply for frequency setting	-10.5 V (allowable current 20 mA maximum)
	A1	MFAI1 (Master frequency reference)	Voltage input or current input Select terminal A1 with DIP switch S1-1 and *H3-01 [Terminal A1 Signal Level Select]*. Select terminal A2 with DIP switch S1-2 and *H3-09 [Terminal A2 Signal Level Select]* • -10 V to +10 V/-100% to +100% (input impedance: 20 kΩ) • 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)	
	A3	MFAI3/PTC input (Auxiliary frequency reference)	• Voltage input or current input Select using DIP switch S1-3 and *H3-05 [Terminal A3 Signal Level Select]*. – -10 V to +10 V/-100% to +100% (input impedance: 20 kΩ) – 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) • PTC input (Motor Overheat Protection) Set DIP switch S4 to "PTC" and set DIP switch S1-3 to "V" to set terminal A3 for PTC input.
	AC	Frequency reference common	0 V
	E (G)	Connecting shielded cable	-

■ Output Terminals

Refer to Table 4.6 and Table 4.7 for a list of output terminals and functions.

Table 4.6 Control Circuit Output Terminals

Type	Terminal	Name (Default)	Function (Signal Level)
Fault Relay Output	MA	N.O. output (Fault)	• Relay output • 30 Vdc, 10 mA to 1 A • 250 Vac, 10 mA to 1 A • Minimum load: 5 V, 10 mA (Reference value)
	MB	N.C. output (Fault)	
	MC	Digital output common	
MFDO	M1	MFDO (During Run)	• Relay output • 30 Vdc, 10 mA to 1 A • 250 Vac, 10 mA to 1 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 4.7 Control Circuit Monitor Output Terminals

Type	Terminal	Name (Default)	Function (Signal Level)
Monitor Output	MP	Pulse train output (Output frequency)	32 kHz (maximum) Refer to "Pulse Train Output" on page 298 for more information.
	FM	Analog monitor output 1 (Output frequency)	Select voltage or current output. • 0 V to 10 V/0% to 100% • -10 V to +10 V/-100% 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	Analog monitor output 2 (Output current)	
	AC	Monitor common	0 V

■ External Power Supply Input Terminals

Refer to Table 4.8 for a list of the functions of the external power supply input terminals.

Table 4.8 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

■ Serial Communication Terminals

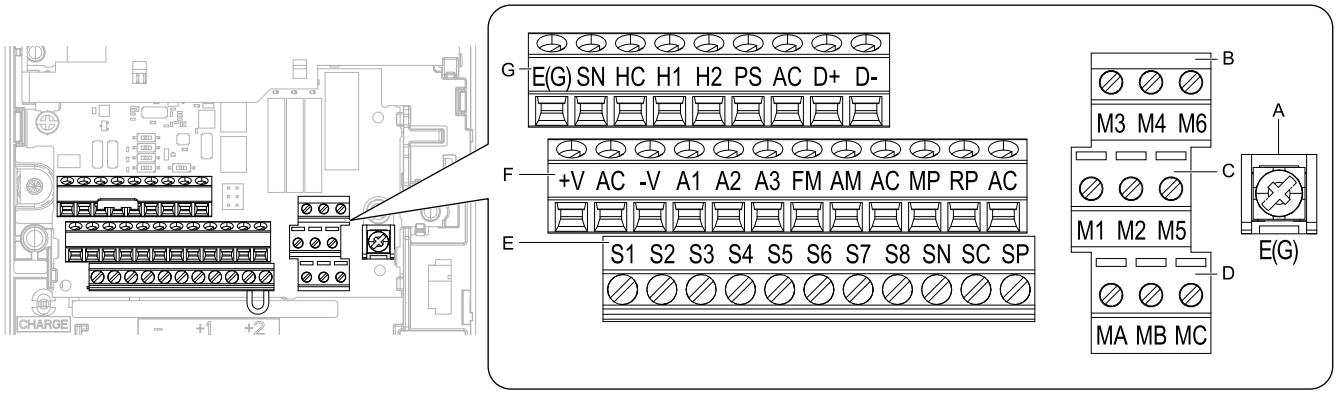
Refer to Table 4.9 for a list of serial communication terminals and functions.

Table 4.9 Serial Communication Terminals

Type	Terminal	Terminal Name	Function (Signal Level)	
Modbus Communication	D+	Communication input/output (+)	MEMOBUS/Modbus 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 a MEMOBUS/Modbus network.	• RS-485 • MEMOBUS/Modbus communication protocol • Maximum 115.2 kbps
	D-	Communication output (-)		
	AC	Signal ground	0 V	

◆ Control Circuit Terminal Configuration

The control circuit terminals are in the positions shown in Figure 4.23.



A - Terminal block (TB5)
B - Terminal block (TB2-3)
C - Terminal block (TB2-2)
D - Terminal block (TB2-1)
E - Terminal block (TB1)
F - Terminal block (TB3)
G - Terminal block (TB4)

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.

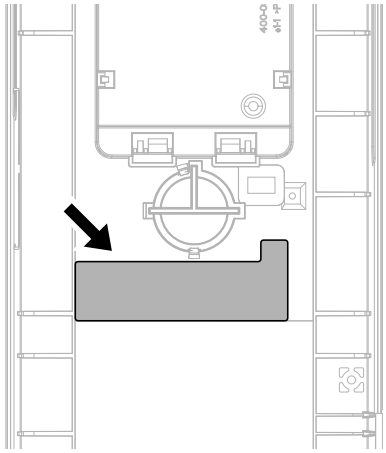


Figure 4.24 Tightening Torque Display Location (Reverse side of Front Cover)

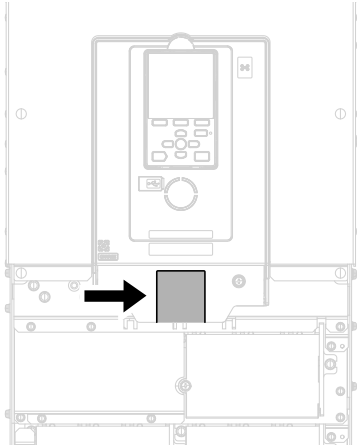


Figure 4.25 Tightening Torque Display Location (Lower Front Side of Front Cover)

■ 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 4.10 Control Circuit Wire Gauges and Tightening Torques

Termi-nal 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	S1 - S8, SN, SC, SP	M3	0.5 - 0.6 (4.4 - 5.3)	0.75 (18)	• Stranded wire 0.2 - 1.0 (24 - 16) • Solid wire 0.2 - 1.5 (24 - 16)	0.5 (20)	0.25 - 0.5 (24 - 20)
TB2	M1 - M6, MA, MB, MC						
TB3	+V, AC, -V, A1, A2, A3, FM, AM, AC, MP, RP, AC						
TB4	E (G), SN, HC, H1, H2, PS, AC, D+, D-						
TB5	E (G)	M3.5	0.5 - 1.0 (4.4 - 8.9)	0.5 - 2 (20 - 14)	1.25 (12)	-	-

Crimp Ferrules

Attach an insulated sleeve when you use crimp ferrules. Refer to Table 4.11 for the recommended external dimensions and model numbers of the crimp ferrules.

Use the CRIMPFOX 6, a crimping tool made by PHOENIX CONTACT.

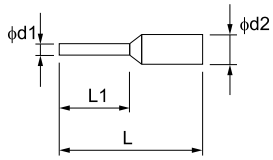


Figure 4.26 External Dimensions of Crimp Ferrules

Table 4.11 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

◆ 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:

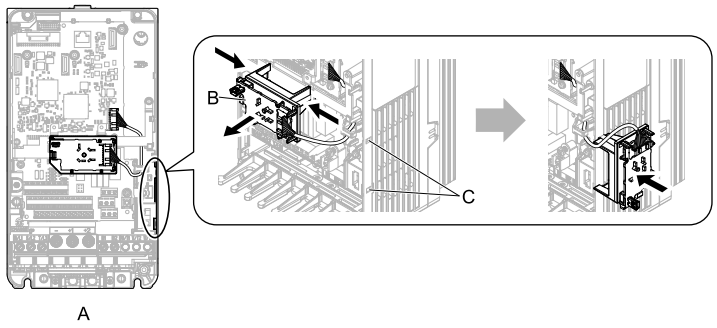
- Isolate control circuit wiring from main circuit wiring (terminals R/L1, S/L2, T/L3, B1, B2, U/T1, V/T2, W/T3, -, +1, +2, +3) and other high-power wiring. If control circuit wiring is adjacent to main circuit wiring, it can cause incorrect operation of the drive and equipment from electrical interference.
- Isolate wiring for contact output terminals MA, MB, MC and M1-M6 from other control circuit wiring. If contact output terminal wiring is adjacent to other control circuit wiring, it can cause incorrect operation of the drive and equipment from electrical interference.
- Use a 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. Incorrect equipment grounding can cause drive or equipment malfunction from electrical interference.

Correctly ground the drive terminals and complete main circuit wiring before you wire the control circuit. Remove the keypad and front cover.

1. Push in on the tabs on the both sides of the LED status ring board to release the board from the bracket. Pull the board forward to remove it.

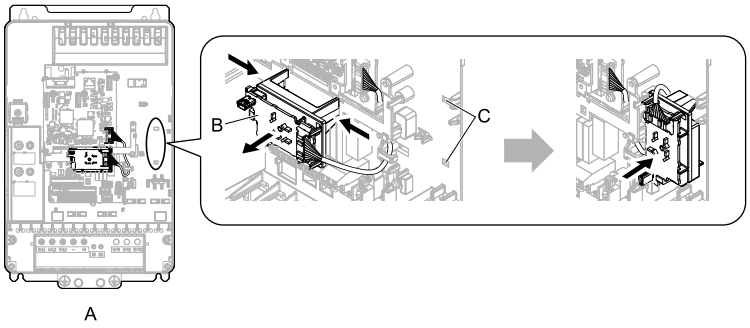
   NOTICE: *When you remove the LED Status Board from the drive bracket, make sure that you temporarily install it in the holding position provided on the drive. If you cause damage to the LED status ring board, the LEDs will not function correctly.*

Note:
You can temporarily store the LED status ring board with the temporary placement holes on the drive. The location of the temporary placement holes is different on different drive models.



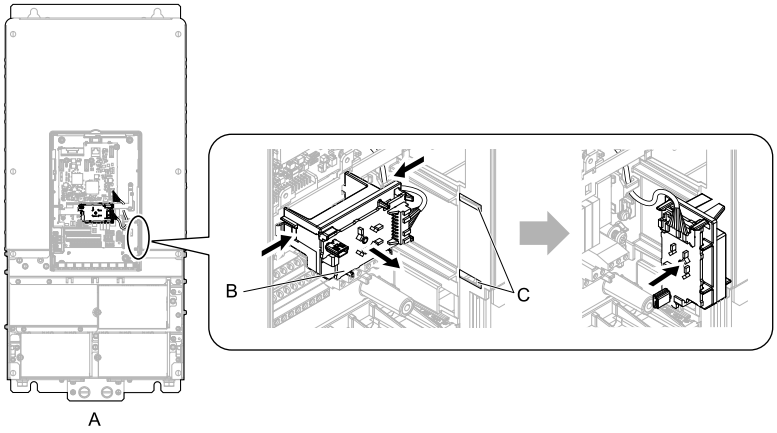
A - Drive front
B - LED status ring board
C - Temporary placement holes

Figure 4.27 Remove the LED Status Ring Board



A - Drive front
B - LED status ring board
C - Temporary placement holes

Figure 4.28 Remove the LED Status Ring Board



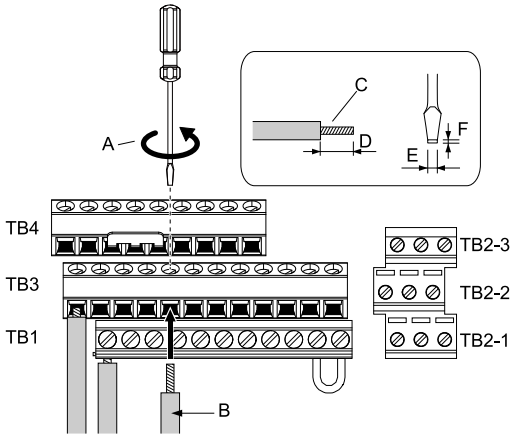
A - Drive front
B - LED status ring board
C - Temporary placement holes

Figure 4.29 Remove the LED Status Ring Board

2. Refer to the following figure 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.*

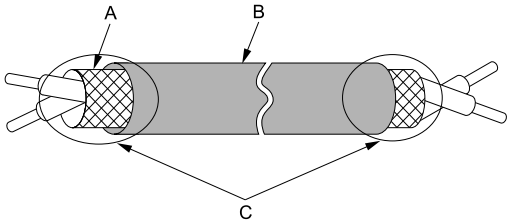
Note:
- Use shielded, twisted-pair wires and ground the shield to the ground terminal of the drive. Incorrect equipment grounding can cause drive or equipment malfunction from electrical interference.
- Do not use control circuit wiring that is longer than 50 m (164 ft) to supply the analog frequency reference from a remote source. If the control circuit wiring is too long, it 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 unsoldered wire 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 - Remove approximately 5.5 mm (0.21 in) of the covering at the end of the wire when you do not use crimp ferrules.
E - Blade width of 2.5 mm (0.1 in) or less
F - Blade thickness of 0.4 mm (0.01 in) or less

Figure 4.30 Wiring Procedure for the Control Circuit

Note:
- Do not solder the core wire. Soldered wiring connections can become loose and cause the drive to malfunction.
- 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.
- Refer to Figure 4.31 for information to prepare terminal ends of the shielded wire.
- Prepare the wire ends of shielded twisted-pair wires as shown in Figure 4.31 to use an analog reference from an external frequency setting potentiometer to set the frequency. Connect the shield to terminal E (G) of the drive.



A - Connect the shield to terminal E (G) of the drive.
B - Sheath
C - Insulate with electrical tape or shrink tubing.

Figure 4.31 Prepare the Ends of Shielded Wire

3. Put the cable through the clearance in the wiring cover.

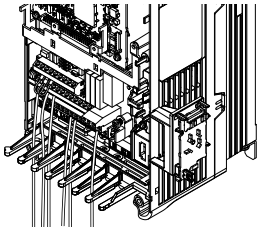


Figure 4.32 Control Circuit Wiring

4. Install the LED status ring board, 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 4.33. Set the switches to select the functions for each terminal.

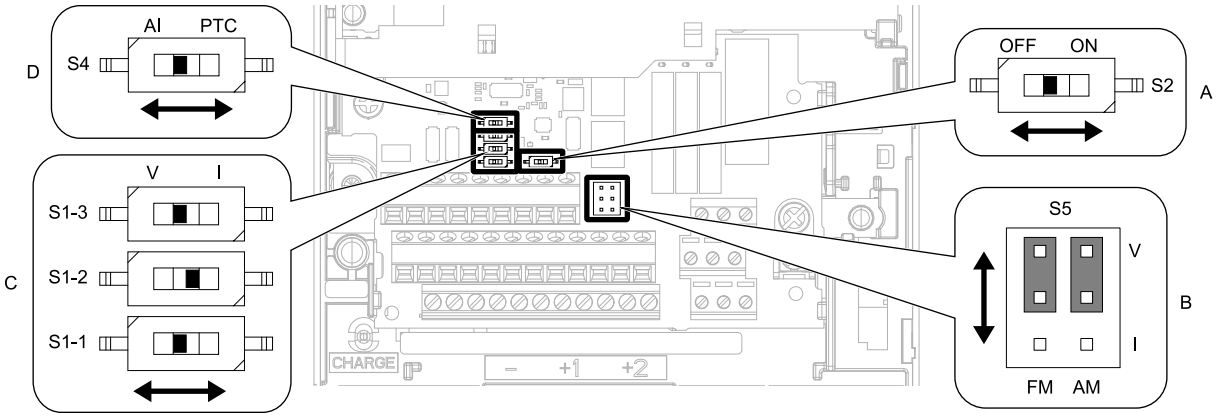


Figure 4.33 Locations of Switches

Table 4.12 I/O Terminals and Switches Functions

Posi-tion	Switch	Terminal	Function	Default Setting
A	DIP switch S2	-	Enables and disables the MEMOBUS/Modbus communications termination resistor.	OFF
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 S1-1	A1	Selects the input signal type (voltage/current).	V (voltage input)
	DIP switch S1-2	A2	Selects the input signal type (voltage/current).	I (current input)
	DIP switch S1-3	A3	Selects the input signal type (voltage/current).	V (voltage input)
D	Dip switch S4	A3	Selects MFAI or PTC input.	AI (analog input)

4.7 Control I/O Connections

This section gives information about the settings for the listed control circuit I/O signals.

- MFDI (terminals S1 to S8)
- Pulse train output (terminal MP)
- MFAI (terminals A1 to A3)
- PTC input (terminal A3)
- MFAO (terminals FM, AM)
- MEMOBUS/Modbus communications (terminals D+, D-, AC)

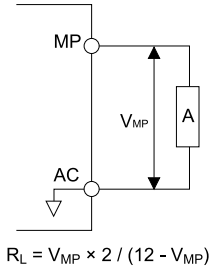
◆ Pulse Train Output

You can use pulse train monitor output terminal MP for sourcing mode or for sinking mode.

- Use for sourcing mode
  The load impedance changes the voltage level of the pulse train output signal.

Load Impedance R_L(kΩ)	Output Voltage V_{MP}(V)
1.5 kΩ or more	5 V or more
4.0 kΩ or more	8 V or more
10 kΩ or more	10 V or more

Note:
Use the formula in Figure 4.34 to calculate the necessary load resistance (kΩ) to increase output voltage V_{MP}(V).

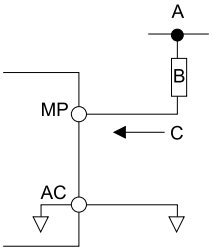


A - Load Impedance

Figure 4.34 Wiring to Use Pulse Train Output in Sourcing Mode

- Use in sinking mode
  The external power supply changes the voltage level of the pulse train output signal. Keep the voltage from an external source between 10.8 Vdc to 16.5 Vdc. Adjust the load impedance to keep the current at 16 mA or lower.

External Power Supply (V)	Load Impedance (kΩ)	Sinking current (mA)
10.8 Vdc to 16.5 Vdc	1.0 kΩ or more	16 mA maximum



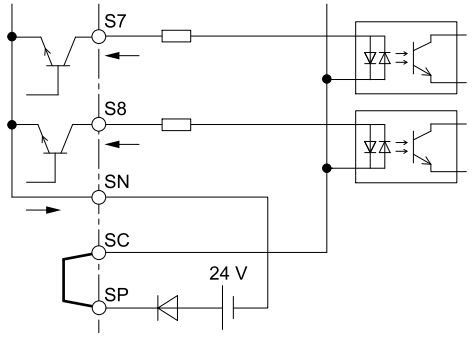
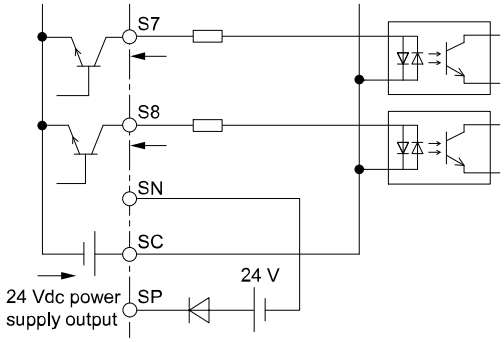
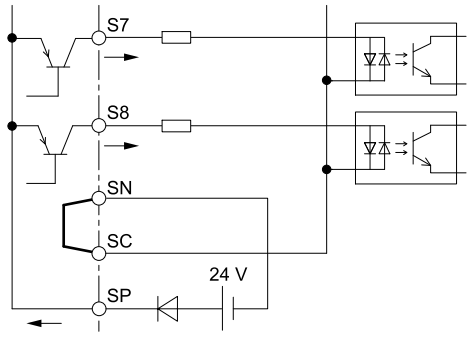
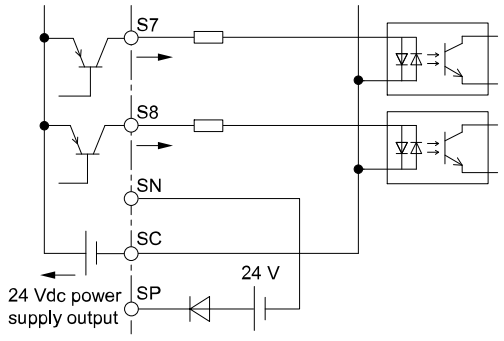
A - External power supply
B - Load Impedance
C - Sinking current

Figure 4.35 Wiring to Use Pulse Train Output in Sinking Mode

◆ 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: *Do not close the circuit between terminals SP and SN. A closed circuit between these terminals 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 to A3

Use terminals A1 to A3 to input a voltage or a current signal. Set the signal type as shown in Table 4.13.

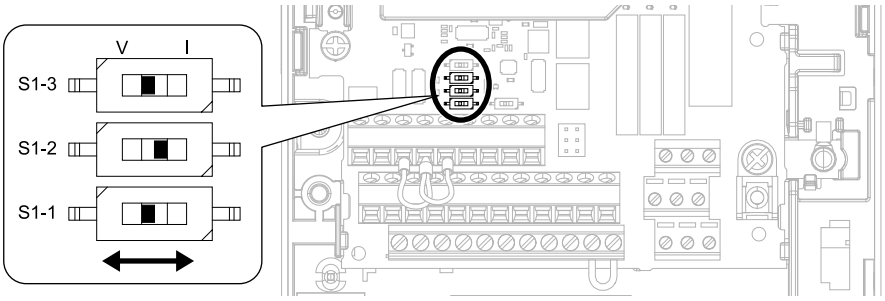


Figure 4.36 Location of DIP Switch S1

Table 4.13 MFAI Terminals A1 to A3 Signal Settings

Terminal	Input Signal	DIP Switch Settings		Parameter	
		Switch	Setting	No.	Signal Level
A1	Voltage input	S1-1	V (Default)	H3-01	0: 0 V to 10 V/0% to 100% (input impedance: 20 kΩ) 1: -10 V to +10 V/-100% to 100% (input impedance: 20 kΩ)
	Current input		I		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	S1-2	V	H3-09	0: 0 V to 10 V/0% to 100% (input impedance: 20 kΩ) 1: -10 V to +10 V/-100% to 100% (input impedance: 20 kΩ)
	Current input		I (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)
A3	Voltage input	S1-3	V (Default)	H3-05	0: 0 V to 10 V/0% to 100% (input impedance: 20 kΩ) 1: -10 V to +10 V/-100% to 100% (input impedance: 20 kΩ)
	Current input		I		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.
- Use tweezers or a jig with a tip width of approximately 0.8 mm (0.03 in) to set DIP switches.
- Set DIP switch S4 to "AI" to use terminal A3 as an analog input (voltage/current) terminal. The default setting for DIP switch S4 is "AI".

◆ Set MFAI Terminal A3 to PTC Input

Set terminal A3 as an MFAI or as the PTC input for motor overload protection.
Use DIP switch S4 to set the input function.

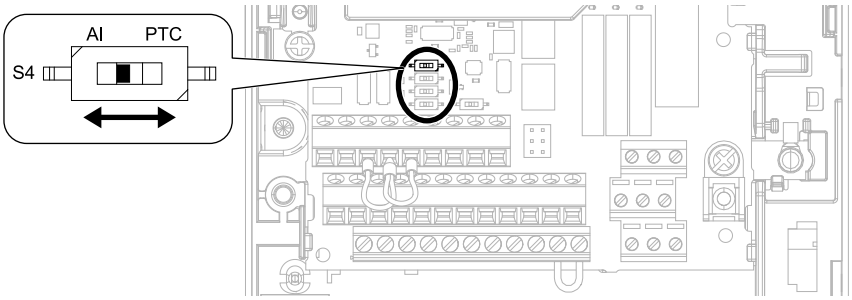


Figure 4.37 Location of DIP Switch S4

Terminal	Settings for DIP Switches	Description
A3	AI (Default)	Functions as an MFAI terminal. Set *H3-06 [Terminal A3 Function Selection]* to select the input function.
	PTC	Functions as the PTC input terminal. Set *H3-06 = E [Motor Temperature (PTC Input)]*. Set S1-3 to "V" for voltage input.

◆ 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.

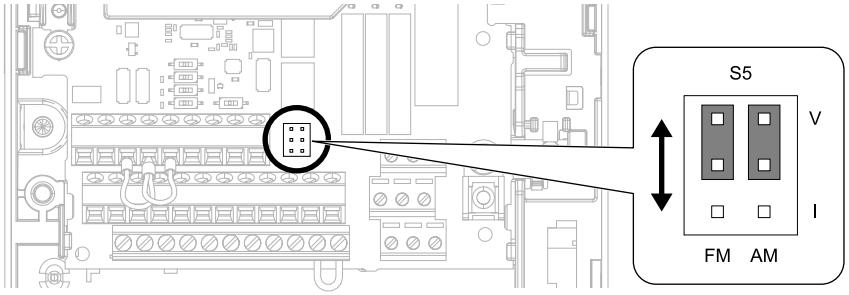
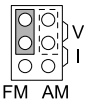
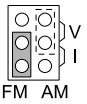
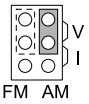
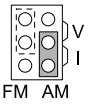


Figure 4.38 Location of Jumper Switch S5

Terminal	Types of Output Signals	Jumper Switch S5	Parameter	
			No.	Signal Level
FM	Voltage output (Default)		H4-07	0: 0 V to 10 V 1: -10 V to +10 V
	Current output			2: 4 mA to 20 mA
AM	Voltage output (Default)		H4-08	0: 0 V to 10 V 1: -10 V to +10 V
	Current output			2: 4 mA to 20 mA

◆ Switch ON Termination Resistor for MEMOBUS/Modbus Communications

When the drive is the last slave in a MEMOBUS/Modbus communications, set DIP switch S2 to the ON position. This drive has a built-in termination resistor for the RS-485 interface.

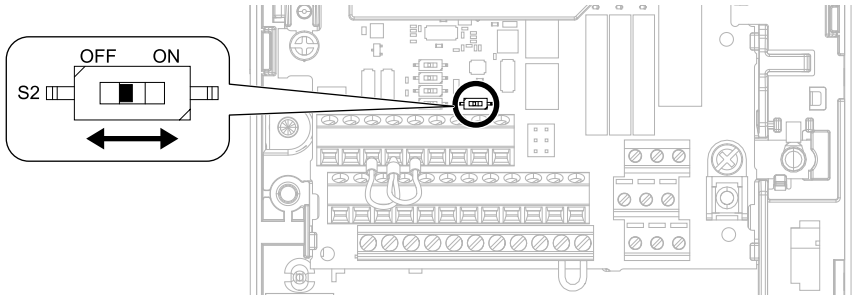


Figure 4.39 Location of DIP Switch S2

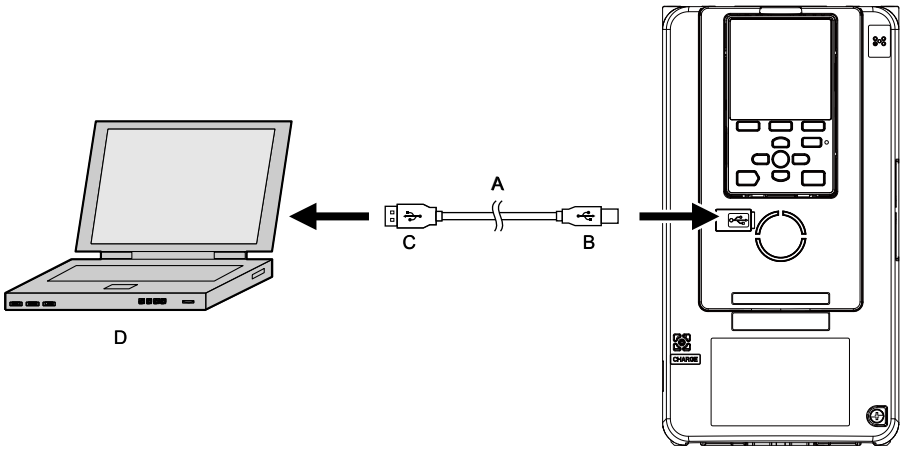
Table 4.14 MEMOBUS/Modbus Communications Termination Resistor Setting

DIP Switch S2	Description
ON	The built-in termination resistor is ON.
OFF (Default)	The built-in termination resistor is OFF.

4.8 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. After you connect the drive to the PC, you can use Yaskawa DriveWizard Industrial software to monitor drive performance and manage parameter settings.



A - USB 2.0, type A - mini-B cable
B - Mini-B type connector
C - Type-A connector
D - PC

Figure 4.40 Connect to a PC (USB)

Yaskawa recommends that you use a USB cable with connectors connected with shielded wires.

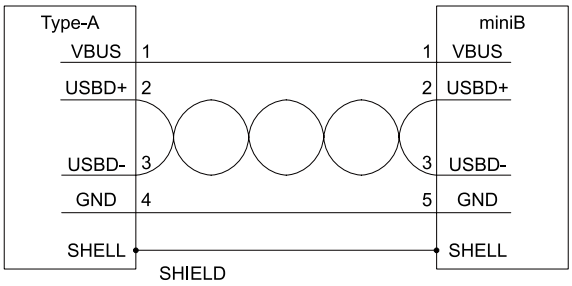


Figure 4.41 Recommended USB Cable

4.9 Protect the Drive during Failures

◆ Factory-Recommended Branch Circuit Protection for UL Listing

Use branch circuit protection to protect against short circuits and to maintain compliance with UL61800-5-1. Yaskawa recommends connecting semiconductor protection fuses on the input side for branch circuit protection. Refer to Table 4.15 to Table 4.18 for the recommended fuses.

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.*

- 200 V Class
  Use the fuses specified in this document to prepare the drive for use on a circuit that supplies not more than 100,000 RMS and not more than 240 Vac when there is a short circuit in the power supply.
- 400 V Class
  Use the fuses specified in this document to prepare the drive for use on a circuit that supplies not more than 100,000 RMS and not more than 480 Vac when there is a short circuit in the power supply.

The built-in short circuit protection of the drive does not provide branch circuit protection. The user must provide branch circuit protection as specified by the National Electric Code (NEC), the Canadian Electric Code, Part I (CEC), and local codes.

■ 200 V Class

Table 4.15 Factory-Recommended Branch Circuit Protection: 200 V Class (ND)

Drive Model	Maximum Applicable Motor Output kW (HP)	Input Current Rating A	Semiconductor Protection Fuse Rated Current Manufacturer: EATON/Bussmann
2004	0.75 (0.75)	4.8	FWH-45B
2006	1.1 (1.5)	6.7	FWH-45B
2008	1.5 (2)	8.9	FWH-45B
2010	2.2 (3)	12.7	FWH-45B
2012	3 (4)	17	FWH-50B FWH-80B *1
2018	3.7 (5)	20.7	FWH-80B FWH-100B *1
2021	5.5 (7.5)	30	FWH-80B FWH-100B *1
2030	7.5 (10)	40.3	FWH-125B
2042	11 (15)	52	FWH-150B
2056	15 (20)	78.4	FWH-200B
2070	18.5 (25)	96	FWH-225A
2082	22 (30)	114	FWH-225A FWH-250A *1
2110	30 (40)	111	FWH-225A FWH-250A *1
2138	37 (50)	136	FWH-275A FWH-300A *1
2169	45 (60)	164	FWH-275A FWH-350A *1
2211	55 (75)	200	FWH-325A FWH-450A *1
2257	75 (100)	271	FWH-600A
2313	90 (125)	324	FWH-800A

Drive Model	Maximum Applicable Motor Output kW (HP)	Input Current Rating A	Semiconductor Protection Fuse Rated Current Manufacturer: EATON/Bussmann
2360	110 (150)	394	FWH-1000A
2415	110 (150)	394	FWH-1000A

*1 Yaskawa recommends a fuse with a large rated current for applications with repeated loads.

Table 4.16 Factory-Recommended Branch Circuit Protection: 200 V Class (HD)

Drive Model	Maximum Applicable Motor Output kW (HP)	Input Current Rating A	Semiconductor Protection Fuse Rated Current Manufacturer: EATON/Bussmann
2004	0.55 (0.5)	3.6	FWH-45B
2006	0.75 (1)	4.8	FWH-45B
2008	1.1 (1.5)	6.7	FWH-45B
2010	1.5 (2)	8.9	FWH-45B
2012	2.2 (3)	12.7	FWH-50B FWH-80B *1
2018	3 (4)	17	FWH-80B FWH-100B *1
2021	3.7 (5)	20.7	FWH-80B FWH-100B *1
2030	5.5 (7.5)	30	FWH-125B
2042	7.5 (10)	40.3	FWH-150B
2056	11 (15)	58.2	FWH-200B
2070	15 (20)	78.4	FWH-225A
2082	18.5 (25)	96	FWH-225A FWH-250A *1
2110	22 (30)	82	FWH-225A FWH-250A *1
2138	30 (40)	111	FWH-275A FWH-300A *1
2169	37 (50)	136	FWH-275A FWH-350A *1
2211	45 (60)	164	FWH-325A FWH-450A *1
2257	55 (75)	200	FWH-600A
2313	75 (100)	271	FWH-800A
2360	90 (125)	324	FWH-1000A
2415	110 (150)	394	FWH-1000A

*1 Yaskawa recommends a fuse with a large rated current for applications with repeated loads.

■ 400 V Class

Table 4.17 Factory-Recommended Branch Circuit Protection: 400 V Class (ND)

Drive Model	Maximum Applicable Motor Output kW (HP) Input Voltage < 460 V	Maximum Applicable Motor Output kW (HP) Input Voltage ≥ 460 V	Input Current Rating A	Semiconductor Protection Fuse Rated Current Manufacturer: EATON/ Bussmann
4002	0.75 (1)	0.75 (1)	2.5	FWH-50B
4004	1.5 (2)	1.5 (2)	4.7	FWH-50B
4005	2.2 (3)	2.2 (3)	6.7	FWH-50B
4007	3.0 (4)	3.0 (4)	8.9	FWH-60B
4009	4.0 (5)	3.7 (5)	11.7	FWH-60B

Drive Model	Maximum Applicable Motor Output kW (HP) Input Voltage < 460 V	Maximum Applicable Motor Output kW (HP) Input Voltage ≥ 460 V	Input Current Rating A	Semiconductor Protection Fuse Rated Current Manufacturer: EATON/ Bussmann
4012	5.5 (7.5)	5.5 (7.5)	15.8	FWH-60B
4018	7.5 (10)	7.5 (10)	21.2	FWH-80B
4023	11 (15)	11 (15)	30.6	FWH-90B
4031	15 (20)	15 (20)	41.3	FWH-150B
4038	18.5 (25)	18.5 (25)	50.5	FWH-200B
4044	22 (30)	22 (30)	59.7	FWH-200B
4060	30 (40)	30 (40)	58.3	FWH-225A
4075	37 (50)	37 (50)	71.5	FWH-250A
4089	45 (60)	45 (60)	86.5	FWH-275A
4103	55 (75)	55 (75)	105	FWH-275A
4140	75 (100)	75 (100)	142	FWH-300A
4168	90 (125)	90 (125)	170	FWH-325A FWH-400A *1
4208	110 (150)	110 (150)	207	FWH-500A
4250	132 (175)	150 (200)	248	FWH-600A
4302	160 (200)	185 (250)	300	FWH-700A
4371	200 (250)	220 (300)	373	FWH-800A
4414	220 (300)	260 (350)	410	FWH-1000A
4477	250 (335)	300 (400)	465	FWH-1200A
4568	315 (400)	335 (450)	584	FWH-1200A
4605	355 (450)	370 (500)	657	FWH-1400A
4720	-	450 (600)	739	FWH-1400A

*1 Yaskawa recommends a fuse with a large rated current for applications with repeated loads.

Table 4.18 Factory-Recommended Branch Circuit Protection: 400 V Class (HD)

Drive Model	Maximum Applicable Motor Output kW (HP) Input Voltage < 460 V	Maximum Applicable Motor Output kW (HP) Input Voltage ≥ 460 V	Input Current Rating A	Semiconductor Protection Fuse Rated Current Manufacturer: EATON/ Bussmann
4002	0.55 (0.75)	0.55 (0.75)	1.9	FWH-50B
4004	1.1 (1.5)	0.75 (1)	3.5	FWH-50B
4005	1.5 (2)	1.5 (2)	4.7	FWH-50B
4007	2.2 (3)	2.2 (3)	6.7	FWH-60B
4009	3 (4)	3 (4)	8.9	FWH-60B
4012	4.0 (5)	3.7 (5)	11.7	FWH-60B
4018	5.5 (7.5)	5.5 (7.5)	15.8	FWH-80B
4023	7.5 (10)	7.5 (10)	21.2	FWH-90B
4031	11 (15)	11 (15)	30.6	FWH-150B
4038	15 (20)	15 (20)	41.3	FWH-200B
4044	18.5 (25)	18.5 (25)	50.5	FWH-200B
4060	22 (30)	22 (30)	43.1	FWH-225A
4075	30 (40)	30 (40)	58.3	FWH-250A
4089	37 (50)	37 (50)	71.5	FWH-275A
4103	45 (60)	45 (60)	86.5	FWH-275A

Drive Model	Maximum Applicable Motor Output kW (HP) Input Voltage < 460 V	Maximum Applicable Motor Output kW (HP) Input Voltage ≥ 460 V	Input Current Rating A	Semiconductor Protection Fuse Rated Current Manufacturer: EATON/ Bussmann
4140	55 (75)	55 (75)	105	FWH-300A
4168	75 (100)	75 (100)	142	FWH-325A FWH-400A *1
4208	90 (125)	90 (125)	170	FWH-500A
4250	110 (150)	110 (150)	207	FWH-600A
4302	132 (175)	150 (200)	248	FWH-700A
4371	160 (200)	185 (250)	300	FWH-800A
4414	200 (250)	220 (300)	373	FWH-1000A
4477	220 (300)	260 (350)	410	FWH-1200A
4568	250 (335)	300 (400)	465	FWH-1200A
4605	315 (400)	335 (450)	584	FWH-1400A
4720	-	370 (500)	657	FWH-1400A

*1 Yaskawa recommends a fuse with a large rated current for applications with repeated loads.

5

Keypad Use and Test Run

5.1 Section Safety 308
5.2 LED Status Ring 309
5.3 Keypad Operation 311
5.4 Automatic Parameter Settings Optimized for Specific Applications (Application Presets) 349
5.5 Auto-Tuning 351
5.6 Test Run 360
5.7 Fine Tuning during Test Runs (Adjust the Control Function) 362
5.8 Test Run Checklist 369

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. The drive has internal capacitors that stay charged after you de-energize the drive.

⚠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.

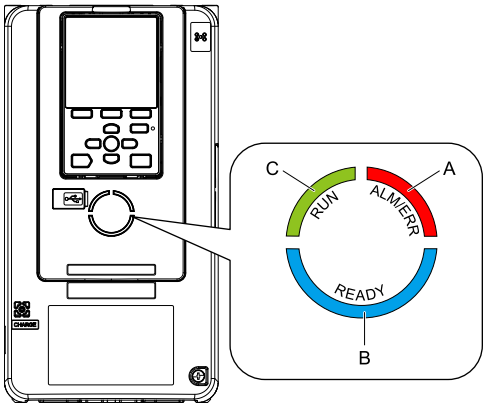
Some figures in this section include drives without covers or safety shields to more clearly show the inside of the drive. If covers or safety shields are missing from the drive, it can cause serous injury or death.

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.

5.2 LED Status Ring

The LED Status Ring on the drive cover shows the drive operating status.



A - ALM/ERR **C - RUN**
B - Ready

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:** The LED will illuminate to identify a fault if the drive detects a fault and an alarm at the same time.
		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 provides 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 or when RUN is flashing.
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, but the drive is not set for zero speed control. • The drive received a DC Injection Braking command.
		Flashing Quickly *1	• The drive received a Run command from the MFDI terminals and is switching to REMOTE Mode while the drive is in LOCAL Mode. • 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 STOP on the keypad while the drive is operating in REMOTE Mode. • 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 5.1 for the difference between “flashing” and “flashing quickly”.

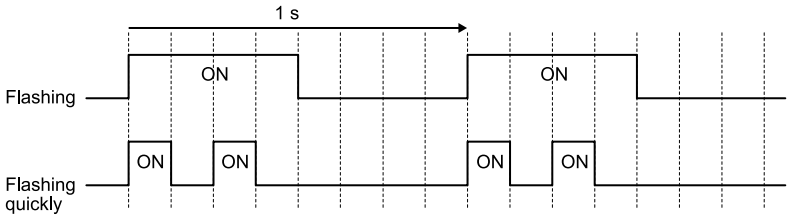


Figure 5.1 LED Flashing Statuses

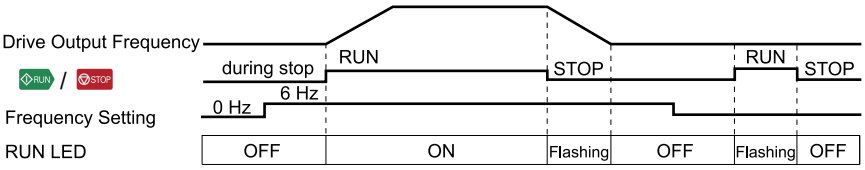
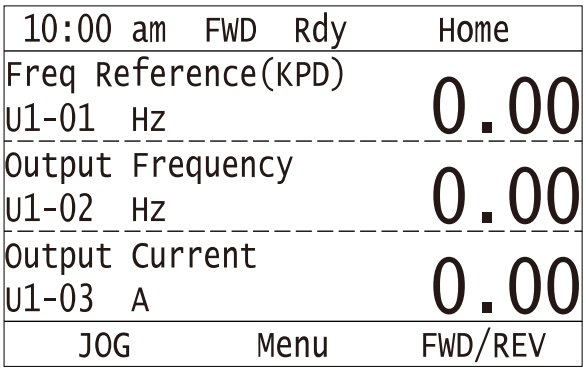


Figure 5.2 Relation between RUN LED and Drive Operation

5.3 Keypad Operation

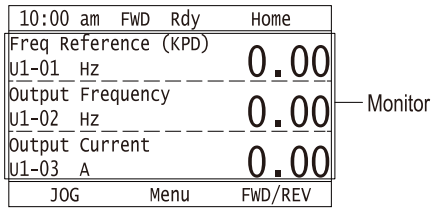
◆ Home Screen Display Selection

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.

■ JOG Operation

Push LO/RE to illuminate LO/RE. Push F1 (JOG) to run the motor. Release F1 to stop the motor.

■ Change Motor between Forward/Reverse Run

You can change the direction of motor rotation when operating the drive from the keypad. Push LO/RE to illuminate LO/RE.

Push and hold F3 (FWD/REV) to toggle the direction of motor rotation between forward and reverse.

■ 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*).

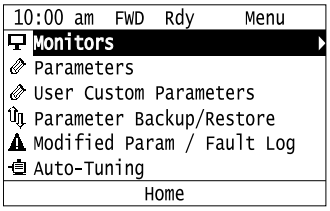
■ Change the Frequency Reference Value

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 the keypad as the Run command source (REMOTE) 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.



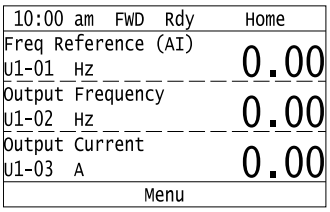
◆ Displaying the Monitor

This section shows how to show the standard monitor (*Ux-xx*).

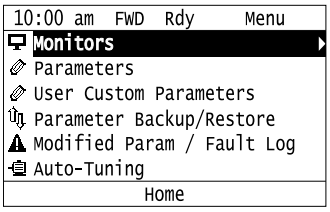
1. Push F2 (Home) to show the HOME screen.

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].

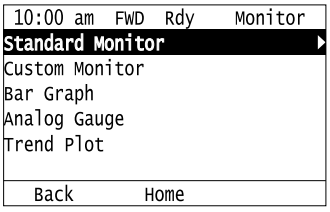
2. Push F2 (Menu).



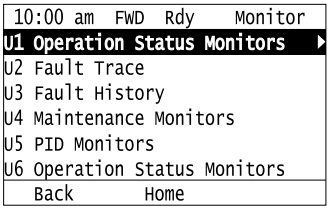
3. Push ^ or v to select [Monitors], then push ↵.



4. Push ^ or v to select [Standard Monitor], then push ↵.



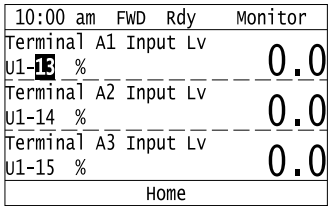
5. Push ^ or v to select the monitor group, then push ↵.



6. Push ▲ or ▼ to change the monitor number to show the monitor item.

Note:

Push ◀ to return to the previous page.



◆ Set Custom Monitors

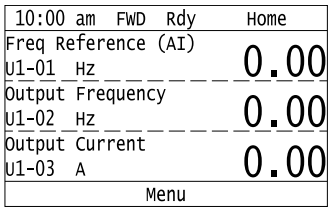
You can select and register a maximum of 12 monitoring items to regularly show on the keypad.
This procedure shows how to set the motor speed to [Custom Monitor 1].

1. Push F2 (Home) to show the HOME screen.

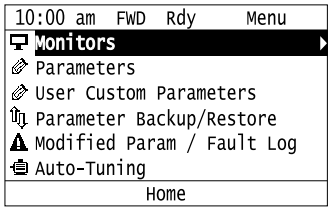
Note:

- 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.

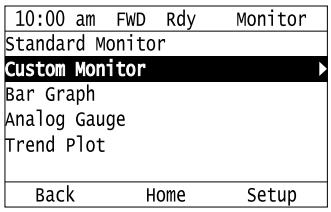
2. Push F2 (Menu).



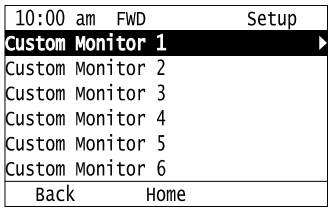
3. Push ▲ or ▼ to select [Monitors], then push ↵.



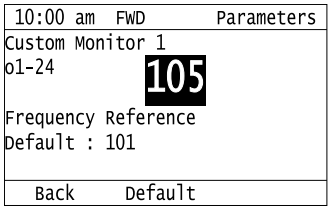
4. Push ▲ or ▼ to select [Custom Monitor], then push F3 (Setup).



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.

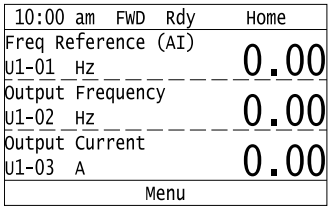
◆ Show Custom Monitors

The procedure in this section shows how to show the registered custom monitors.

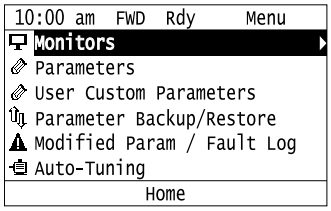
1. Push F2 (Home) to show the HOME screen.

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.

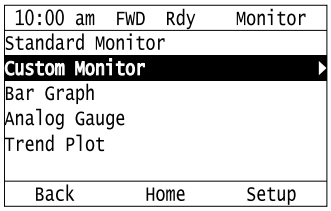
2. Push F2 (Menu).



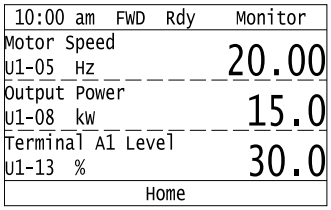
3. Push ▲ or ▼ to select [Monitors], then push ↵.



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.

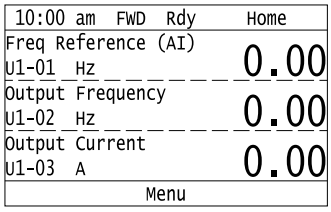
◆ Set the Monitors to Show as a Bar Graph

The procedure in this section shows how to show the frequency reference monitor as a bar graph.

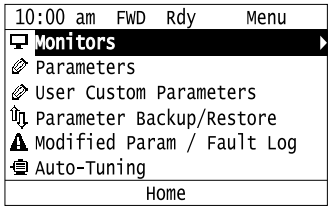
1. Push F2 (Home) to show the HOME screen.

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.

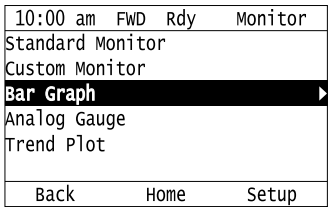
2. Push F2 (Menu).



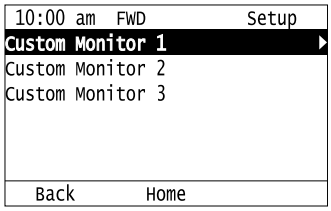
3. Push ▲ or ▼ to select [Monitors], then push ↵.



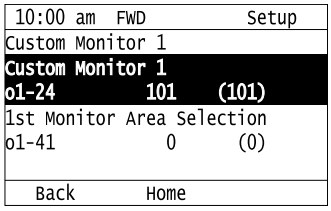
4. Push ▲ or ▼ to select [Bar Graph], then push F3 (Setup).



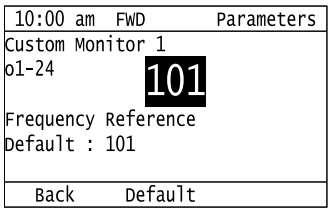
5. Push ▲ or ▼ to select the location to store the monitor, then push ↵.



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.

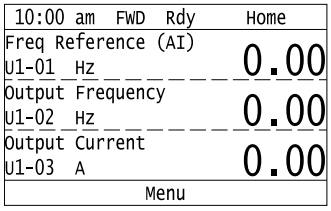
◆ Show Monitors as Bar Graphs

The procedure in this section shows how to show a specific monitor as a bar graph. You can show a maximum of three.

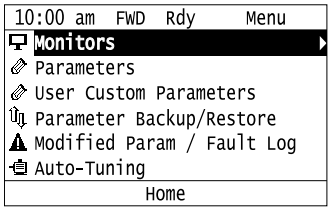
1. Push F2 (Home) to display the HOME screen.

Note:
- [Home] appears in the upper right hand corner of the screen when in HOME mode.
- If [Home] is not shown on F2, push F1 (Back) to show [Home] on F2.

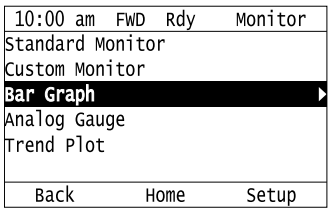
2. Push F2 (Menu).



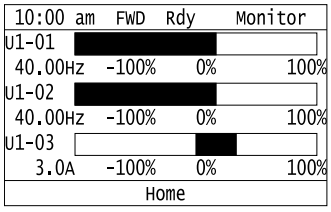
3. Push ▲ or ▼ to select [Display Monitor], then push ↵.



4. Push ▲ or ▼ to select [Display Bar Graph], and push ↵.



The screen will show the monitors as shown in this figure.



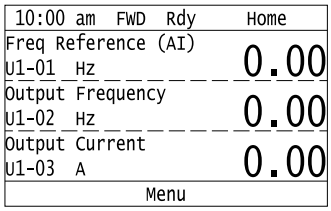
◆ Set the Monitors to Show as Analog Gauges

The procedure in this section shows how to show the frequency reference monitor as an analog gauge.

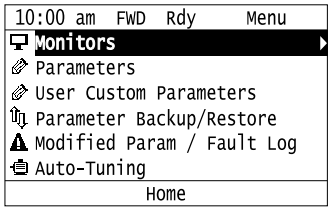
1. Push F2 (Home) to show the HOME screen.

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.

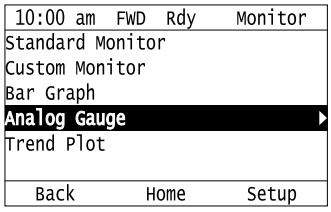
2. Push F2 (Menu).



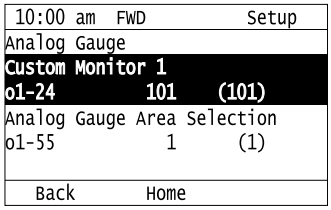
3. Push ▲ or ▼ to select [Monitors], then push ↵.



4. Push ▲ or ▼ to select [Analog Gauge], then push F3 (Setup).

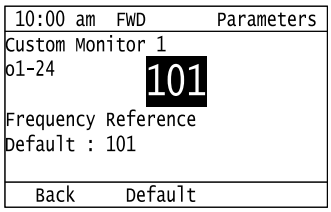


5. Push ↵.



6. 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.

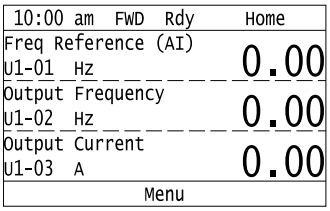
◆ Display Monitors as an Analog Gauge

The following explains how to display the contents selected for a monitor as an analog gauge.

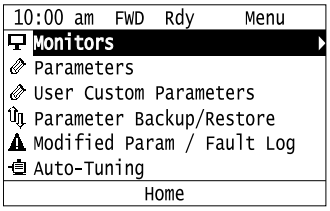
1. Push F2 (Home) to show the HOME screen.

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.

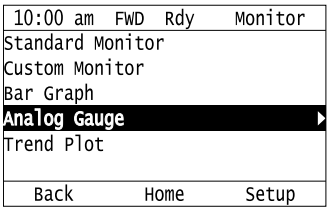
2. Push F2 (Menu).



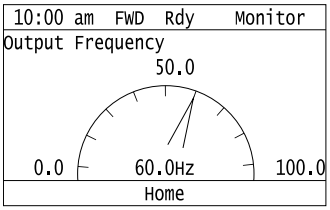
3. Push ▲ or ▼ to select [Monitors], then push ↵.



4. Push ▲ or ▼ to select [Analog Gauge], then push ↵.

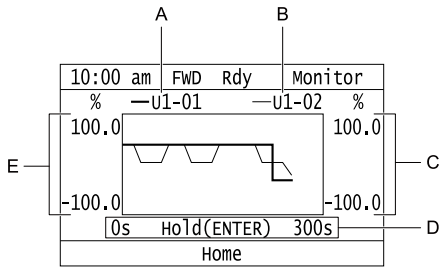


It will be displayed as follows.



◆ Set Monitoring Items to be Shown 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

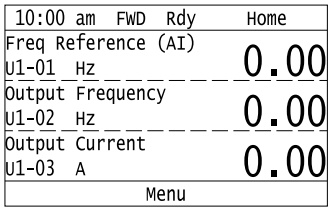
■ Select Monitor Items to Show as a Trend Plot

The procedure in this section shows how to show the frequency reference monitor as a trend plot.

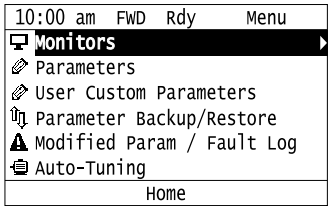
1. Push F2 (Home) to show the HOME screen.

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.

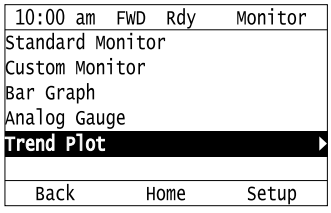
2. Push F2 (Menu).



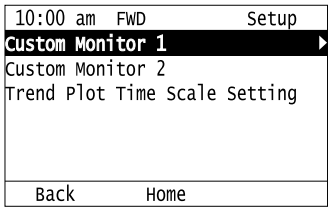
3. Push ^ or v to select [Monitors], then push ↵.



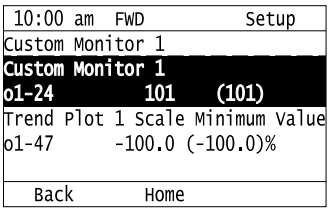
4. Push ^ or v to select [Trend Plot], then push F3 (Setup).



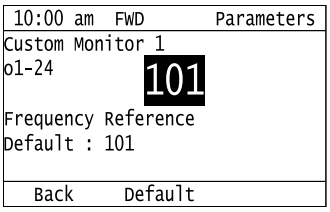
5. Push ^ or v to select [Custom Monitor 1], then push ↵.



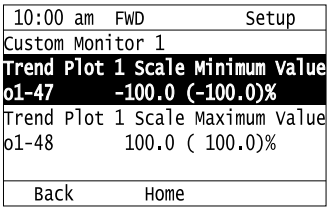
6. Push ↵.



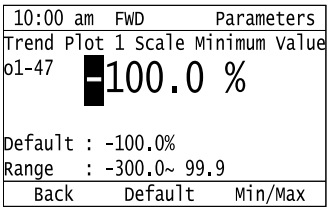
7. Push ∧ or ∨ to select the monitor number to register, then push ↵.
When the *U parameters* are on the display as "Ux-xx", the three digits in "x-xx" identify which monitor to output. For example, to show monitor *U1-01 [Frequency Reference]*, set it to "101" as shown in this figure.



8. Push ∧ or ∨ to select [Trend Plot 1 Scale Minimum Value], then push ↵.

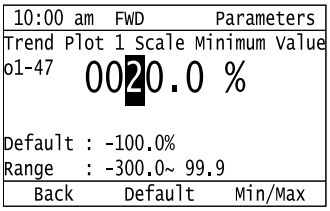


9. Push < or > to select the specified digit, then push ∧ or ∨ to select the correct number.

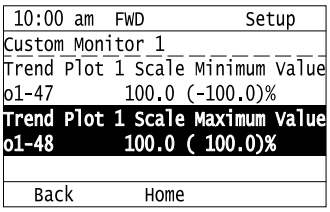


- Push F2 (Default) to set the parameters to the factory default.
- Push F3 (Min/Max) to move between the minimum value and maximum value.

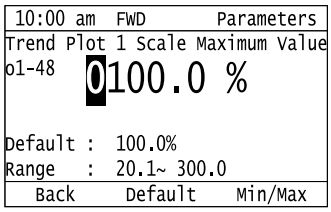
10. Push ↵ to keep the changes.



11. Push ∧ or ∨ to select [Trend Plot 1 Scale Maximum Value], then push ↵.

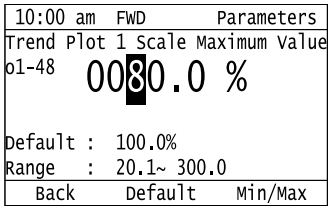


12. Push < or > to select the specified digit, then push ^ or v to select the correct number.



- Push F2 (Default) to set the parameters to the factory default.
- Push F3 (Min/Max) to move between the minimum value and maximum value.

13. Push Enter to keep the changes.



14. Push F1 (Back).
    If necessary, use the same procedure to set [Custom Monitor 2].

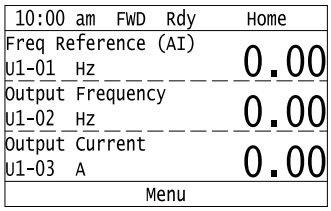
■ Set the Time Scale for the Trend Plot Monitor

The procedure in this section shows how to set the time scale for the trend plot monitor.

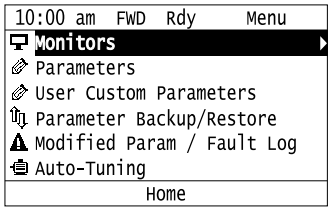
1. Push F2 (Home) to show the HOME screen.

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.

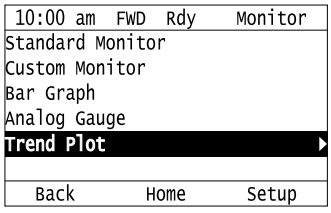
2. Push F2 (Menu).



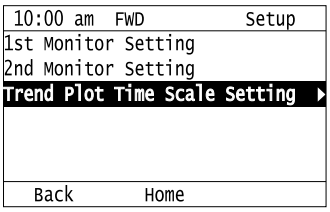
3. Push ^ or v to select [Monitors], then push Enter.



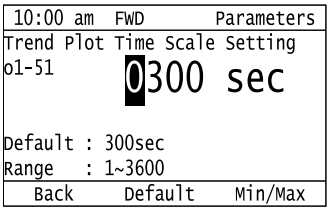
4. Push ^ or v to select [Trend Plot], then push F3 (Setup).



5. Push ▲ or ▼ to select [Trend Plot Time Scale Setting], then push ↵.

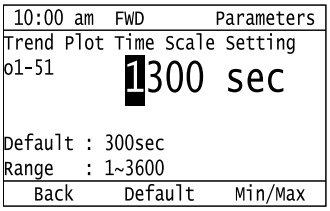


6. Push ◀ or ▶ to select the specified digit, then push ▲ or ▼ to select the correct number.



- 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.

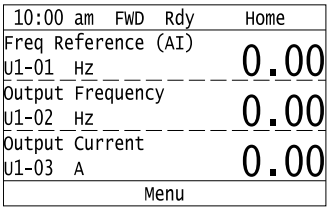
◆ Show Monitor Items as a Trend Plot

The procedure in this section shows how to show the selected monitor data as a trend plot.

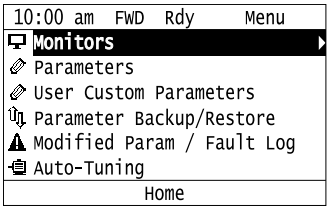
1. Push F2 (Home) to show the HOME screen.

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.

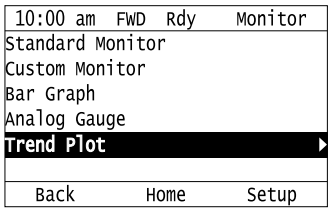
2. Push F2 (Menu).



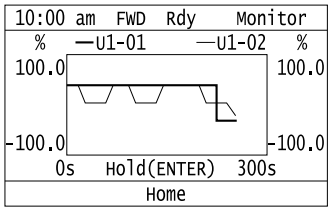
3. Push ▲ or ▼ to select [Monitors], then push ↵.



4. Push ▲ or ▼ 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 monitoring is paused.

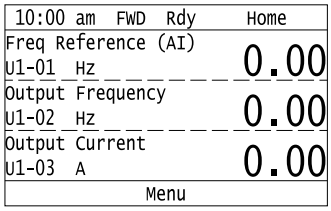
◆ Change Parameter Settings

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.

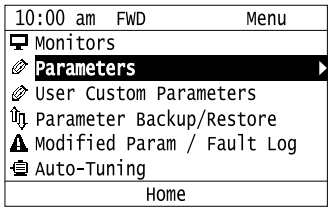
1. Push F2 (Home) to show the HOME screen.

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).

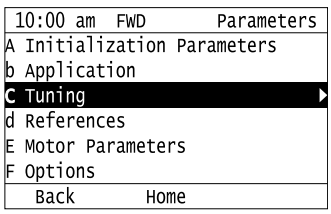
2. Push F2 (Menu).



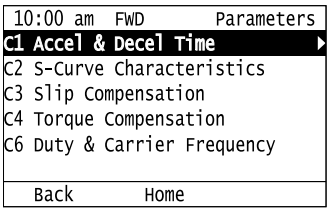
3. Push ▲ or ▼ to select [Parameters], then push ↵.



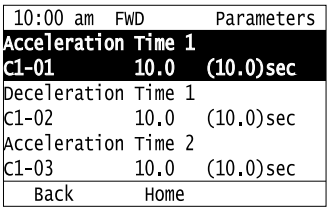
4. Push ▲ or ▼ to select [C Tuning], then push ↵.



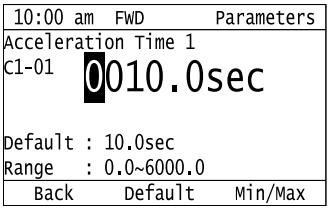
5. Push ▲ or ▼ to select [C1 Accel & Decel Time], then push ↵.



6. Push ▲ or ▼ to select *C1-01*, then push ↵.

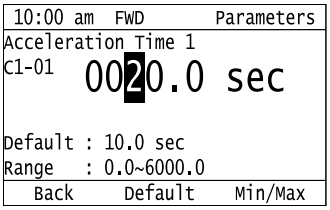


7. Push ◀ or ▶ to select the specified digit, then push ▲ or ▼ to select the correct number.



- 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]*. This lets users to quickly access and change settings to these parameters.

Note:

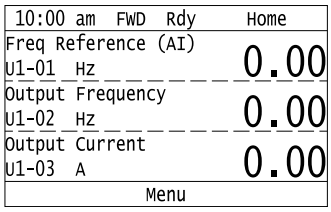
The User Custom Parameters always show *A1-06 [Application Selection]* at the top of the list. The *A2-01 to A2-32* settings change when the *A1-06* setting changes, which makes it easier to set and reference the necessary parameter settings.

1. Push F2 (Home) to show the HOME screen.

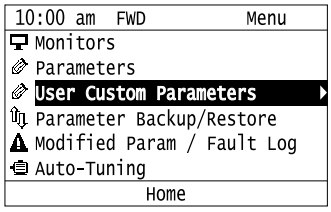
Note:

- 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.

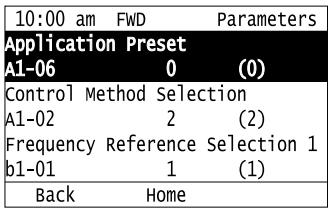
2. Push F2 (Menu).



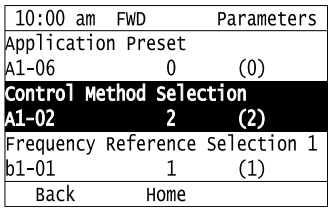
3. Push ▲ or ▼ to select [User Custom Parameters], then push ↵.



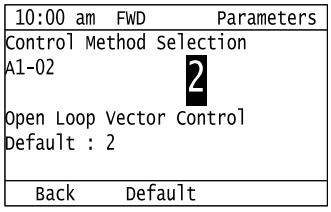
4. Push ▲ or ▼ to show the parameter to examine.



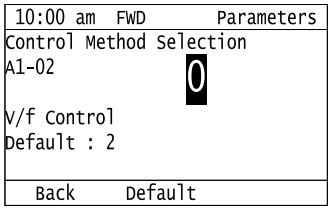
5. To change the parameter settings, push ▲ or ▼ to select the parameter, then push ↵.



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

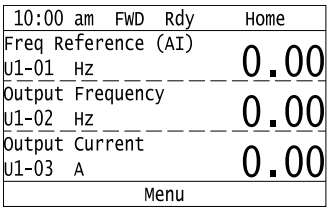
You can save a backup of the drive parameters to the keypad. The keypad can store parameter setting values for a maximum of four drives in different storage areas. Making backups of the parameter settings can save time when setting parameters after replacing a drive. If you set up more than one drive, you can copy the parameter settings from a drive that completed a test run to the other drives.

Note:
- Be sure to stop the monitor before backing up parameters.
- While making a backup, the drive will not accept Run commands.
- The DriveWorksEZ PC software password is required to back up *qx-xx [DriveWorksEZ Parameter]* and *rx-xx [DWEZ Connection Parameter]*. If an incorrect password is entered, the drive detects *PWEr [DWEZ Password Missmatch]*.

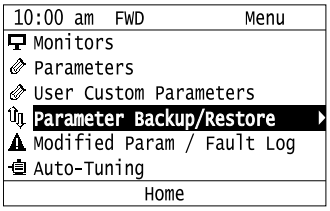
1. Push F2 (Home) to show the HOME screen.

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].

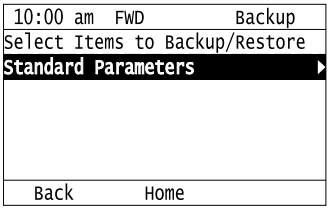
2. Push F2 (Menu).



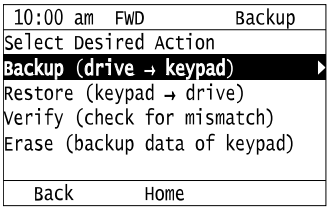
3. Push ▲ or ▼ to select [Parameter Backup/Restore], then push ↵.



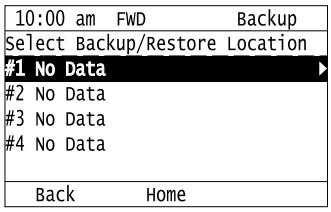
4. Push ▲ or ▼ to select the items to back up, then push ↵.



5. Push ▲ or ▼ to select [Backup (drive → keypad)], then push ↵.



6. Push ⌃ or ⌄ to select a memory location, then push ↵.



The keypad shows “End” when the backup procedure completes successfully.

◆ Write Backed-up Parameters to the Drive

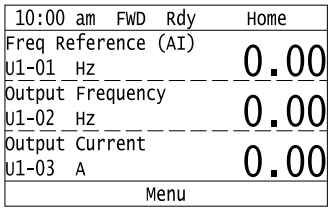
You can back up parameters on the keypad and write them to different drives.

Note:
- Always stop the drive before you start to restore the parameter backups.
- The drive rejects Run commands while it is restoring parameters.

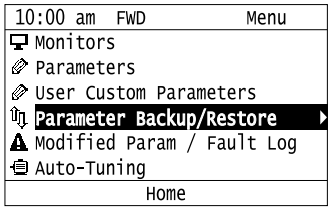
1. Push F2 (Home) to show the HOME screen.

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].

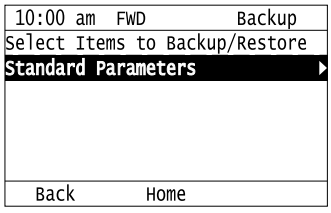
2. Push F2 (Menu).



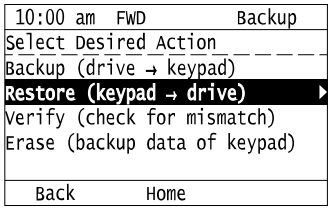
3. Push ⌃ or ⌄ to select [Parameter Backup/Restore], then push ↵.



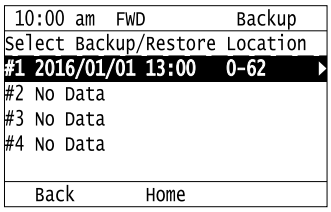
4. Push ⌃ or ⌄ to select the item to restore, then push ↵.



5. Push ⌃ or ⌄ to select [Restore (keypad → drive)], then push ↵.

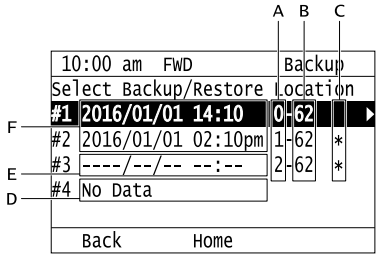


6. Push ▲ or ▼ to select the backed-up parameter data, then push ENTER.



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

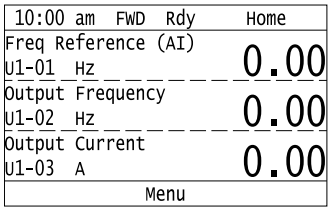
This procedure verifies that the parameter setting values that were backed up in the keypad agree with the parameter setting values in the drive.

Note:
- Always stop the drive before you start to verify the parameters.
- The drive does not accept Run commands while restoring parameters.

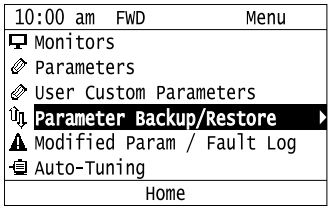
1. Push F2 (Home) to show the HOME screen.

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].

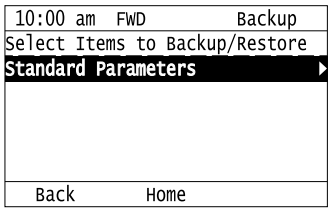
2. Push F2 (Menu).



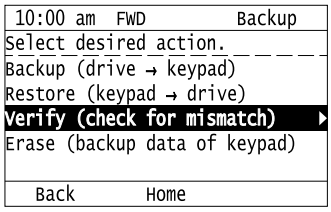
3. Push ▲ or ▼ to select [Parameter Backup/Restore], then push ENTER.



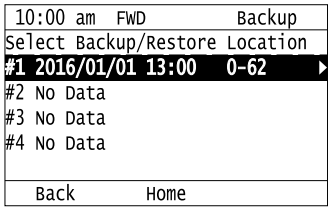
4. Push ▲ or ▼ to select the item to verify, then push ↵.



5. Push ▲ or ▼ to select [Verify (drive → keypad)], then push ↵.



6. Push ▲ or ▼ to select the data to verify, then push ↵.



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.

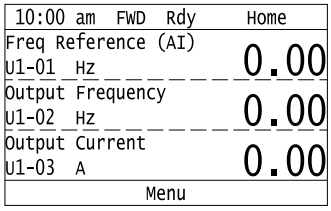
◆ Delete Parameters Backed Up to the Keypad

This procedure deletes the parameters that were backed up to the keypad.

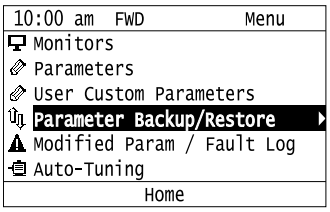
1. Push F2 (Home) to show the HOME screen.

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].

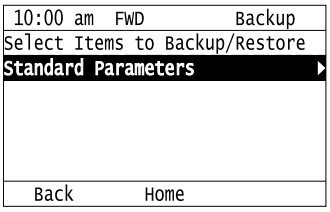
2. Push F2 (Menu).



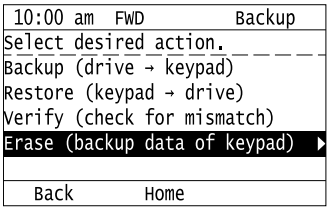
3. Push ▲ or ▼ to select [Parameter Backup/Restore], then push ↵.



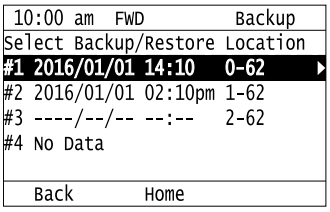
4. Push ▲ or ▼ to select the item to verify, then push ↵.



5. Push ▲ or ▼ to select [Delete (kepad)], 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.

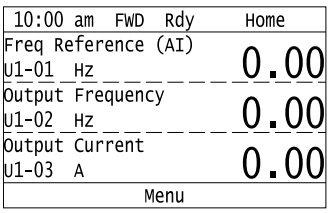
◆ Check Modified Parameters

This procedure will show all parameters that were changed from their defaults as the result of Auto-Tuning or setting changes. This helps find which settings have been changed, and is very useful when you replace a drive. This lets users quickly access and re-edit changed parameters. If no parameters have been changed, the keypad will show “0 Parameters”.

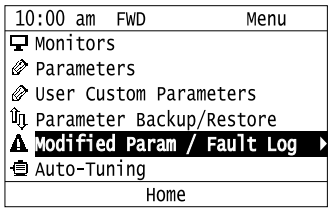
1. Push F2 (Home) to show the HOME screen.

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.

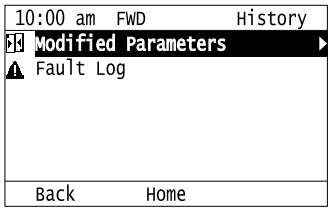
2. Push F2 (Menu).



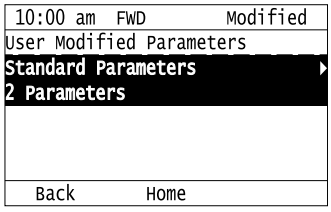
3. Push ▲ or ▼ to select [Modified Param / Fault Log], then prush ↵.



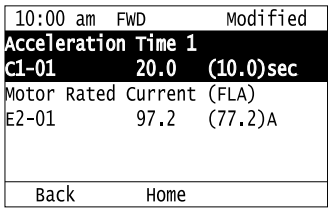
4. Push ▲ or ▼ to select [Modified Parameters], then push ↵.



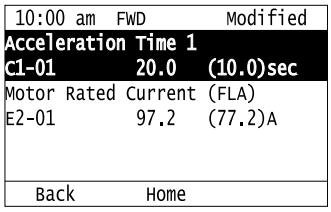
5. Push ↵.



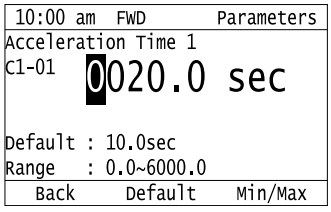
6. Push ▲ or ▼ to show the parameter to check.



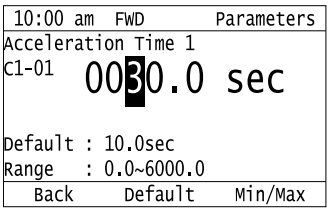
7. To re-edit a parameter, push ▲ or ▼, select the parameter to edit, then push ↵.



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.

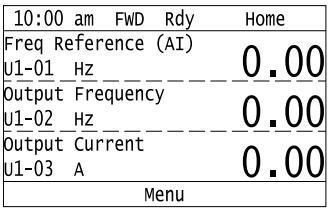
◆ Restore Modified Parameters to Defaults

This procedure will set all parameters with changed values to their default settings.

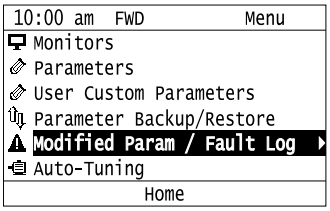
1. Push F2 (Home) to show the HOME screen.

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.

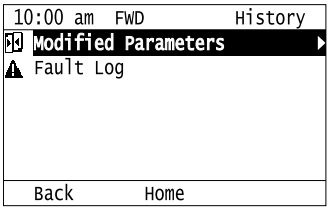
2. Push F2 (Menu).



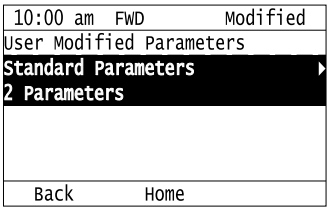
3. Push ▲ or ▼ to select [Modified Param / Fault Log], then push ↵.



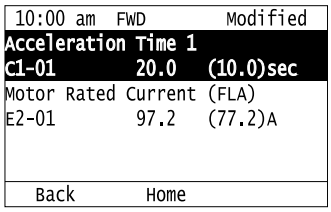
4. Push ▲ or ▼ to select [Modified Parameters], then push ↵.



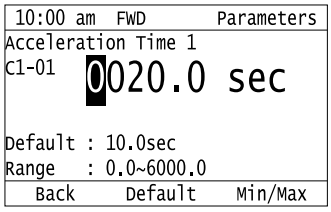
5. Push ↵.



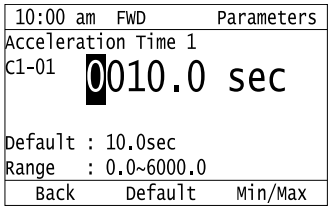
6. Push ▲ or ▼ to select the parameters to return to their default settings, then push ↵.



7. Push F2 (Default).



8. Push ↵.



The modified parameters are now set to default values.

◆ Show Fault History

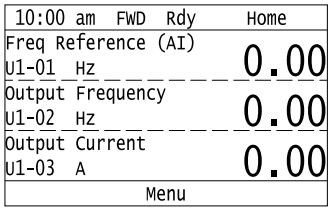
You can examine a maximum of 10 fault codes and dates and times that the faults occurred.

Note:
- Make sure that you first set the date and time on the keypad if you will monitor the date and time of the faults.
- If the keypad does not have a clock battery, you must set the date and time each time you energize the drive.

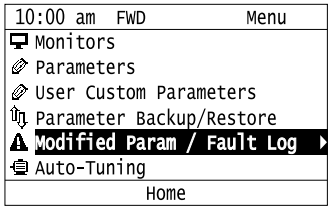
1. Push F2 (Home) to show the HOME screen.

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.

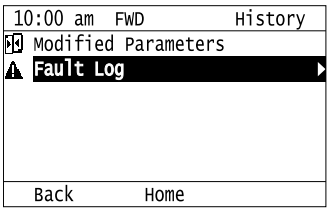
2. Push F2 (Menu).



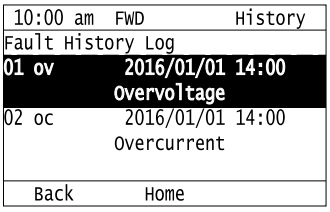
3. Push ▲ or ▼ to select [Modified Parameters/Fault History], then push ↵.



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.

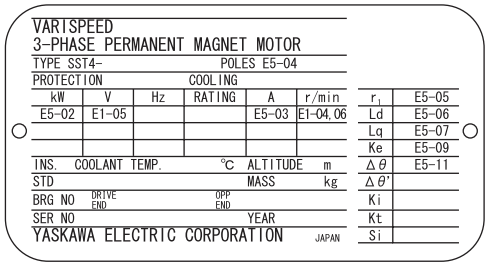


Figure 5.3 Motor Nameplate (Example)

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.*

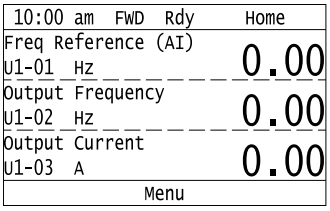
WARNING! *Before you do Rotational Auto-Tuning, disconnect the load from the motor. The load can move suddenly and cause serious injury or death.*

This procedure shows how to do Rotational Auto-Tuning.

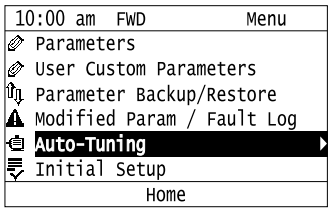
1. Push F2 (Home) to show the HOME screen.

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].

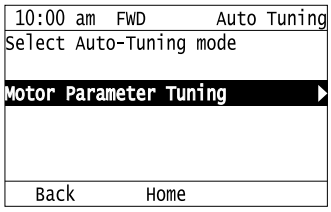
2. Push F2 (Menu).



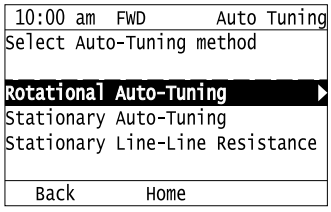
3. Push ▲ or ▼ to select [Auto-Tuning], then push ↵.



4. Push ↵.

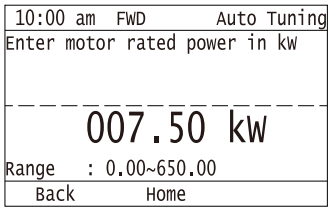


5. Push ▲ or ▼ to select [Rotational Auto-Tuning], then push ↵.



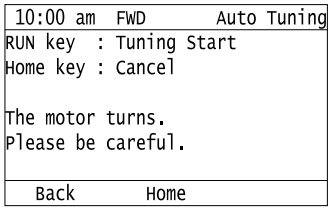
6. Follow the messages shown on the keypad to input the necessary Auto-Tuning data.

   Example: Push ◀ or ▶ to select the specified digit, then push ▲ or ▼ 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.

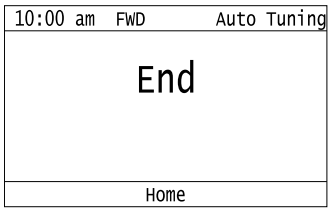
8. When the keypad shows the Auto-Tuning start screen, push RUN.



   Auto-Tuning starts.

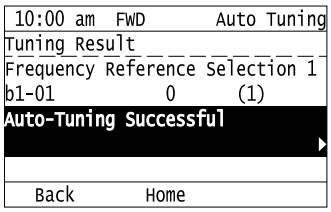
   When doing Rotational Auto-Tuning, the motor will stay stopped for approximately one minute with power energized and then the motor will start to rotate.

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.

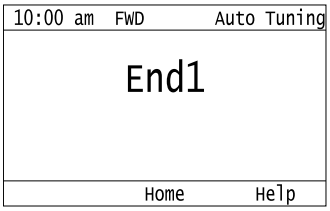


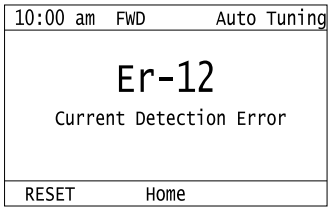
To change a parameter again, push UP or DOWN to select the parameter to change, then push ENTER to show the parameter setting screen.

Auto-Tuning is complete.

Note:

If the drive detects an error or you push STOP 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.





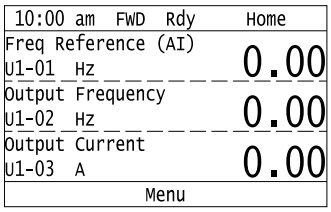
◆ Set the Keypad Language Display

The procedure in this section shows how to set the language shown on the keypad.

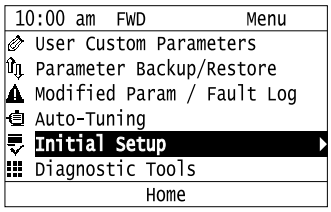
1. Push F2 (Home) to show the HOME screen.

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.

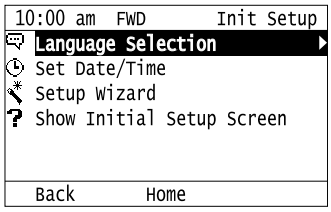
2. Push F2 (Menu).



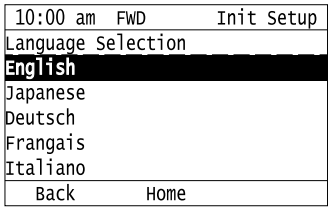
3. Push ▲ or ▼ to select [Initial Settings], then push Enter.



4. Push ▲ or ▼ to select [Language Selection], then push Enter.



5. Push ▲ or ▼ to select the language, then push Enter.



The procedure to set the keypad language is complete.

◆ Set the Date and Time

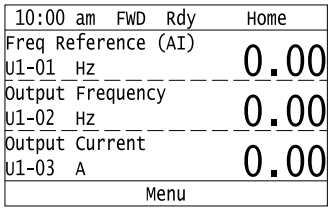
The procedure in this section shows how to set the date and time.

Note:
- Refer to *Replace the Keypad Battery on page 61* for information about the battery installation procedure.
  To set the drive to detect an alarm when the battery is dead or when the clock is not set, install the battery then set *o4-24 = 1 [bAT Detection selection = Enable (Alarm Detected)]*.
- If the keypad does not have a clock battery, you must set the date and time each time you energize the drive.

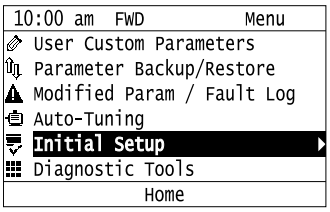
1. Push F2 (Home) to show the HOME screen.

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.

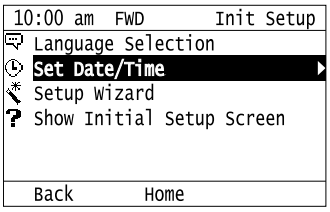
2. Push F2 (Menu).



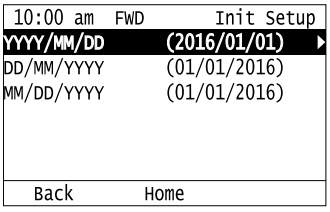
3. Push ▲ or ▼ to select [Initial Setup], then push ↵.



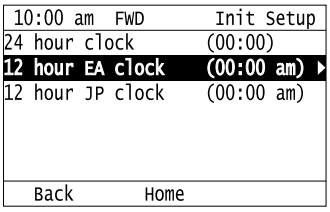
4. Push ▲ or ▼ to select [Set Date/Time], and push ↵.



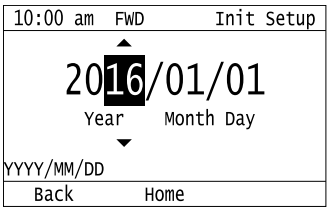
5. Push ▲ or ▼ to select the format of date display, then push ↵.



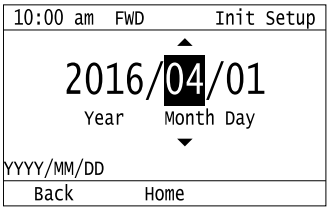
6. Push ▲ or ▼ to select the format of time display, then push ↵.



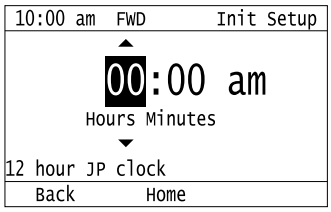
7. Push ◀ or ▶ to select a number from Year/Month/Day, then push ▲ or ▼ to change the value.



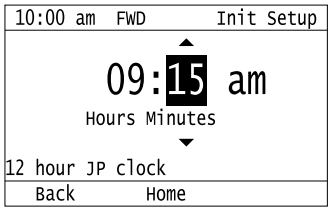
8. When you are done changing the value, push ↵.



9. Push < or > to select the hour or minute, then push ^ or v to change the value.



10. When you are done setting the time, push Enter.



The procedure for setting the date and time is complete.

◆ Set Parameters Using the Setup Wizard

The Setup Wizard lets users follow simple messages on the keypad to set these basic parameters:

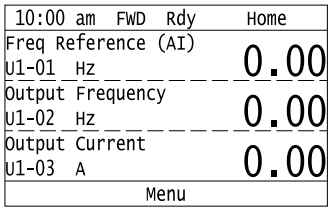
- Frequency reference source
- Input signal level
- Run command source
- Duty Rating
- Motor type
- Control method
- Maximum frequency
- Input/output settings

Note:
The Setup Wizard function will initialize all parameters before it sets the basic parameters.

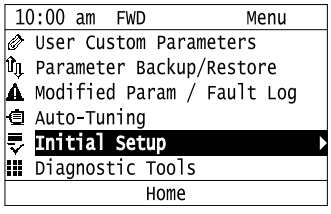
1. Push F2 (Home) to show the HOME screen.

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.

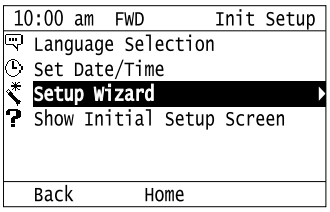
2. Push F2 (Menu).



3. Push ^ or v to select [Initial Setup], then push Enter.

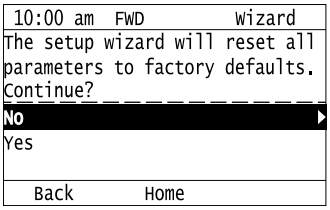


4. Push ▲ or ▼ to select [Setup Wizard], then push ↵.

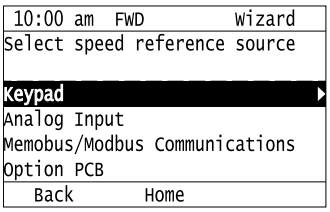


5. Push ▲ or ▼ to select [Yes], then push ↵.

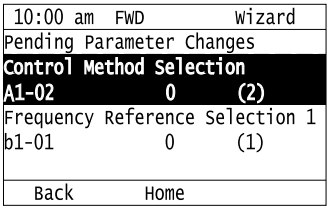
Note:
This operation will initialize all parameters.



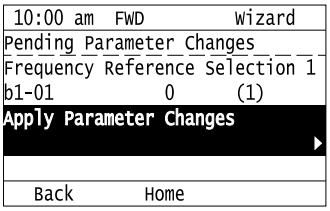
6. Push ▲ or ▼ to select the item to set, then push ↵.



7. For the next steps, follow the instructions shown on the keypad until the “Parameter Change Confirmation Screen” is shown.



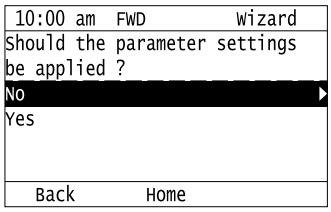
8. In the parameter change confirmation screen, push ▲ or ▼ to examine the changed parameter, then select [Apply of each parameter] at the bottom of the screen and push ↵.



Note:

To change a parameter again, push ▲ or ▼ to select the parameter to change, then push ↵ to show the parameter setting screen.

9. Push ▲ or ▼ to select [Yes], then push ↵.



The Setup Wizard procedure is complete.

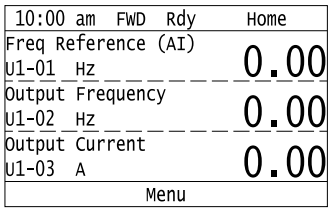
◆ Disable the Initial Setup Screen

Do the steps in this procedure to not show the initial start-up screen when the drive is energized.

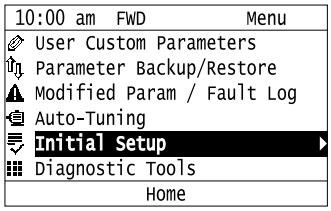
1. Push F2 (Home) to show the HOME screen.

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].

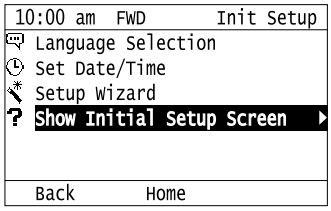
2. Push F2 (Menu).



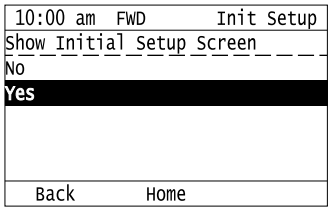
3. Push ▲ / ▼ to select [Initial Setup], then push ↵.



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

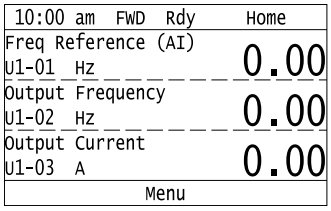
The data log function saves drive status information. Monitors *Ux-xx* are the source of log information. The procedure in this section shows how to start logging data.

You can record a maximum of 10 monitors.

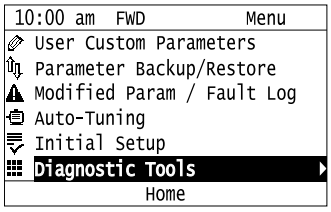
1. Make sure that a microSD card is inserted in the keypad.
2. Push F2 (Home) to show the HOME screen.

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].

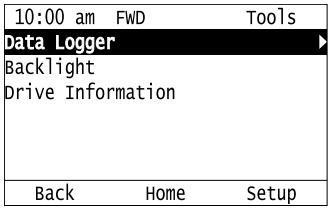
3. Push F2 (Menu).



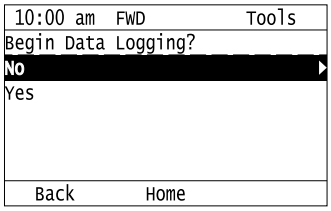
4. Push ▲ or ▼ to select [Diagnostic Tools], then push ↵.



5. Push ▲ or ▼ to select [Data Logger], then push ↵.

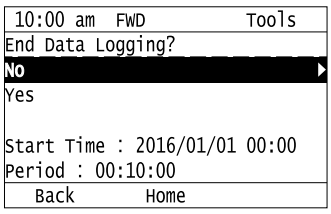


6. Push ▲ or ▼ to select [Yes] or [No], then push ↵.



- [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

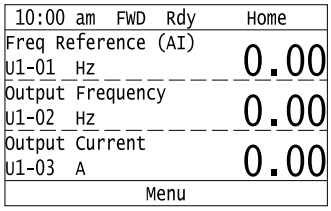
■ Set Monitor to Log

The procedure in this section shows how to set the monitor for which to log data.

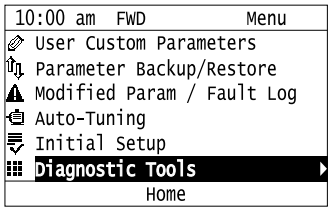
1. Push F2 (Home) to show the HOME screen.

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].

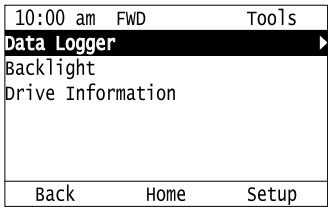
2. Push F2 (Menu).



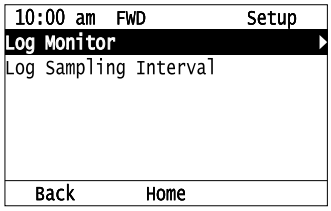
3. Push ^ or v to select [Diagnostic Tools], then push ↵.



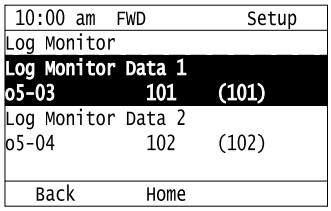
4. Push ^ or v to select [Data Logger], then push F3 (Setup).



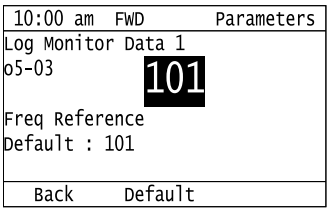
5. Push ^ or v to select [Log Monitor], then push ↵.



6. Push ^ or v 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.

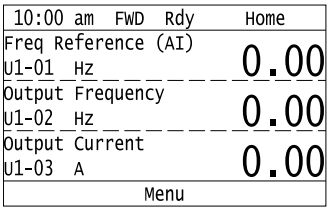
■ Set the Sampling Time

The procedure in this section shows how to set the sampling time for data logging.

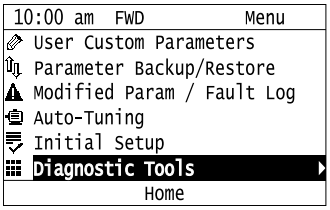
1. Push F2 (Home) to show the HOME screen.

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].

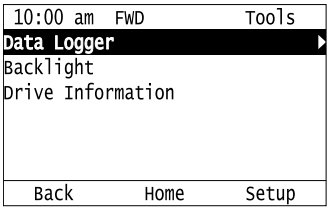
2. Push F2 (Menu).



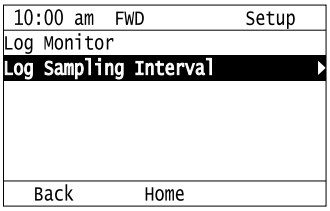
3. Push ▲ or ▼ to select [Diagnostic Tools], then push ↵.



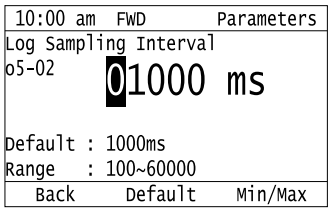
4. Push ▲ or ▼ to select [Data Logger], then push F3 (Setup).



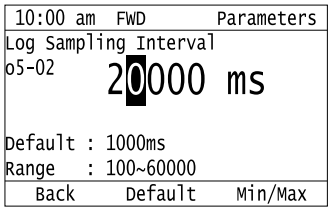
5. Push ▲ or ▼ to select [Log Sampling Interval], then push ↵.



6. Push < or > to select the digit, then push ^ or v to change the value.



7. When you complete changing the value, push Enter.



The procedure to set the sampling time is complete.

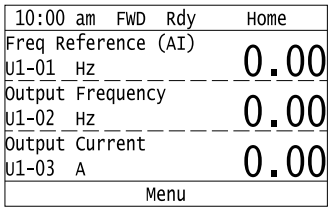
◆ Set Backlight to Automatically Turn OFF

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.

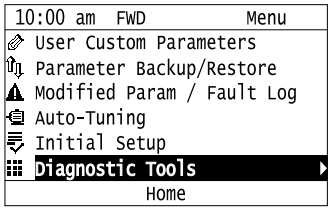
1. Push F2 (Home) to show the HOME screen.

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.

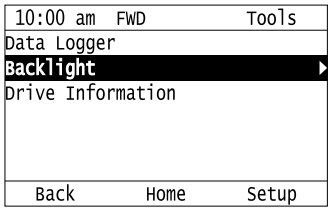
2. Push F2 (Menu).



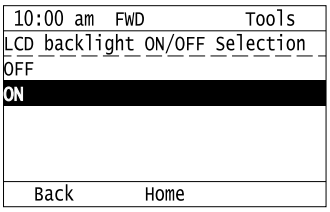
3. Push ^ or v to select [Diagnostic Tools], then push Enter.



4. Push ^ or v to select [Backlight], then push Enter.

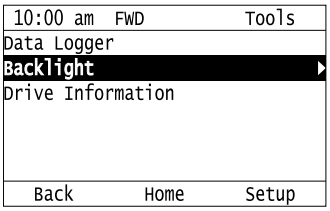


5. Push ▲ or ▼ to select [ON] or [OFF], then push ↵.

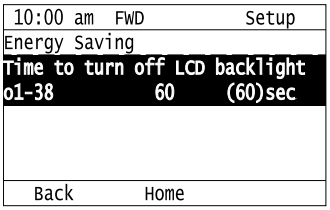


- [ON]: Backlight is always ON
- [OFF]: Backlight turns OFF after set length of time.

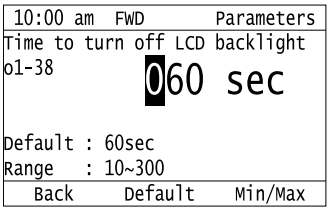
6. Push F3 (Setup).



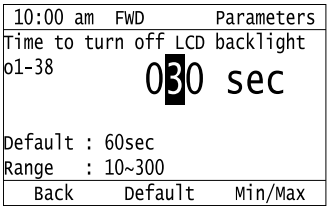
7. Push ↵.



8. Push ◀ or ▶ to select the digit, then push ▲ or ▼ to change the value.



9. When you are done changing the value, push ↵.



The procedure to set the backlight to turn OFF automatically is complete.

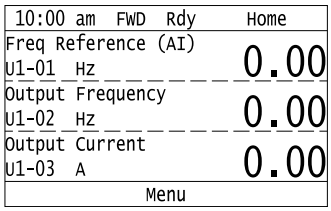
◆ Show Information about the Drive

The procedure in this section shows how to show the drive model, maximum applicable motor output (HD/ND), rated output current (HD/ND), software version, and the serial number on the keypad.

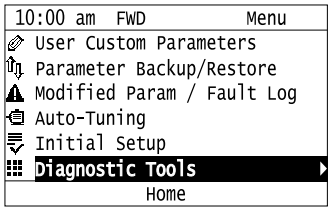
1. Push F2 (Home) to show the HOME screen.

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.

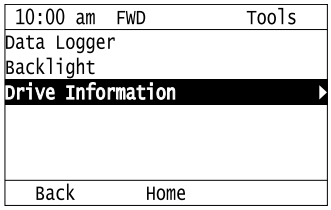
2. Push F2 (Menu).



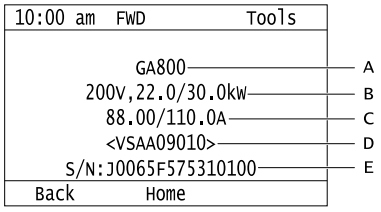
3. Push ▲ or ▼ to select [Diagnostic Tools], then push ↵.



4. Push ▲ or ▼ to select [Drive Information], then push ↵.



The keypad will show the drive information.



A - Drive Series
B - Maximum Applicable Motor Output (HD/ND)
C - Rated Output Current (HD/ND)
D - Drive Software Version
E - Serial Number

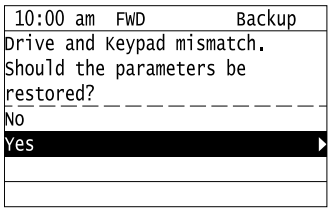
◆ Write Automatically Backed-up Parameters to the Drive

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]*.

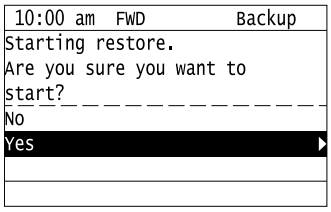
Note:
- Set *o3-06 = 1 [Auto Parameter Backup Selection = Enabled]* in each drive to which you will write the parameters.
- This operation is not available when the parameters in the keypad and the parameters on the other drives are set to the same values.

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.

5.4 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. Use *A1-06* from [User Custom Parameters] on the Main menu to check the parameters that were automatically changed by the application preset function.

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*.

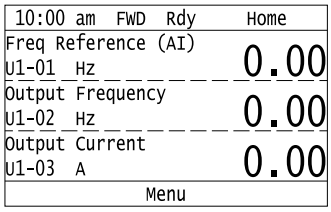
This section shows the procedure to set an application preset.

1. Push F2 (Home) to show the HOME screen.

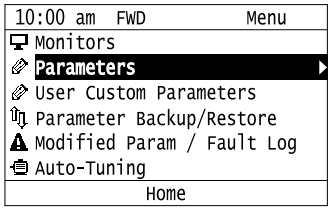
Note:

- 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.

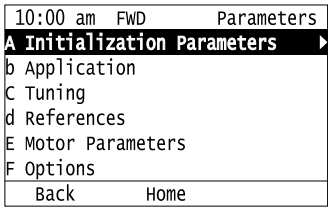
2. Push F2 (Menu).



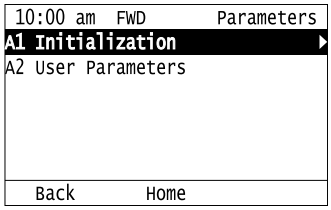
3. Push ▲ or ▼ to select [Parameters], then push ↵.



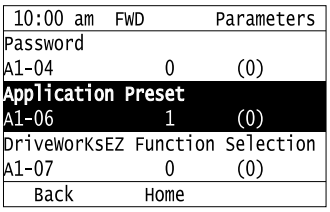
4. Push ▲ or ▼ to select [A Initialization Parameters], then push ↵.



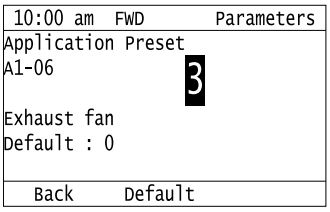
5. Push ▲ or ▼ to select [A1 Initialization], then push ↵.



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]*.

5.5 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 these parameters:

- Motor parameters *E1-xx, E2-xx* (*E3-xx, E4-xx* for motor 2)
- Speed feedback detection-use *F1-xx* (only with CLV)

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 5.1 Types of Auto-Tuning for Induction Motors

Mode	Parameter Settings	Application Conditions and Benefits	Applicable Control Method (A1-02 Setting)				
			V/f (0)	CL-V/f (1)	OLV (2)	CLV (3)	AOLV (4)
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	x	x	x	x
Stationary Auto-Tuning 1	T1-01 = 1	• When you cannot decouple the motor and load, but the motor load is more than 30%. • When the information from the motor test report or motor nameplate is not available. With Stationary Auto-Tuning, the energized drive stays stopped for approximately 1 minute. During this time, the drive automatically measures the necessary motor parameters. • When operating the motor with a light load after Auto-Tuning. The drive can automatically calculate the motor parameter settings necessary for torque control. Set *T1-12 = 1 [Test Mode Selection = Yes]* to do a test run after Auto-Tuning.	-	-	x	x	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	x	x	x	x

■ Input Data for Induction Motor Auto-Tuning

To do Auto-Tuning, input data for the items in Table 5.2 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 5.2 Input Data for Induction Motor Auto-Tuning

Input Data	Parameter	Unit	Auto-Tuning Mode (T1-01 Setting)		
			Rotational Auto-Tuning (0)	Stationary Auto-Tuning 1 (1)	Line-to-Line Resistance (2)
Motor Rated Power	T1-02	kW	x	x	x
Motor Rated Voltage	T1-03	V	x	x	-
Motor Rated Current	T1-04	A	x	x	x
Motor Base Frequency	T1-05	Hz	x	x	-
Number of Motor Poles	T1-06	-	x	x	-
Motor Base Speed	T1-07	min^{-1}	x	x	-
Encoder Pulse Count (PPR)	T1-08	-	○ *1	○ *1	-
Motor No-Load Current	T1-09	A	-	x	-
Motor Rated Slip Frequency	T1-10	Hz	-	○ *2	-
Motor Iron Loss	T1-11	W	○ *3	-	-
Test Mode Selection *4	T1-12	-	-	○ *5	-
No-load voltage	T1-13	V	○ *6	○ *6	-

*1 Input this value when *A1-02 = 3 [Control Method Selection = Closed Loop Vector]*.
*2 Shows 0 Hz as the default value. If you do not know the Motor Rated Slip Frequency, keep the setting at 0 Hz.
*3 Input this value when *A1-02 = 0 or 1 [Control Method Selection = V/f Control or V/f Control w/ PG]*.
*4 If *T1-12 = 1 [Test Mode Selection = Yes]*, when you run the motor in Drive Mode for the first time after Auto-Tuning, the drive will automatically set *E2-02 [Motor Rated Slip]* and *E2-03 [Motor No-Load Current]*.
*5 Input this value when *T1-10 [Motor Rated Slip Frequency]* = 0 Hz.
*6 Set the same value to No-Load Voltage as *T1-03 [Motor Rated Voltage]* to get the same characteristics using Yaskawa 1000-Series drives or other legacy models.

◆ Auto-Tuning for Motor Parameters for PM Motor

This section gives information about Auto-Tuning for PM motors. Auto-Tuning sets these parameters:

- Motor parameters *E1-xx, E5-xx*
- Speed feedback detection uses *F1-xx* (only with CLV/PM)

Table 5.3 Auto-Tuning for PM Motors

Mode	Parameter Settings	Application Conditions and Benefits	Applicable Control Method (A1-02 Setting)		
			OLV/PM (5)	AOLV/PM (6)	CLV/PM (7)
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	x	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	x	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	x	x

Mode	Parameter Settings	Application Conditions and Benefits	Applicable Control Method (A1-02 Setting)		
			OLV/PM (5)	AOLV/PM (6)	CLV/PM (7)
Z-Pulse Offset (Pole Position)	T2-01 = 3	• When you do not know the encoder Z-pulse offset. • When the encoder was replaced • If you have compensated for the deviation from Z phase (Δθ). **Note:** The motor will rotate slowly while the drive measures the encoder base position.	-	-	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	x	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]* or *n8-57 = 1 [HFI Overlap Selection = Enabled]*. • Applicable to IPM motors only. • Perform tuning with the motor connected to the drive. **Note:** When you want to set *n8-35 = 1* or *n8-57 = 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	x	x

■ Input Data for PM Motor Auto-Tuning

To do Auto-Tuning, input data for the items in Table 5.4 and Table 5.5 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 5.4 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, 6, 7**	**5**	**6, 7**	**5**	**6, 7**	**5, 6, 7**
PM Motor Code Selection	**T2-02**	**-**	**Motor code of Yaskawa motor *1***	**FFFF *2***	**FFFF *2***	**-**	**-**	**-**
PM Motor Type	T2-03	-	-	-	-	x	x	-
PM Motor Rated Power	T2-04	kW	-	x	x	x	x	-
PM Motor Rated Voltage	T2-05	V	-	x	x	x	x	-
PM Motor Rated Current	T2-06	A	-	x	x	x	x	x
PM Motor Base Frequency	T2-07	Hz	-	x	-	x	-	-
Number of PM Motor Poles	T2-08	-	-	x	x	x	x	-
PM Motor Base Speed	T2-09	min^{-1}	-	-	x	-	x	-
PM Motor Stator Resistance	T2-10	Ω	x	x	x	-	-	-
PM Motor d-Axis Inductance	T2-11	mH	x	x	x	-	-	-
PM Motor q-Axis Inductance	T2-12	mH	x	x	x	-	-	-
Back-EMF Units Selection	T2-13	-	x	x	x	-	-	-
Back-EMF Voltage Constant (Ke)	T2-14	*3*	x	x	x	-	-	-
Pull-In Current Level	T2-15	%	-	-	-	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, 6, 7**	**5**	**6, 7**	**5**	**6, 7**	**5, 6, 7**
PM Motor Code Selection	**T2-02**	**-**	**Motor code of Yaskawa motor** **1*	**FFFF** **2*	**FFFF** **2*	**-**	**-**	**-**
Encoder Pulse Count (PPR)	T2-16	-	**4*	-	**4*	-	**4*	-
Encoder Z-Pulse Offset for PM Motor	T2-17	Degrees	**4*	-	**4*	-	**4*	-

*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.
*4 Input this value when *A1-02 = 7 [Control Method Selection = PM Closed Loop Vector Control]*.

Table 5.5 Input Data for PM Motor Auto-Tuning

Input Data	Parameter	Unit	Auto-Tuning Mode (T2-01 Setting)				
			Z-Pulse Offset (Pole Position) (3)	PM Rotational Auto-Tuning (4)			High Frequency Injection Auto-Tuning (5)
Control method selection	**A1-02**	**-**	**7**	**5**	**6**	**7**	**5, 6, 7**
PM Motor Code Selection	**T2-02**	**-**	**-**	**-**	**-**	**-**	**-**
PM Motor Type	T2-03	-	-	x	x	x	-
PM Motor Rated Power	T2-04	kW	-	x	x	x	-
PM Motor Rated Voltage	T2-05	V	-	x	x	x	-
PM Motor Rated Current	T2-06	A	-	x	x	x	-
PM Motor Base Frequency	T2-07	Hz	-	x	-	-	-
Number of PM Motor Poles	T2-08	-	-	x	x	x	-
PM Motor Base Speed	T2-09	min^{-1}	-	-	x	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	x	x	-
Encoder Pulse Count (PPR)	T2-16	-	-	-	-	x	-
Encoder Z-Pulse Offset for PM Motor	T2-17	Degrees	-	-	-	-	-

*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 5.6 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 5.7 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 5.7 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	-

◆ Control Tuning

To increase drive responsiveness and prevent hunting, use Auto-Tuning to automatically adjust the control-related parameters.

These types of Auto-Tuning are available for the control system:

- Inertia Tuning
- ASR Tuning
- Deceleration Rate Tuning
- KEB Tuning

Note:

If you do Control Tuning, you cannot set *H1-xx = 16 [Motor 2 Selection]*. Do not do Control Tuning for applications that switch between motor 1 and motor 2.

Table 5.8 Control Loop Tuning Selection

Mode	T3-00	Application Conditions and Benefits	Applicable Control Method (A1-02 Value)								
			V/f (0)	CL-V/f (1)	OLV (2)	CLV (3)	AOLV (4)	OLV/PM (5)	AOLV/PM (6)	CLV/PM (7)	EZOLV (8)
Inertia Tuning	0	• For Feed Forward Control • When *L2-29 = 1 [Kinetic Energy Backup Method = Single Drive KEB Ride-Thru 2]*. • When MFDI *H1-xx = 7A [KEB Ride-Thru 2 Activate (N.C.)]*.	-	-	-	x	-	-	-	x	-
ASR Tuning	1	To let the set response frequency (including Inertia Tuning) automatically adjust the ASR gain.	-	-	-	x	-	-	-	x	-

Mode	T3-00	Application Conditions and Benefits	Applicable Control Method (A1-02 Value)								
			V/f (0)	CL-V/f (1)	OLV (2)	CLV (3)	AOLV (4)	OLV/PM (5)	AOLV/PM (6)	CLV/PM (7)	EZOLV (8)
Deceleration Rate Tuning	2	To automatically adjust the deceleration rate to prevent an *ov [Overvoltage]* fault.	x	x	x	x	x	x	x	x	x
KEB Tuning	3	• To automatically adjust parameter settings to prevent an *ov [Overvoltage]* fault with the KEB Ride-Thru function. • When *L3-11 = 1 [Overvoltage Suppression Select = Enabled]*.	x	x	x	x	x	x	x	x	x

Table 5.9 Input Data for Control Tuning

Input Data	Parameters	Unit	Auto-Tuning Mode (T3-00 Value)			
			Inertia Tuning (0)	ASR (Speed Regulator) (1)	Dec Rate Tuning (2)	KEB Tuning (3)
Test Signal Frequency	T3-01	Hz	x	x	-	-
Test Signal Amplitude	T3-02	Rad	x	x	-	-
Motor Inertia	T3-03	$Kg \cdot m^2$	x	x	-	-
System Response Frequency	T3-04	Hz	-	x	-	-

■ Inertia Tuning

Inertia Tuning uses the motor speed and torque reference to estimate the system inertia and automatically sets the drive parameters related to the inertia ratio of the machinery and motor. Use Inertia Tuning for Feed Forward control or when *H1-xx = 7A [MFDI Function Select = KEB Ride-Thru 2 Activate (N.C.)]*.

Inertia tuning identifies the load inertia and optimizes the speed loop gain and feed forward gain to get a high level of control capability. You can set the speed response without thinking about the load, which increases the precision when synchronizing multiple drives. Since the motor can continue to operate during a power outage, Inertia Tuning keeps the best ramp to stop deceleration curve for KEB Ride-Thru.

■ ASR Tuning

ASR Tuning estimates the motor load inertia and automatically sets the parameters. ASR Tuning also uses the measured load inertia value to do an automatic adjustment after calculating the proportional gain of speed control (ASR).

■ Deceleration Rate Tuning

Deceleration Rate Tuning automatically sets the deceleration rate to prevent an *ov [Overvoltage]* fault during motor deceleration. Set *C1-11 [Accel/Decel Time Switchover Freq]* first to automatically set parameters *C1-02 [Deceleration Time 1]* (high speed range) and *C1-08 [Deceleration Time 4]* (low speed range).

■ KEB Tuning

KEB Tuning automatically sets parameters used for the KEB Ride-Thru function and for the overvoltage suppression function.

Control Tuning automatically sets the parameters in Table 5.10 to the best values.

Table 5.10 Parameters set in Control Tuning

Parameters Automatically Set	Inertia Tuning	ASR Tuning	Deceleration Rate Tuning	KEB Tuning
C1-02 [Deceleration Time 1]	-	-	x	-
C1-08 [Deceleration Time 4]	-	-	x *1	-
C1-09 [Fast Stop Time]	-	-	-	x *2
C5-01 [ASR Proportional Gain 1]	-	x	-	-
C5-17 [Motor Inertia]	x	x	-	-

Parameters Automatically Set	Inertia Tuning	ASR Tuning	Deceleration Rate Tuning	KEB Tuning
C5-37 [Motor 2 Inertia]	x	x	-	-
C5-18 [Load Inertia Ratio]	x	x	-	-
C5-38 [Motor 2 Load Inertia Ratio]	x	x	-	-
L2-06 [Kinetic Energy Backup Decel Time]	-	-	-	x *3
L3-24 [Motor Accel Time @ Rated Torque]	x	x	-	-
L3-25 [Load Inertia Ratio]	x	x	-	x
n5-02 [Motor Inertia Acceleration Time]	x	x	-	-
n5-03 [Feed Forward Control Gain]	x	x	-	-

*1 The drive automatically sets *C1-08 [Deceleration Time 4]* only when *C1-11 [Accel/Decel Time Switchover Freq] ≠ 0*.
*2 When *L2-29 = 0 [Kinetic Energy Backup Method = Single Drive KEB Ride-Thru 1]*, the drive will automatically adjust *C1-09 [Fast Stop Time]* and will not adjust *L2-06 [Kinetic Energy Backup Decel Time]*. If the Fast Stop time must not change, do not do KEB Tuning.
*3 When *L2-29 = 1, 2, or 3 [Kinetic Energy Backup Method = Single Drive KEB Ride-Thru 2, System KEB Ride-Thru 1, or System KEB Ride-Thru 2]*, the drive will automatically adjust *L2-06 [Kinetic Energy Backup Decel Time]*.

◆ 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 200 V class models or by 40 V for 400 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 STOP 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 5.11 shows the status of input/output terminals during Auto-Tuning.

Table 5.11 Status of Input/Output Terminals during Auto-Tuning

Auto-Tuning Type	Mode		Multifunctional input	Multifunctional output *1
Induction Motor Auto-Tuning	Rotational	Rotational Auto-Tuning	Disabled	Functions the same as during usual operation.
	Stationary	Stationary Auto-Tuning 1	Disabled	Keeps the status at the start of Auto-Tuning.
		Line-to-Line Resistance	Disabled	Keeps the status at the start of Auto-Tuning.
PM Motor Auto-Tuning	Rotational	Z-Pulse Offset (Pole Position)	Disabled	Keeps the status at the start of Auto-Tuning.
		PM Rotational Auto-Tuning	Disabled	Functions the same as during usual operation.
	Stationary	PM Motor Parameter Settings	Disabled	Disabled
		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.

Auto-Tuning Type	Mode		Multifunctional input	Multifunctional output *1
EZ Tuning	Stationary	Motor Parameter Setting	Disabled	Disabled
		Line-to-Line Resistance	Disabled	Keeps the status at the start of Auto-Tuning.
ASR and Inertia Tuning	Rotational	Inertia Tuning	Disabled	Functions the same as during usual operation.
		ASR (Speed Regulator)	Disabled	Functions the same as during usual operation.
		Deceleration Rate Tuning	Disabled	Functions the same as during usual operation.
		KEB Tuning	Disabled	Functions the same as during usual operation.

*1 A terminal to which *H2-xx = E [MFDO Function Select = 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! *Before you do Rotational Auto-Tuning, disconnect the load from the motor. The load can move suddenly and cause serious injury or death.*

WARNING! *Crush Hazard. This seems incorrect. The drive should not take a 60 Hz motor to 90 Hz during tuning. We thing this is a translation error. Please confirm it. 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.*

- Uncouple the drive from the motor before Rotational Auto-Tuning to prevent drive malfunction. 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.*

Automatically Set E2-02 [Motor Rated Slip] and E2-03 [Motor No-Load Current]

If *T1-12 = 1 [Test Mode Selection = Yes]* when selecting Stationary Auto-Tuning, the drive will automatically set motor parameters *E2-02 [Motor Rated Slip]* and *E2-03 [Motor No-Load Current]* after Auto-Tuning is complete when you use the motor for the first time in Drive Mode.

After Stationary Auto-Tuning is complete, use this procedures to do the operation in test mode:

1. Check the *E2-02* and *E2-03* values on the “Modified Parameters/Fault Log” screen or the “Parameters” screen.
2. Operate the motor in Drive Mode with these conditions:
   - Make sure that you connect all wiring between the drive and motor
   - Make sure that a mechanical brake on the motor shaft is not locked
   - The maximum motor load must be 30% of the rated load.
   - Keep a constant speed of 30% of *E1-06 [Base Frequency]* (default value = maximum frequency) or more for 1 second or longer.
3. After the motor stops, check the *E2-02* and *E2-03* values on the “Modified Parameters/Fault Log” screen or the “Parameters” screen again.
4. Make sure that the input data is correct.
   When the settings in *E2-02* and *E2-03* are different than in step 1, the drive set the values automatically.

Note:
- If you cannot operate the motor with the conditions in step 2 for the first test run and if the values set in *E2-02* and *E2-03* are much different than data in the official test report for the motor and the data listed in *Defaults by Drive Model and Duty Rating ND/HD on page 230*, these problems can occur:
  – Motor vibrations or hunting
  – Not sufficient torque
  – Overcurrent

  In elevator applications, there is a risk of the cage falling and causing personal injury.
  Do one of these precautions to decrease the risk:
  – After doing Stationary Auto-Tuning, operate the drive as specified by the conditions and procedure above.
  – Set *T1-12 = 0 [Test Mode Selection = No]*.
  – Do Rotational Auto-Tuning.
- If you initialize the drive after completing Step 1, do the procedure beginning from Step 1 again.
- For general-purpose motors, the target value for *E2-02* is 1 Hz to 3 Hz, and the target rated current for *E2-03* is 30% to 65%. Larger capacity motors have a lower rated slip, and a smaller ratio for the no-load current rated current. Refer to *Defaults by Drive Model and Duty Rating ND/HD on page 230*.

■ 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.*

■ Precautions before Inertia Tuning and ASR Tuning

Before Inertia Tuning or ASR Tuning, check these items:

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.*

- Do rotational motor parameter tuning or look at the motor test report or nameplate to enter the values manually.
- Make sure that the motor magnetic brake is released.
- Connect the motor and load.
- Make sure that external force from the machine will not cause the motor to rotate.
- Make sure that the machine does not prevent reverse rotation. You cannot do Inertia Tuning or ASR Tuning with machines that prevent reverse rotation.
- When the motor can rotate during Auto-Tuning, check for safety issues near the drive, motor, and machine.

Note:
If there are gears between the machine and motor shaft, Inertia Tuning or ASR Tuning are possibly not applicable.

■ Precautions before Using Deceleration Rate Tuning and KEB Tuning

Before Deceleration Rate Tuning or KEB Tuning, check these items:

Note:
- Do not do Deceleration Rate Tuning if you use a braking resistor unit or a regenerative converter.
- Do Deceleration Rate Tuning and KEB Tuning with the load attached to the motor.
- Do not do Deceleration Rate Tuning or KEB Tuning for these applications:
  In Deceleration Rate Tuning and KEB Tuning, the drive will automatically rotate the motor forward and accelerate and decelerate the motor again and again.
  – On a machine that does not let the motor rotate forward
  – In applications with a small range of operation (trolleys and other such applications that can only move linearly)
  – Applications where sudden acceleration and sudden deceleration are not applicable.
- To do KEB Tuning with the external main circuit capacitors connected to the drive, set *L3-26 [Additional DC Bus Capacitors]* then do KEB Tuning.
- Do not do KEB Tuning or Deceleration Rate Tuning if the drive is set to use *H1-xx = 16 [MFDI Function Select = Motor 2 Selection]*. Failure to obey can cause an *ov [Overvoltage]* fault.

5.6 Test Run

After you use the Setup Wizard to set the basic parameters and 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

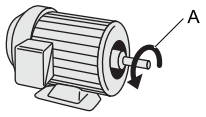
Check these items before operation:

- 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 LO/RE to illuminate the LOCAL/REMOTE indicator.
3. Push ↵ to show *d1-01 [Reference 1]*, and set it to 6.00 Hz.
4. Push RUN.
   The RUN indicator 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.
   Ex.: 6 Hz → 20 Hz → 30 Hz → 40 Hz → 50 Hz → 60 Hz
8. Make sure that the motor rotates correctly, then push STOP.
   The RUN indicator will flash. When the motor stops, the indicator will go out.

◆ 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 STOP 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 *d1-01 [Reference 1]* to 6.00 Hz.
3. Push LO/RE to illuminate the LOCAL/REMOTE indicator.
4. Push RUN.
   The RUN indicator 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.
   Ex.: 6 Hz → 20 Hz → 30 Hz → 40 Hz → 50 Hz → 60 Hz
8. Make sure that the motor rotates correctly, then push STOP.
   The RUN indicator will flash. When the motor stops, the indicator will go out.
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, adjust the settings to stop the errors.

5.7 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.

- *V/f Control and Closed Loop V/f Control on page 362*
- *Open Loop Vector Control Method on page 363*
- *Closed Loop Vector Control Method on page 364*
- *Advanced Open Loop Vector Control Method on page 365*
- *Fine-Tuning Open Loop Vector Control for PM Motors on page 366*
- *Advanced Open Loop Vector Control Method for PM on page 367*
- *Closed Loop Vector Control Method for PM on page 367*
- *EZ Open Loop Vector Control Method on page 368*

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 and Closed Loop V/f Control

Table 5.12 Parameters for Fine Tuning the Drive (V/f and CL-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 ms to 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
Speed precision is unsatisfactory. (Closed Loop V/f Control)	• C5-01 [ASR Proportional Gain 1] • C5-02 [ASR Integral Time 1 (I)] *5	Adjust *C5-01, C5-02*.	• C5-01: 0.20 • C5-02: 0.200 s	• Proportional gain = 0.10 to 1.00 • Integral time = 0.100 to 2.000 s

*1 The default setting changes when the settings for *C6-01 [Normal / Heavy Duty Selection]* and *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 200 V class drives. Multiply the voltage by 2 for 400 V class drives.
*5 In Closed Loop V/f Control, ASR only controls the output frequency. You cannot make a high-gain as in Closed Loop Vector control.

◆ Open Loop Vector Control Method

In Open Loop Vector Control, keep *C4-01 [Torque Compensation Gain]* at its default setting (1.00).

If you cannot get speed precision during regeneration in Open Loop Vector Control, set *C3-04 = 1 [Slip Compensation @ Regen Select = Enabled above 6 Hz]*.

Table 5.13 Parameters for Fine Tuning the Drive (*A1-02 = 2[OLV]*)

Issue	Parameter Number	Possible Solutions	Default	Recommended Setting
• Unsatisfactory motor torque and speed response • Hunting or oscillation at mid-range speeds (10 Hz to 40 Hz)	n2-01 [SpdFeedbackDetectCtr (AFR) Gain]	• To increase the speed of torque or speed response, decrease the setting value in increments of 0.05. • If hunting or oscillation occur, decrease the setting value in increments of 0.05.	1.00	0.50 - 2.00
	n2-02 [SpdFeedbackDetCtr(AFR) TimeConst1]	• To increase the speed of torque or speed response, decrease the setting value in increments of 10 ms and examine the response. • If hunting or oscillation occur or if the load inertia is too much, increase the setting value in increments of 50 ms and examine the response. **Note:** Make sure that this parameter setting is: *n2-02 ≤ n2-03 [Automatic Freq Regulator Time 2]* holds true. When you adjust *n2-02*, you must also increase the *C4-02 [Motor 1 Torque Comp Delay Time]* value by the same ratio.	50 ms	50 ms to 2000 ms
ov [overvoltage] occurs when the drive stops accelerating, starts to decelerate, or when there are large changes in the load.	n2-03 [SpdFeedbackDetCtr(AFR) TimeConst2]	• If *ov* occurs, increase the setting value in increments of 50 ms and examine the response. • If the response is not sufficient, decrease the setting value in increments of 10 ms and examine the response. **Note:** Make sure that this parameter setting is: *n2-02 [Automatic Freq Regulator Time 1] ≤ n2-03*. When you adjust *n2-03* you must also increase the *C4-06 [Motor 2 Torque Comp Delay Time]* value by the same ratio.	750 ms	750 ms to 2000 ms
	C4-06 [Motor 2 Torque Comp Delay Time]	• If *ov* occurs, increase the setting value in increments of 10 ms and examine the response. • If the response is not sufficient, decrease the setting value in increments of 2 ms and examine the response. **Note:** Make sure that this parameter setting is: *C4-02 [Torque Compensation Delay Time] ≤ C4-06*. When you adjust *C4-06*, you must also increase the *n2-03 [SpdFeedbackDetCtr(AFR) TimeConst2]* value by the same ratio.	150 ms	150 ms to 750 ms

Issue	Parameter Number	Possible Solutions	Default	Recommended Setting
• Unsatisfactory motor torque and speed response • Hunting or oscillation	C4-02 [Torque Compensation Delay Time 1]	• If torque or speed response are slow, decrease the setting value in increments of 2 ms. • If hunting or oscillation occur, increase the setting value in increments of 10 ms. **Note:** Make sure that this parameter setting is: *C4-02* ≤ *C4-06 [Motor 2 Torque Comp Delay Time]*. When you adjust *C4-02*, you must also increase the *n2-02 [SpdFeedbackDetCtr (AFR) TimeConst1]* value by the same ratio.	20 ms *1	20 ms to 100 ms *1
• Speed response is slow. • Speed is not stable.	C3-02 [Slip Compensation Delay Time]	• If speed response is slow, decrease the setting value in increments of 10 ms. • If speed is not stable, increase the value in increments of 10 ms.	200 ms *1	100 ms to 500 ms
Speed precision is unsatisfactory.	C3-01 [Slip Compensation Gain]	• If speed is too slow, increase the setting value in increments of 0.1. • If speed is too fast, decrease the setting value in increments of 0.1.	1.0 *2	0.5 - 1.5
• The volume of the motor excitation sound is too high. • Hunting or oscillation at low speeds (10 Hz or lower)	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 speeds, decrease the carrier frequency.	1 (2 kHz) *3	0 to upper limit value
• Torque at low speeds (10 Hz or lower) is not sufficient. speed response is slow. • Speed response is slow. • Large initial vibration at start up.	• E1-08 [Mid Point A Voltage] • E1-10 [Minimum Output Voltage]	• If torque or speed response are slow, increase the setting value. • If there is large initial vibration at start up, decrease the setting value **Note:** If the setting value is set too high, a large torque reference may be output even with light loads.	• E1-08: 11.0 V *2 • E1-10: 2.0 V *2	Default setting +/- 2 V *4

*1 The default setting changes when the settings for*A1-02 [Control Method Selection]* and *o2-04 [Drive Model (KVA) Selection]* change.
*2 The default setting changes when the settings for *A1-02 [Control Method Selection]* and *E1-03 [V/f Pattern Selection]* change.
*3 The default setting changes when the settings for *C6-01 [Normal / Heavy Duty Selection]* and *o2-04* change.
*4 Recommended settings are for 200 V class drives. Multiply the voltage by 2 for 400 V class drives.

◆ Closed Loop Vector Control Method

Table 5.14 Parameters for Fine Tuning the Drive (CLV)

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 (P)] *1	• 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.	20.00	10.00 - 50.00
	• High speed C5-02 [ASR Integral Time 1] • Low speed C5-04 [ASR Integral Time 2 (I)] *1	• 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
The drive cannot find ASR proportional gain or integral time for low speed or high speed.	C5-07 [ASR Gain Switchover Frequency] *1	Change the ASR proportional gain and ASR integral time to conform to the output frequency.	0.0 Hz	0.0 Hz to maximum output frequency

Issue	Parameter Number	Possible Solutions	Default	Recommended Setting
Hunting or oscillation	C5-06 [ASR Delay Time] *1	• If torque or speed response are slow, decrease the setting value in increments of 0.010. • If the rigidity of the machine is unsatisfactory and vibration is possible, increase the setting value.	0.004 s	0.004 s to 0.020 s
• The volume of the motor excitation sound is too high. • Hunting or oscillation at low speeds (3 Hz or lower)	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 speeds, decrease the carrier frequency.	1 (2.0 kHz) *2	2.0 kHz to upper limit value

*1 Refer to the section on *C5-xx parameters* for more information about speed control (ASR).
*2 The default setting changes when the settings for *C6-01 [Normal / Heavy Duty Selection]* and *o2-04 [Drive Model (KVA) Selection]* change.

◆ Advanced Open Loop Vector Control Method

Table 5.15 Parameters for Fine Tuning the Drive (AOLV)

Issue	Parameter Number	Possible Solutions	Default	Recommended Setting
• *oS [Overspeed]* occurs. • Hunting or oscillation.	T1-01 [Auto-Tuning Mode Selection]	• Make sure that the output of the drive and the motor are connected correctly. • Do Rotational Auto-Tuning for a single motor.	-	0
The volume of the motor excitation sound is too high.	C6-02 [Carrier Frequency Selection]	If the volume of the motor excitation sound is too high, increase the carrier frequency.	1 (2 kHz) *1	1 to upper limit value
Speed precision is unsatisfactory	E2-02 [Motor Rated Slip]	• Decouple the motor and machine and do Rotational Auto-Tuning. • If the motor speed is slow, increase the value of *E2-02* in small increments (approximately 0.1% of the default setting value). • If the motor speed is fast, decrease the value of *E2-02* in small increments (approximately 0.1% of the default setting value).	*2	Set to a value that is ±5% of the current value.
• 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 (P)] *3	• 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.	• C5-01 = 10.00 • C5-03 = 20.00	10.00 - 50.00
	• High speed C5-02 [ASR Integral Time 1] • Low speed C5-04 [ASR Proportional Gain 2 (P)] *3	• 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
The drive cannot find speed response for low speed or high speed.	• C5-07 [ASR Gain Switchover Frequency] *4 • High speed C5-01 [ASR Proportional Gain 1] C5-02 [ASR Integral Time 1] • Low speed C5-03 [ASR Proportional Gain 2 (P)] *3 C5-04 [ASR Integral Time 2]	Change the ASR proportional gain and ASR integral time to conform to the output frequency.	• C5-07 = 0.0 Hz • C5-01 = 10.00 • C5-02 = 0.500 s • C5-03 = 20.00 • C5-04 = 0.500 s	C5-07: 0.0 to maximum output frequency
Hunting or oscillation	C5-06 [ASR Delay Time] *4	• If torque or speed response are slow, decrease the setting value in increments of 0.010. • If the rigidity of the machine is unsatisfactory and vibration is possible, increase the setting value.	0.004 s	0.004 s to 0.020 s

*1 The default setting changes when the settings for *C6-01 [Normal / Heavy Duty Selection]* and *o2-04 [Drive Model (KVA) Selection]* change.
*2 The default setting changes when the setting for *o2-04 [Drive Model Selection]* changes.

*3 Refer to the section on *C5-xx parameters* for more information about speed control (ASR).
*4 The best values for a no-load operation are different than the best values for actual loading operation.

◆ Fine-Tuning 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.

◆ Advanced Open Loop Vector Control Method for PM

Table 5.17 Parameters for Fine Tuning the Drive (*A1-02 = 6[AOLV/PM]*)

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	5.00 to 30.00 *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.	0.016 s	0.016 s to 0.035 s *1
Step-out	E1-xx parameters, E5-xx parameters	Refer to the motor nameplate or test report and set *E1-xx* or *E5-xx* correctly.	-	-

*1 The best values for a no-load operation are different than the best values for actual loading operation.

◆ Closed Loop Vector Control Method for PM

Table 5.18 Parameters for Fine Tuning the Drive (CLV/PM)

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.	20.00	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 to 1.000 s *1
The drive cannot find speed response for low speed or high speed.	• C5-07 [ASR Gain Switchover Frequency] • High speed C5-01 [ASR Proportional Gain 1] C5-02 [ASR Integral Time 1] • Low speed C5-03 [ASR Proportional Gain 2] C5-04 [ASR Integral Time 2]	Change the ASR proportional gain and ASR integral time to conform to the output frequency.	• C5-07 = 0.0 % • C5-01 = 20.00 • C5-02 = 0.500 s • C5-03 = 20.00 • C5-04 = 0.500 s	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 to 0.020 s *1
Step-out	E1-xx parameters, E5-xx parameters	Refer to the motor nameplate or test report and set *E1-xx* or *E5-xx* correctly.	-	-

*1 The best values for a no-load operation are different than the best values for actual loading operation.

◆ EZ Open Loop Vector Control Method

Table 5.19 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.

5.8 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 5.20 V/f Control [A1-02 = 0] and Closed Loop V/f Control [A1-02 = 1]

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 5.21 Closed Loop V/f Control [A1-02 = 1]

Checked	No.	Description
	5	Set *F1-01 [Encoder 1 Pulse Count (PPR)]* correctly and make sure that encoder pulse counting direction is correct.
	6	Set *C5-01 [ASR Proportional Gain 1] and C5-02 [ASR Integral Time 1]*.

Table 5.22 Open Loop Vector Control [A1-02 = 2] or Closed Loop Vector Control [A1-02 = 3]

Checked	No.	Description
	7	Decouple motor shafts and machines.
	8	Refer to the information on the motor nameplate and set this data correctly: • Motor rated power (kW) to *T1-02* • Motor rated voltage (V) to *T1-03* • Motor rated current (A) to *T1-04* • Motor base frequency (Hz) to *T1-05* • Number of motor poles to *T1-06* • Motor base speed (min^{-1}) to *T1-07*
	9	Do Rotational Auto-Tuning.

Table 5.23 Closed Loop Vector Control [A1-02 = 3]

Checked	No.	Description
	10	Set *F1-01 [Encoder 1 Pulse Count (PPR)] and F1-05 [Encoder 1 Rotation Selection]*.
	11	Set *C5-01 [ASR Proportional Gain 1] and C5-02 [ASR Integral Time 1]*.

Table 5.24 PM Open Loop Vector Control [A1-02 = 5]

Checked	No.	Description
	12	Set *E5-01 through E5-24 [PM Motor Settings]*.

Table 5.25 PM Advanced Open Loop Vector [A1-02 = 6]

Checked	No.	Description
	13	Set *E5-01 through E5-24 [PM Motor Settings]*.
	14	Set *C5-01 [ASR Proportional Gain 1] and C5-02 [ASR Integral Time 1]*.

Table 5.26 PM Closed Loop Vector Control [A1-02 = 7]

Checked	No.	Description
	15	Set *E5-01 through E5-24 [PM Motor Settings]*.
	16	Set *C5-01 [ASR Proportional Gain 1] and C5-02 [ASR Integral Time 1]*.

Checked	No.	Description
	17	Set *F1-01 [Encoder 1 Pulse Count (PPR)] and F1-05 [Encoder 1 Rotation Selection]*.
	18	Set *E5-11 [Encoder Z-Pulse Offset]*.

Checked	No.	Description
	19	The keypad will show “Rdy” after starting to operate the motor.
	20	To give the Run command and frequency reference from the keypad, push LO/RE to set to LOCAL Mode (when in LOCAL Mode, the LO/RE LED illuminates).
	21	If the motor rotates in the opposite direction during test run, switch two of the motor cables (U/T1, V/T2, W/T3).
	22	Set Heavy Duty or Normal Duty Mode with *C6-01 [Normal / Heavy Duty Selection]* to conform to the load condition.
	23	Set *E2-01 [Motor Rated Current (FLA)] and L1-01 [Motor Overload Protection Select]* correctly for motor thermal protection.
	24	Set the drive for REMOTE Mode when the control circuit terminals supply the Run command and frequency reference (in REMOTE Mode, the LO/RE LED turns OFF).
	25	When terminal A1 is used for the frequency reference: • Voltage input – Set DIP Switch S1-1 on the drive to “V”. – Set *H3-01 = 0, 1 [Terminal A1 Signal Level Select = 0 to 10V (Lower Limit at 0), -10 to +10V (Bipolar Reference)]*. – Set *H3-02 = 0 [Terminal A1 Function Selection = Frequency Reference]*. • Current input – Set DIP Switch S1-1 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]*.
	26	When terminal A2 is used for the frequency reference: • Voltage input – Set DIP Switch S1-2 on the drive to “V”. – Set *H3-09 = 0, 1 [Terminal A2 Signal Level Select = 0 to 10V (Lower Limit at 0), -10 to 10 V (Bipolar Reference)]*. – Set *H3-10 = 0 [Terminal A2 Function Selection = Frequency Reference]*. • Current input – Set DIP Switch S1-2 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]*.
	27	When terminal A3 is used for the frequency reference: • Voltage input – Set DIP Switch S4 on the drive to analog input side. – Set DIP Switch S1-3 on the drive to “V”. – Set *H3-05 = 0, 1 [Terminal A3 Signal Level Select = 0 to 10V (Lower Limit at 0), -10 to +10V (Bipolar Reference)]*. – Set *H3-06 = 0 [Terminal A3 Function Selection = Frequency Reference]*. • Current input – Set DIP Switch S4 on the drive to analog input side. – Set DIP Switch S1-3 on the drive to “I”. – Set *H3-05 = 2, 3 [Terminal A3 Signal Level Select = 4 to 20 mA (Lower Limit at 4), 0 to 20 mA (Bipolar Reference)]*. – Set H3-06 = 0 [Terminal A3 Function Selection = Frequency Reference].
	28	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*, for terminal A3 input: *H3-07*) 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*, for terminal A3 input: *H3-08*)

6

Specifications

6.1 Drive Derating 372

6.1 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 6.1, Table 6.3, and Table 6.4 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. When *A1-02 = 4, 6 [Control Method Selection = AOLV, AOLV/PM]*, refer to Table 6.2, Table 6.5, and Table 6.6.

■ 200 V Class

Table 6.1 Carrier Frequency and Rated Current Derating

Model	Rated Current (A)											
	Heavy Duty Rating (HD) Parameter C6-01 = 0						Normal Duty Rating (ND) Parameter C6-01 = 1					
	2 kHz	5 kHz	8 kHz	10 kHz	12.5 kHz	15 kHz	2 kHz	5 kHz	8 kHz	10 kHz	12.5 kHz	15 kHz
2004	3.5	3.5	3.5	3.4	3.2	3.06	4.2	4.0	3.6	3.4	3.1	2.77
2006	5.0	5.0	5.0	4.8	4.6	4.3	6	5.6	5	4.6	4.1	3.6
2008	6.9	6.9	6.9	6.5	5.9	5.4	8	7.6	6.9	6.5	5.9	5.4
2010	8.0	8.0	8.0	7.4	6.6	5.8	9.6	9.0	8	7.4	6.6	5.8
2012	11.0	11.0	11.0	10.4	9.6	8.8	12	11.7	11	10.5	9.9	9.3
2018	14.0	14.0	14.0	12.6	10.8	9.1	17.5	16.1	14	12.6	10.8	9.1
2021	17.5	17.5	17.5	16.1	14.3	12.6	21	19.6	17	16.1	14.3	12.5
2030	25.0	25.0	25.0	23.0	20.5	18.0	30	28.0	25	23.0	20.5	18.0
2042	33.0	33.0	33.0	29.3	24.8	20.2	42	38.4	33	29.4	24.9	20.4
2056	47.0	47.0	47.0	43.4	38.9	34.4	56	52.4	47	43.4	38.9	34.4
2070	60.0	60.0	60.0	56.0	51.0	46	70	66.0	60	56.0	51.0	46.0
2082	75.0	75.0	75.0	68.6	60.5	53	82	82.0	75	68.8	61.0	53.1
2110	88.0	88.0	88.0	80.5	71.0	62	110	102.7	92	84.3	75.2	66.0
2138	115.0	115.0	115.0	105.1	92.8	81	138	128.8	115	105.8	94.3	82.8
2169	145.0	145.0	125.2	112.0	-	-	169	152.7	128.3	112.0	-	-
2211	180.0	180.0	155.2	138.6	-	-	211	190.2	158.9	138.1	-	-
2257	215.0	215.0	184.8	164.7	-	-	257	230.4	190.5	163.9	-	-
2313	283.0	283.0	249.0	226.4	-	-	313	288.5	251.7	227.1	-	-
2360	346.0	346.0	294.3	259.8	-	-	360	330.8	287.6	258.8	-	-
2415	415.0	415.0	365.2	332.0	-	-	-	-	-	-	-	-

Table 6.2 AOLV，AOLV/PM Carrier Frequency and Rated Current Derating

Model	Rated Current (A)											
	Heavy Duty Rating (HD) *1 Parameter C6-01 = 0						Normal Duty Rating (ND) *1 Parameter C6-01 = 1					
	2 kHz (2 kHz)	4 kHz (-)	6 kHz (5 kHz)	8 kHz (8 kHz)	10 kHz (10 kHz)	12 kHz (12.5 kHz)	2 kHz (2 kHz)	4 kHz (-)	6 kHz (5 kHz)	8 kHz (8 kHz)	10 kHz (10 kHz)	12 kHz (12.5 kHz)
2004	3.5	3.5	3.4	3.2	3.1	2.9	4.2	3.8	3.5	3.1	2.8	2.4
2006	5.0	5.0	4.9	4.6	4.3	4.1	6.0	5.4	4.8	4.2	3.6	3.0
2008	6.9	6.9	6.7	6.0	5.4	4.7	8.0	7.3	6.7	6.0	5.4	4.7

Model	Rated Current (A)											
	Heavy Duty Rating (HD) *1 Parameter C6-01 = 0						Normal Duty Rating (ND) *1 Parameter C6-01 = 1					
	2 kHz (2 kHz)	4 kHz (-)	6 kHz (5 kHz)	8 kHz (8 kHz)	10 kHz (10 kHz)	12 kHz (12.5 kHz)	2 kHz (2 kHz)	4 kHz (-)	6 kHz (5 kHz)	8 kHz (8 kHz)	10 kHz (10 kHz)	12 kHz (12.5 kHz)
2010	8.0	8.0	7.7	6.7	5.8	4.8	9.6	8.6	7.7	6.7	5.8	4.8
2012	11.0	11.0	10.7	9.8	8.8	7.9	12.2	11.5	10.7	10.0	9.3	8.6
2018	14.0	14.0	13.3	11.2	9.1	6.9	17.5	15.4	13.3	11.2	9.1	6.9
2021	17.5	17.5	16.8	14.7	12.6	10.4	21.0	18.9	16.8	14.6	12.5	10.4
2030	25.0	25.0	24.0	21.0	18.0	15.0	30.0	27.0	24.0	21.0	18.0	15.0
2042	33.0	33.0	31.2	25.7	20.2	14.7	42.0	36.6	31.2	25.8	20.4	15.0
2056	47.0	47.0	45.2	39.8	34.4	29.0	56.0	50.6	45.2	39.8	34.4	29.0
2070	60.0	60.0	58.0	52.0	46.0	40.0	70.0	64.0	58.0	52.0	46.0	40.0
2082	75.0	75.0	71.8	62.1	52.5	42.9	82.0	81.4	72.0	62.6	53.1	43.7
2110	88.0	88.0	84.2	72.9	61.6	50.3	110.0	99.0	88.0	77.0	66.0	55.0
2138	115.0	115.0	110.1	95.3	80.5	65.7	138.0	124.2	110.4	96.6	82.8	69.0
2169	145.0	138.4	118.6	98.8	78.9	-	169.0	144.6	120.1	95.7	71.2	-
2211	180.0	171.7	146.9	122.0	97.2	-	211.0	179.7	148.5	117.2	86.0	-
2257	215.0	204.9	174.7	144.5	114.3	-	257.0	217.1	177.2	137.3	97.4	-
2313	283.0	271.7	237.7	203.8	169.8	-	313.0	276.2	239.4	202.6	165.8	-
2360	346.0	328.8	277.0	225.3	173.6	-	359.6	316.4	273.2	230.0	186.8	-
2415	415.0	398.4	348.6	298.8	249.0	-	-	-	-	-	-	-

*1 The upper values are for *A1-02 = 6 [Control Method Selection = AOLV/PM]*. The values in parenthesis are for *A1-02 = 4 [ALOV]*.

■ 400 V Class

Table 6.3 Carrier Frequency and Rated Current Derating (400 V Output Applications)

Model	Rated Current (A)											
	Heavy Duty Rating (HD) Parameter C6-01 = 0						Normal Duty Rating (ND) Parameter C6-01 = 1					
	2 kHz	5 kHz	8 kHz	10 kHz	12.5 kHz	15 kHz	2 kHz	5 kHz	8 kHz	10 kHz	12.5 kHz	15 kHz
4002	1.8	1.8	1.8	1.6	1.3	1.0	2.1	2.0	1.8	1.7	1.5	1.4
4004	3.4	3.4	3.4	2.9	2.3	1.7	4.1	3.8	3.4	3.1	2.8	2.4
4005	4.8	4.8	4.8	4.3	3.7	3.0	5.4	5.2	4.8	4.6	4.3	3.9
4007	5.5	5.5	5.5	4.9	4.1	3.2	7.1	6.5	5.5	4.8	4.0	3.2
4009	7.2	7.2	7.2	6.5	5.6	4.8	8.9	8.2	7.2	6.5	5.6	4.8
4012	9.2	9.2	9.2	8.1	6.8	5.4	11.9	10.8	9.2	8.1	6.7	5.4
4018	14.8	14.8	14.8	13.1	11.0	8.9	17.5	17.3	14.8	13.1	11.0	8.9
4023	18.0	18.0	18.0	15.9	13.4	10.8	23	21.5	18.3	16.2	13.6	11.0
4031	24.0	24.0	24.0	21.2	17.7	14.1	31	28.2	24.0	21.1	17.6	14.1
4038	31.0	31.0	31.0	27.5	23.0	18.6	38	36.3	31.0	27.5	23.0	18.6
4044	39.0	39.0	39.0	34.5	29.0	23.4	44	43.6	37.5	33.5	28.4	23.4
4060	45.0	45.0	45.0	39.1	31.8	24.4	60	53.7	44.9	39.1	31.7	24
4075	60.0	60.0	60.0	53.1	44.6	36.0	75	73.8	62.9	55.6	46.5	37
4089	75.0	75.0	75.0	66.4	55.7	45.0	89	88.8	75.8	67.2	56.4	46
4103	91.0	91.0	91.0	80.6	67.6	54.6	103	103.0	90.3	80.1	67.3	55
4140	112.0	112.0	91.8	78.4	-	-	140	122.8	96.7	79	-	-

Model	Rated Current (A)											
	Heavy Duty Rating (HD) Parameter C6-01 = 0						Normal Duty Rating (ND) Parameter C6-01 = 1					
	2 kHz	5 kHz	8 kHz	10 kHz	12.5 kHz	15 kHz	2 kHz	5 kHz	8 kHz	10 kHz	12.5 kHz	15 kHz
4168	150.0	150.0	123.0	105.0	-	-	168	150.5	124.4	107	-	-
4208	180.0	180.0	147.6	126.0	-	-	208	179.7	137.2	109	-	-
4250	216.0	216.0	177.1	151.2	-	-	250	221.8	179.4	151	-	-
4302	260.0	260.0	213.2	182.0	-	-	296	263.4	214.6	182	-	-
4371	304.0	304.0	249.3	212.8	-	-	371	327.2	261.6	218	-	-
4414	371.0	371.0	304.2	259.7	-	-	389	348	286.3	245	-	-
4477	389.0	324.8	-	-	-	-	453	349	-	-	-	-
4568	453.0	378.3	-	-	-	-	568	437	-	-	-	-
4605	605.0	505.2	-	-	-	-	675	529	-	-	-	-
4720	605.0	505.2	-	-	-	-	675	529	-	-	-	-

Table 6.4 Carrier Frequency and Rated Current Derating (≥ 460 V)

Model	Rated Current (A)											
	Heavy Duty Rating (HD) Parameter C6-01 = 0						Normal Duty Rating (ND) Parameter C6-01 = 1					
	2 kHz	5 kHz	8 kHz	10 kHz	12.5 kHz	15 kHz	2 kHz	5 kHz	8 kHz	10 kHz	12.5 kHz	15 kHz
4002	2.1	1.9	1.6	1.4	1.1	0.9	2.1	2.0	1.8	1.7	1.5	1.4
4004	3.0	3.0	3.0	2.6	2.0	1.5	3.4	3.2	2.8	2.6	2.3	2.0
4005	4.3	3.9	3.4	3.0	2.6	2.2	4.8	4.6	4.3	4.0	3.8	3.5
4007	6.2	5.6	4.8	4.2	3.5	2.8	6.9	6.3	5.3	4.7	3.9	3.2
4009	8.6	7.9	6.9	6.2	5.4	4.6	7.6	7.0	6.1	5.5	4.8	4.1
4012	9.8	8.9	7.6	6.7	5.6	4.5	11.0	10.0	8.5	7.5	6.2	5.0
4018	14.1	12.9	11.0	9.7	8.2	6.6	15.2	13.9	11.8	10.5	8.8	7.1
4023	18.0	16.4	14.0	12.4	10.4	8.4	21	19.3	16.4	14.6	12.2	9.9
4031	27.2	24.7	21.0	18.5	15.4	12.4	27	24.5	20.9	18.4	15.4	12.3
4038	34.7	31.6	27.0	23.9	20.1	16.2	34	32.5	27.7	24.6	20.6	16.6
4044	34.0	34.0	34.0	30.1	25.3	20.4	40	39.6	34.1	30.5	25.9	21.3
4060	40.0	40.0	40.0	34.8	28.3	21.7	52	46.9	39.2	34.1	27.7	21
4075	52.0	52.0	52.0	46.1	38.6	31.2	65	64.1	54.6	48.3	40.4	33
4089	65.0	65.0	65.0	57.6	48.3	39.0	77	76.6	65.5	58.0	48.7	39
4103	77.0	77.0	77.0	68.2	57.2	46.2	96	96.0	84.1	74.6	62.8	51
4140	96.0	96.0	78.7	67.2	-	-	124	108.7	85.7	70	-	-
4168	124.0	124.0	101.7	86.8	-	-	156	139.8	115.5	99	-	-
4208	156.0	156.0	127.9	109.2	-	-	180	155.5	118.7	94	-	-
4250	180.0	180.0	147.6	126.0	-	-	240	212.9	172.3	145	-	-
4302	240.0	240.0	196.8	168.0	-	-	302	268.8	218.9	186	-	-
4371	302.0	302.0	247.6	211.4	-	-	361	318.5	254.7	212	-	-
4414	361.0	361.0	296.0	252.7	-	-	414	370	303.3	259	-	-
4477	414.0	345.0	-	-	-	-	477	367	-	-	-	-
4568	477.0	397.5	-	-	-	-	515	397	-	-	-	-
4605	515.0	429.2	-	-	-	-	605	473	-	-	-	-
4720	605.0	504.2	-	-	-	-	720	563	-	-	-	-

Table 6.5 AOLV/PM Carrier Frequency and Rated Current Derating (400 V Output Applications)

Model	Rated Current (A)											
	Heavy Duty Rating (HD) *1 Parameter C6-01 = 0						Normal Duty Rating (ND) *1 Parameter C6-01 = 1					
	2 kHz (2 kHz)	4 kHz (-)	6 kHz (5 kHz)	8 kHz (8 kHz)	10 kHz (10 kHz)	12 kHz (12.5 kHz)	2 kHz (2 kHz)	4 kHz (-)	6 kHz (5 kHz)	8 kHz (8 kHz)	10 kHz (10 kHz)	12 kHz (12.5 kHz)
4002	1.8	1.8	1.7	1.3	1.0	0.6	2.1	1.9	1.7	1.6	1.4	1.2
4004	3.4	3.4	3.2	2.4	1.7	1.0	4.1	3.7	3.3	2.8	2.4	2.0
4005	4.8	4.8	4.5	3.8	3.0	2.3	5.4	5.0	4.7	4.3	3.9	3.6
4007	5.5	5.5	5.2	4.2	3.2	2.3	7.1	6.1	5.2	4.2	3.2	2.3
4009	7.2	7.2	6.9	5.8	4.8	3.8	8.9	7.9	6.8	5.8	4.8	3.7
4012	9.2	9.2	8.7	7.0	5.4	3.8	11.9	10.3	8.6	7.0	5.4	3.8
4018	14.8	14.8	14.0	11.4	8.9	6.3	17.5	16.5	14.0	11.4	8.9	6.3
4023	18.0	18.0	17.0	13.9	10.8	7.7	23.4	20.4	17.3	14.1	11.0	7.8
4031	24.0	24.0	22.6	18.4	14.1	9.9	31.0	26.8	22.6	18.3	14.1	9.9
4038	31.0	31.0	29.2	23.9	18.6	13.3	38.0	34.5	29.2	23.9	18.6	13.3
4044	39.0	39.0	36.8	30.1	23.4	16.7	44.0	41.6	35.5	29.5	23.4	17.3
4060	45.0	45.0	42.1	33.3	24.4	15.6	59.6	50.8	42.0	33.2	24.4	15.6
4075	60.0	60.0	56.6	46.3	36.0	25.7	74.9	70.2	59.3	48.4	37.5	26.5
4089	75.0	75.0	70.7	57.9	45.0	32.1	89.2	84.5	71.5	58.6	45.6	32.7
4103	91.0	91.0	85.8	70.2	54.6	39.0	103.0	100.5	85.2	69.9	54.6	39.3
4140	112.0	105.3	85.1	65.0	44.8	-	140.0	114.1	88.1	62.0	36.0	-
4168	150.0	141.0	114.0	87.0	60.0	-	168.0	141.8	115.6	89.5	63.3	-
4208	180.0	169.2	136.8	104.4	72.0	-	208.0	165.5	123.1	80.6	38.1	-
4250	216.0	203.0	164.2	125.3	86.4	-	250.0	207.7	165.3	123.0	80.6	-
4302	260.0	244.4	197.6	150.8	104.0	-	302.0	252.2	202.3	152.5	102.6	-
4371	304.0	285.8	231.0	176.3	121.6	-	371.0	305.3	239.7	174.0	108.3	-
4414	371.0	348.7	282.0	215.2	148.4	-	414.0	348.6	282.8	216.9	151.1	-
4477	389.0	292.5	-	-	-	-	477.0	312.4	-	-	-	-
4568	477.0	358.7	-	-	-	-	568.0	372.0	-	-	-	-
4605	605.0	455.0	-	-	-	-	675.0	455.0	-	-	-	-
4720	605.0	455.0	-	-	-	-	720.0	485.3	-	-	-	-

*1 The upper values are for *A1-02 = 6 [Control Method Selection = AOLV/PM]*. The values in parenthesis are for *A1-02 = 4 [ALOV]*.

Table 6.6 AOLV, AOLV/PM Carrier Frequency and Rated Current Derating

Model	Rated Current (A)											
	Heavy Duty Rating (HD) *1 Parameter C6-01 = 0						Normal Duty Rating (ND) *1 Parameter C6-01 = 1					
	2 kHz (2 kHz)	4 kHz (-)	6 kHz (5 kHz)	8 kHz (8 kHz)	10 kHz (10 kHz)	12 kHz (12.5 kHz)	2 kHz (2 kHz)	4 kHz (-)	6 kHz (5 kHz)	8 kHz (8 kHz)	10 kHz (10 kHz)	12 kHz (12.5 kHz)
4002	2.1	1.8	1.5	1.2	0.9	0.6	2.1	1.9	1.7	1.6	1.4	1.2
4004	3.0	3.0	2.8	2.1	1.5	0.9	3.4	3.0	2.7	2.3	2.0	1.6
4005	4.3	3.8	3.2	2.7	2.2	1.6	4.8	4.5	4.2	3.8	3.5	3.2
4007	6.2	5.4	4.5	3.7	2.8	2.0	6.9	6.0	5.0	4.1	3.2	2.2
4009	8.6	7.6	6.6	5.6	4.6	3.6	7.6	6.7	5.8	5.0	4.1	3.2
4012	9.8	8.5	7.2	5.8	4.5	3.1	11.0	9.5	8.0	6.5	5.0	3.5
4018	14.1	12.3	10.4	8.5	6.6	4.7	15.2	13.2	11.2	9.1	7.1	5.1

Model	Rated Current (A)											
	Heavy Duty Rating (HD) *1 Parameter C6-01 = 0						Normal Duty Rating (ND) *1 Parameter C6-01 = 1					
	2 kHz (2 kHz)	4 kHz (-)	6 kHz (5 kHz)	8 kHz (8 kHz)	10 kHz (10 kHz)	12 kHz (12.5 kHz)	2 kHz (2 kHz)	4 kHz (-)	6 kHz (5 kHz)	8 kHz (8 kHz)	10 kHz (10 kHz)	12 kHz (12.5 kHz)
4023	18.0	15.6	13.2	10.8	8.4	6.0	21.0	18.3	15.5	12.7	9.9	7.0
4031	27.2	23.5	19.8	16.1	12.4	8.7	27.0	23.3	19.6	16.0	12.3	8.6
4038	34.7	30.1	25.5	20.8	16.2	11.6	34.0	30.9	26.2	21.4	16.6	11.9
4044	34.0	34.0	32.1	26.2	20.4	14.6	40.0	37.8	32.3	26.8	21.3	15.8
4060	40.0	40.0	37.4	29.6	21.7	13.9	52.0	44.3	36.7	29.0	21.3	13.6
4075	52.0	52.0	49.0	40.1	31.2	22.3	65.0	60.9	51.4	42.0	32.5	23.0
4089	65.0	65.0	61.3	50.1	39.0	27.9	77.0	72.9	61.7	50.6	39.4	28.2
4103	77.0	77.0	72.6	59.4	46.2	33.0	96.0	93.6	79.4	65.1	50.9	36.6
4140	96.0	90.2	73.0	55.7	38.4	-	124.0	101.1	78.0	54.9	31.9	-
4168	124.0	116.6	94.2	71.9	49.6	-	156.0	131.7	107.4	83.1	58.8	-
4208	156.0	146.6	118.6	90.5	62.4	-	180.0	143.2	106.5	69.7	33.0	-
4250	180.0	169.2	136.8	104.4	72.0	-	240.0	199.4	158.7	118.1	77.4	-
4302	240.0	225.6	182.4	139.2	96.0	-	302.0	252.2	202.3	152.5	102.6	-
4371	302.0	283.9	229.5	175.2	120.8	-	361.0	297.2	233.5	169.7	105.9	-
4414	361.0	339.3	274.4	209.4	144.4	-	414.0	347.6	281.1	214.7	148.3	-
4477	414.0	310.5	-	-	-	-	477.0	312.6	-	-	-	-
4568	477.0	357.8	-	-	-	-	515.0	337.5	-	-	-	-
4605	515.0	386.3	-	-	-	-	605.0	406.7	-	-	-	-
4720	605.0	453.8	-	-	-	-	720.0	484.0	-	-	-	-

*1 The upper values are for *A1-02 = 6 [Control Method Selection = AOLV/PM]*. The values in parenthesis are for *A1-02 = 4 [ALOV]*.

◆ 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.

No. (Hex.)	Name	Description	Default (Range)
L8-12 (04B8)	Ambient Temperature Setting	Sets the ambient temperature of the drive installation area.	40 °C (-10 - +50 °C)

No. (Hex.)	Name	Description	Default (Range)
L8-35 (04EC)	Installation Method Selection	Sets the type of drive installation.	Determined by the drive (0 - 3)

0 : IP20/OpenChassis Enc/Ex Heatsink

You can use the drive within the rated output current range of -10 °C to 50 °C 100%. Use this setting to install an open-chassis type (IP20) drive or when the heatsink (cooling fin) is outside the enclosure panel.

Make sure that there is 30 mm (1.18 in) minimum of space between drives or between the drive and side of the enclosure panel.

1 : Side-by-Side Mounting

Derates the drive rated output current from "-10 °C to 30 °C 100%" to "30 °C 100%" to "50 °C 70%". Use this setting to install more than one drive Side-by-Side.

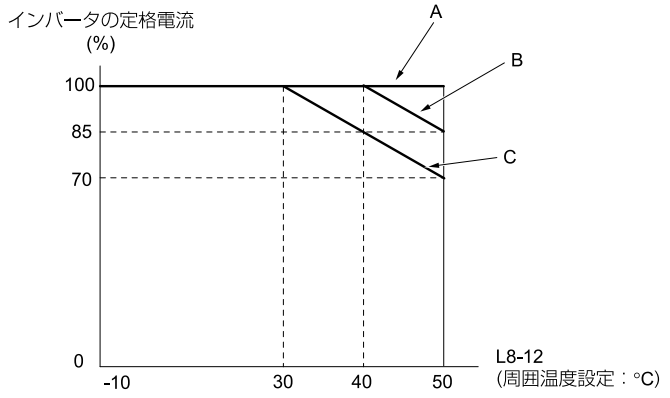
Make sure that there is 2 mm (0.08 in) minimum of space between drives.

2 : IP21/NEMA Type 1/IP55

Derates the drive rated output current from "-10 °C to 40 °C 100%" to "40 °C 100%" to "50 °C 85%". Use this setting to install UL Type 1 enclosed wall-mounted type drives or IP55 drives.

3 : Finless

Derates the drive rated output current from "-10 °C to 40 °C 100%" to "40 °C 100%" to "50 °C 85%". Use this setting to install a finless drive.



A - *L8-35 = 0* **C - *L8-35 = 1***
B - *L8-35 = 2, L8-35 = 3*

Figure 6.1 Derating Depending on Drive Installation Method

◆ Altitude Derating

Install the drive in a location that with 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 m to 4000 m (3281 ft 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 m to 4000 m (6562 ft to 13123 ft) and grounding the neutral point on the power supply.
  Contact Yaskawa or your nearest sales representative when the drive is not grounded with the neutral network.

Index

Numerics

24 V power supply
Power supply input terminals....292

A

Adjustment of control functionality....362
AEr....93
Alarm....66, 93
ALM/ERR
LED status....309
Altitude
Derating....377
Environment....272
Ambient humidity....272
Ambient Temperature Setting....272
Derating....376
Analog gauge
Monitors....317
Application Preset
Operation....349
ASR tuning....355
Precautions....359
Auto-Tuning....351
ASR tuning....355
Induction Motor....351
Inertia Tuning....355
PM Motors....352
Precautions....357
Precautions to Note before ASR Tuning....359
Precautions to Note before Inertia Tuning....359
Procedure....334
Rotational Auto-Tuning Precautions....358
Stationary Auto-Tuning for Line-to-Line Resistance precautions....359
Stationary Auto-Tuning Precautions....358
Stator resistance Auto-Tuning precautions....359
Auto-Tuning Error....66, 109

B

Backlight
Timing of shut-off....345
Backup
Parameters (drive to keypad)....326
Bar graph
Monitors....315
bAT
Fault....73
Minor Fault....93
Battery
Replacement....61
Specifications....61
bb....93
bCE
Fault....73
Minor Fault....93
boL
Fault....73
Minor Fault....93
bUS
Fault....73
Minor Fault....93

C

CALL....94
Carrier Frequency
Derating....372
CE
Fault....73
Minor Fault....94
CF....74
Checklist
Test run....369
Circulation Fan
Replacement....23
CoF....74
Control circuit terminals
Configuration of terminal block....292
I/O terminals function selection switches....297
Terminal functions....290
Wire gauge....293
Wiring....289
Wiring procedure for terminal block....294
Cooling Fan
Estimated Lifespan....21
Replacement....23
Copy Function Error....66, 114
CP1
Fault....74
Minor Fault....94
CP2
Fault....75
Minor Fault....94
CPEr....114
CPF00 to CPF03....75
CPF06....75
CPF07 to CPF08....75
CPF11 to CPF14....75
CPF16 to CPF24....75
CPF25....75
CPF26 to CPF39....75
CPyE....114
Crimp ferrule....293
CrST....95
CSEr....114
CyC....95
CyPo....95

D

Data log....343
Monitor selection....343
Sampling time....344
Start procedure....342
Stop procedure....342
Delete
Delete Backed-up Parameters....329
Derating
Altitude....377
Ambient Temperature Setting....376
Carrier Frequency....372
dEv
Fault....75
Minor Fault....95
dFPS....114
Diagnosing and Resetting Faults....116

DIP switch 297
dnE 95
Drive
Inspection 18
dv1 75
dv2 76
dv3 76
dv4 76
dv7 77
dWA2 95
dWA3 95
dWAL 95
dWF1 77
dWF2 77
dWF3 77
dWFL 77

E

E5
Fault 77
Minor Fault 95
EF 96
EF0
Fault 77
Minor Fault 96
EF1
Fault 78
Minor Fault 96
EF2
Fault 78
Minor Fault 96
EF3
Fault 78
Minor Fault 96
EF4
Fault 78
Minor Fault 96
EF5
Fault 78
Minor Fault 96
EF6
Fault 78
Minor Fault 97
EF7
Fault 79
Minor Fault 97
EF8
Fault 79
Minor Fault 97
Electrolytic Capacitor
Estimated Lifespan 21
End1 109
End2 109
End3 109
End4 109
End5 109
End6 109
End7 109
End8 110
End9 111
EP24v 97
Er-01 109
Er-02 110
Er-03 110
Er-04 110
Er-05 110
Er-08 111
Er-09 111
Er-10 111
Er-11 111
Er-12 111
Er-13 112
Er-14 112
Er-15 112
Er-16 112
Er-17 112
Er-18 112
Er-19 112
Er-20 112
Er-21 112
Er-25 113
Err 79
Error Code List 67
External 24 V power supply
Power supply input terminals 292

F

FAn1 79
Fault 66, 73
Fault Code List 67
Fault history
Display procedure 333
Fault Reset 116
FbH
Fault 79
Minor Fault 97
FbL
Fault 79
Minor Fault 97
Fine tuning 362
Frequency reference
Making changes using keypad 311
Fuse rating 303

G

GF 80
Ground
Drive 282, 285

H

HCA 98
HLCE 80
HOME screen 311
Humidity
Environment 272

I

iFEr 114
Induction Motor
Auto-Tuning 351
Inertia Tuning 355
Precautions 359
Inspection
Drive 18
Installation
Front cover 273
Terminal cover 273
Installation environment 272

J

Jog operation 311
JOG operation 311
Jumper switch 297

K

Keypad
- Application Preset 349
- Backlight setting 345
- Battery Replacement 61
- Data log setting 343
- Display drive information 346
- Display software version 346
- HOME screen 311
- Language selection 336
- Set date and time 337
- Set time 337
- Setup Wizard 339
- Start/stop data logging 342

L

L24v 98
Language selection
- Procedure 336

LED status ring
- ALM/ERR 309
- Ready 309
- RUN 309

LF 80
LF2 80
LoG 98
LSo 81
LT-1 98
LT-2 98
LT-3 98
LT-4 98

M

Main circuit terminals
- Wiring 283

Main menu
- Display procedure 311

MEMOBUS/Modbus communications
- Setting for termination resistor 301

MEMOBUS/Modbus Communications
- Serial communication terminals 292

Minor Fault 66, 93
Minor Fault Code List 67
Monitors
- Data log setting 343–344
- Display analog gauge 317
- Display bar graph 315
- Display procedure 312
- Set custom monitors 313
- Show custom monitors 314
- Start/stop data logging 342
- Trend Plot Display 318

Motor
- Change direction of motor rotation 311
- Wiring 283
- Wiring distance 282, 285

N

ndAT 114
nSE 81

O

oC 81
oFA00 82
oFA01 82
oFA02 82
oFA03 to oFA06 82
oFA10 83
oFA11 83
oFA12 to oFA17 83
oFA30 to oFA43 83
oFb00 83
oFb01 83
oFb02 83
oFb03 to oFb11 83
oFb12 to oFb17 83
oFC00 84
oFC01 84
oFC02 84
oFC03 to oFC11 84
oFC12 to oFC17 84
oFC50 to oFC55 84
oH
- Fault 84
- Minor Fault 99

oH1 85
oH2 99
oH3
- Fault 85
- Minor Fault 99

oH4 85
oL1 85
oL2 86
oL3
- Fault 87
- Minor Fault 99

oL4
- Fault 87
- Minor Fault 100

oL5
- Fault 87
- Minor Fault 100

oL7 87
oPE01 103
oPE02 103
oPE03 103
oPE05 104
oPE06 105
oPE07 105
oPE08 105
oPE09 106
oPE10 106
oPE11 106
oPE13 107
oPE15 107
oPE16 107
oPE18 107
oPE20 107
oPE33 108
oPr 88
oS
- Fault 88
- Minor Fault 100

ov
Fault 88
Minor Fault 100

P

Parameter
Backup (drive to keypad) 326
Changing setting values 323
Checking modified parameters 330
Checking user custom parameters 324
Delete Backed-up Parameters 329
Restore (Auto Backup) 347
Restore (keypad to drive) 327
Restoring default settings 332
Verify (keypad and drive) 328
Parameter Setting Errors 66, 103
PASS 100
PC
Connection procedure 302
PE1 89
PE2 89
PF 89, 100
PGo
Fault 89
Minor Fault 101
PGoH
Fault 90
Minor Fault 101
PM Motors
Auto-Tuning 352
Pulse train output
Wiring specifications 298
PWEr 114

R

rdEr 115
Ready
LED status 309
Remove
Front cover 273
Terminal cover 273
Restore
Parameters (Auto Backup) 347
Parameters (keypad to drive) 327
rF 90
rH 90
Rotational Auto-Tuning
Induction Motor 351
PM Motors 352
Precautions 358
rr 90
rUn 101
RUN
LED status 309

S

Sampling time setting
Data log 344
SC 90
SCF 91
SE 101
SEr 91
Serial communication terminals
MEMOBUS/Modbus Communications 292
Set date and time
Operation 337
Set time
Operation 337
Setup Wizard
Operation 339
Software version
Display procedure 346
Stationary Auto-Tuning
Induction Motor 351
PM Motors 352
Precautions 358
Stationary Auto-Tuning for Line-to-Line Resistance 351
Precautions 359
Stator resistance Auto-Tuning 352
Precautions 359
STo 101
SToF 101
STPo 91
SvE 91

T

Temperature
Environment 272
Terminal block 292
Control circuit terminal block functions 290
I/O terminals function selection switches 297
Terminal function selection 299
Terminal A1 ..... 297, 299
Terminal A2 ..... 297, 299
Terminal A3 ..... 297, 300
Terminal AM 297, 300
Terminal FM 297, 300
Termination resistor
Setting switch 301
Test run
Checklist 369
Fine tuning 362
Procedure for no-load test run 360
Procedure for test run with actual load 360
Tightening torque
Control circuit terminals 293
TiM
Fault 91
Minor Fault 102
Trend Plot
Monitors 318
Troubleshooting
Code Displayed 67
No Code Displayed 118
Troubleshooting without Fault Display 118
TrPC 102

U

UL3
Fault 91
Minor Fault 102
UL4
Fault 92
Minor Fault 102
UL5
Fault 92
Minor Fault 102
USB port

Connecting a PC 302
Uv 102
Uv1 92
Uv2 92
Uv3 92

V

vAEr 115
Verify
Parameters (keypad and drive) 328
vFyE 115
Vibration-resistant 272

W

Wire gauges
Control circuit terminals 293
Wiring
Control circuit terminal block 294
Control circuit terminals 289
Main circuit terminals 283
Motor 283
Wiring distance
Drive and motor 282, 285

Z

Z pulse Auto-Tuning 352

Revision History

Date of Publication	Revision Number	Section	Revised Content
August 2018	–	–	First Edition

GA800 Drive

Maintenance & Troubleshooting

YASKAWA AMERICA, INC.
2121, Norman Drive South,
Waukegan, IL 60085, U.S.A.
Phone: +1-800-YASKAWA (927-5292) or +1-847-887-7000 Fax: +1-847-887-7310
http://www.yaskawa.com

DRIVE CENTER (INVERTER PLANT)
2-13-1, Nishimiyaichi, Yukuhashi, Fukuoka, 824-8511, Japan
Phone: +81-930-25-2548 Fax: +81-930-25-3431
http://www.yaskawa.co.jp

YASKAWA EUROPE GmbH
Hauptstraβe 185, 65760
Eschborn, Germany
Phone: +49-6196-569-300 Fax: +49-6196-569-398
E-mail: support@yaskawa.eu.com
http://www.yaskawa.eu.com

YASKAWA ELECTRIC CORPORATION
New Pier Takeshiba South Tower,
1-16-1, Kaigan, Minatoku, Tokyo,
105-6891, Japan
Phone: +81-3-5402-4502 Fax: +81-3-5402-4580
http://www.yaskawa.co.jp

YASKAWA ELÉTRICO DO BRASIL LTDA.
777, Avenida Piraporinha,
Diadema, São Paulo, 09950-000,
Brasil
Phone: +55-11-3585-1100 Fax: +55-11-3585-1187
http://www.yaskawa.com.br

In the event that the end user of this product is to be the military and said product is to be employed in any weapons systems or the manufacture thereof, the export will fall under the relevant regulations as stipulated in the Foreign Exchange and Foreign Trade Regulations. Therefore, be sure to follow all procedures and submit all relevant documentation according to any and all rules, regulations and laws that may apply.
Specifications are subject to change without notice for ongoing product modifications and improvements.

Original instructions.

© 2018 YASKAWA America, Inc.

YASKAWA America, Inc.

TOEPYAIGA8001

TOEPYAIGA8001
Revision: A <0>-1
February 2019
Published in U.S.A.

YASKAWA

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP