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MAGNETEK
ELEVATOR

RegenAC™

R1000 Regenerative Unit

Technical Manual

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

TM7357 rev 01
© Magnetek Elevator 2015

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Preface & General Safety

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

i.1 Preface

Magnetek manufactures products used as components in a wide variety of industrial systems and equipment. The selection and application of Magnetek products remain the responsibility of the equipment manufacturer or end user. Magnetek accepts no responsibility for the way its products are incorporated into the final system design. Under no circumstances should any Magnetek product be incorporated into any product or design as the exclusive or sole safety control. Without exception, all controls should be designed to detect faults dynamically and fail safely under all circumstances. All systems or equipment designed to incorporate a product manufactured by Magnetek must be supplied to the end user with appropriate warnings and instructions as to the safe use and operation of that part. Any warnings provided by Magnetek must be promptly provided to the end user. Magnetek offers an express warranty only as to the quality of its products in conforming to standards and specifications published in the Magnetek manual. NO OTHER WARRANTY, EXPRESS OR IMPLIED, IS OFFERED. Magnetek assumes no liability for any personal injury, property damage, losses, or claims arising from misapplication of its products.
This manual is designed to ensure correct and suitable application of R1000-Series Regenerative Units. Read this manual before attempting to install, operate, maintain, or inspect a regenerative unit and keep it in a safe, convenient location for future reference. Be sure you understand all precautions and safety information before attempting application.

◆ Applicable Documentation

The following manuals are available for R1000 series:

	Magnetek R1000 Series Power Regenerative Unit Instruction Manual (TM7357)
	This guide is packaged together with the product and contains basic information required to install and wire the regenerative unit. It also gives an fault diagnostics, maintenance, and parameter settings. The purpose of this guide is to prepare the regenerative unit for a trial run with an application and for basic operation.

◆ Symbols

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

◆ Terms and Abbreviations

- **Regenerative Unit**: Magnetek R1000 Series Power Regenerative Unit
- **Drive**: Magnetek 1000-Series Drive
- **BCD**: Binary Coded Decimal
- **H**: Hexadecimal Number Format
- **IGBT**: Insulated Gate Bipolar Transistor

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- Other companies and product names mentioned in this manual are trademarks of those companies.

i.2 General Safety

◆ Supplemental Safety Information

General Precautions

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

⚠ WARNING

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

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

⚠ DANGER

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

⚠ WARNING

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

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

⚠ CAUTION

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

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

NOTICE

Indicates a property damage message.

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

◆ Safety Messages

⚠ DANGER

Heed the safety messages in this manual.

Failure to comply will result in death or serious injury.

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

Electrical Shock Hazard

Do not install, wire, maintain, or inspect the product or replace parts while the power supply is turned on.

Failure to comply will result in death or serious injury.

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

⚠ WARNING

Sudden Movement Hazard

System may start unexpectedly upon application of power, resulting in death or serious injury.

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

Electrical Shock Hazard

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

Failure to comply could result in death or serious injury.

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

Do not allow unqualified personnel to perform work on the regenerative unit.

Failure to comply could result in death or serious injury.

Installation, maintenance, inspection, and servicing must be performed only by authorized personnel familiar with installation, adjustment, and maintenance of regenerative units.

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

Failure to comply could result in death or serious injury.

Always use a ground wire that complies with technical standards on electrical equipment and minimize the length of the ground wire.

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

Always use a type B ground fault circuit interrupter GFCI according to IEC/EN 60755 when a protective residual current monitor/detection device is installed for indirect or direct shock hazard protection.

The regenerative unit can cause a residual current with a DC component in the protective earthing conductor.

Do not operate equipment with covers removed.

Failure to comply could result in death or serious injury.

⚠ WARNING

Fire Hazard

Do not use an improper voltage source.

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

Verify that the rated voltage of the regenerative unit matches the voltage of the incoming power supply before applying power.

Tighten all terminal screws to the specified tightening torque.

Loose electrical connections could result in death or serious injury by fire due to overheating of electrical connections.

Do not use improper combustible materials.

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

Do not install the regenerative unit to a combustible surface. Never place combustible materials on the regenerative unit.

Crush Hazard

Only allow qualified personnel to operate a crane or hoist to transport the regenerative unit.

Failure to comply may result in serious injury or death from falling equipment.

⚠ CAUTION

Do not carry the regenerative unit by the front cover or the terminal cover.

Failure to comply may result in minor or moderate injury from the main body of the regenerative unit falling.

NOTICE

Do not disconnect the wiring to the regenerative unit while the regenerative unit is outputting a voltage.

Improper equipment sequencing could result in damage to the regenerative unit.

Connect a power supply with a capacity (kVA) that is larger than the rated input capacity (kW) of the regenerative unit.

Connecting a power supply with a capacity smaller than the rated input capacity may trigger an operating fault. If it is necessary to connect a power supply with a capacity smaller than the rated input capacity, consult your Magnetek representative or the nearest Magnetek sales office. Failure to comply may result in damage to the regenerative unit.

Observe proper electrostatic discharge procedures (ESD) when handling the regenerative unit, circuit boards, and CMOSIC.

Failure to comply may result in ESD damage to the regenerative unit circuitry.

Do not perform a withstand voltage test on any part of the regenerative unit.

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

Do not operate damaged equipment.

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

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

NOTICE

Install adequate branch circuit short circuit protection per applicable codes.

Failure to comply could result in damage to the regenerative unit.

The regenerative unit is suitable for circuits capable of delivering not more than 100,000 RMS symmetrical Amperes, 240 Vac maximum (200 V Class) and 480 Vac maximum (400 V Class).

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

Failure to comply could result in damage to the regenerative unit. Place a temporary cover over the top during installation. Be sure to remove the temporary cover before start-up, as the cover will reduce ventilation and cause the regenerative unit to overheat.

Never lift the regenerative unit up while the cover is removed.

This can damage the terminal board and other components.

Do not perform signal checks during operation.

Failure to comply could result in damage to the regenerative unit.

Do not modify the circuitry of the regenerative unit.

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

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

Do not expose the regenerative unit to halogen group disinfectants.

Failure to comply may cause damage to the electrical components in the regenerative unit.

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

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

◆ General Application Precautions

■ Load Capacity

- Install the regenerative unit in one-to-one with a drive. Do not connect the multiple drives to a regenerative unit.
- Connect a regenerative unit to a drive with the same or smaller capacity (heavy duty (HD)).
- Do not connect regenerative units in parallel.

■ Selecting the Capacity

Refer to ***Table i.1*** to select the regenerative unit capacity.
Depending on the amount of regenerated energy, you can select an R1000 with a smaller capacity than the drive.
Use the DriveSelect Inverter Capacity Selection Program to make the selection.
Contact your Magnetek representative or the nearest Magnetek sales office.

Table i.1 Model Selection

Drive Capacity or Motor Capacity (HP)	Model	
	200 V Class	400 V Class
≤ 5	2A03P5	4A03P5
7	2A0005	4A0005
10	2A0007	4A0007
15	2A0010	4A0010
20	2A0014	4A0014
25	2A0017	4A0017
30	2A0020	4A0020
40	2A0028	4A0028
50	2A0035	4A0035

Drive Capacity or Motor Capacity (HP)	Model	
	200 V Class	400 V Class
60	2A0053	4A0043
74		4A0053
101	2A0073	4A0073
121	2A0105	4A0105
148		
177	–	4A0150
215	–	
248	–	4A0210
295	–	
422	–	4A0300

■ Installing Standard Configuration Devices

Each regenerative unit requires a corresponding set of input fuses, power coordinating reactor, and current suppression reactor. Always install the specified devices.

■ Installation

Enclosure Panels

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

Installation Direction

NOTICE: *Install the regenerative unit upright as specified in the manual. Refer to* ***Mechanical Installation on page 21*** *for more information on installation. Failure to comply may damage the regenerative unit due to improper cooling*

■ General Handling

Wiring Check

NOTICE: *Do not connect power supply lines to output terminals. Failure to comply will destroy the regenerative unit. Be sure to perform a final check of all sequence wiring and other connections before turning on the power and also check for short circuits on the control terminals, which may damage the regenerative unit.*

Inspection and Maintenance

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

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

To connect or perform maintenance for the standard configuration devices, turn off the power supply to the regenerative unit, wait for the time that is given on the regenerative unit, and then confirm that the temperature of the reactor has sufficiently decreased before you proceed.

Wiring

Magnetek recommends using ring terminals on all models. Regenerative units require the use of ring terminals for UL/ cUL compliance. Use only the tools recommended by the terminal manufacturer for crimping.

Transporting and Installing the Regenerative Unit

NOTICE: *Never steam clean the regenerative unit. During transport, keep the regenerative unit from coming into contact with salts, fluorine, bromine, phthalate ester, and other such harmful chemicals.*

CAUTION! *Crush Hazard. Carry all standard configuration and peripheral devices in a method suitable for the weight of the device. Incorrectly handling devices could cause them to fall and result in injury or damage to the device.*

Always use a three-phase power supply. The regenerative unit cannot be used with a single-phase power supply.

◆ Precautions on Using Peripheral Devices

■ Installing a Noise Filter

Install a reactor-type noise filter without a capacitor such as a zero phase reactor after the MCCB on the power supply side when installing a noise filter on the power supply.

NOTICE: *Do not install a filter with a built-in capacitor. The harmonic components may cause the capacitor to overheat or may damage the capacitor. Always install the specified harmonic noise filter.*

Wire Gauges and Wiring Distances

Use a motor cable gauge large enough to avoid unstable regenerative unit phase control from voltage drop caused by a long motor cable.

When using the digital operator remotely, always use the cable specified (option). When controlling the regenerative unit remotely using analog signals, limit the length of the control lines between the control signals and regenerative unit to 50 m or shorter and separate the control lines from power lines (main circuit and sequence circuits) to prevent induction from peripheral devices.

When using a multi-function analog input, connect the shield wire to the sheath ground terminal E (G) with shielded twisted-pair wires. Refer to ***Standard Connection Diagram on page 38*** for details.

◆ Warning Label Example

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

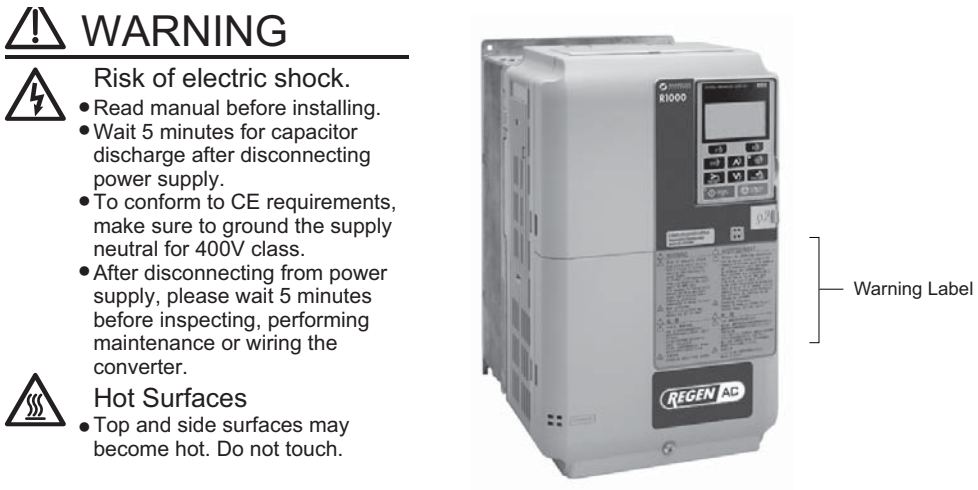


Figure i.1 Warning Information Position

◆ Warranty Information

■ Restrictions

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

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

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

1

Receiving

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

1.1 Section Safety

⚠ CAUTION

Do not carry the unit by the front cover or the terminal cover.

Failure to comply may cause the main body of the regenerative unit to fall, resulting in minor or moderate injury.

NOTICE

Observe proper electrostatic discharge procedures (ESD) when handling the regenerative unit and circuit boards.

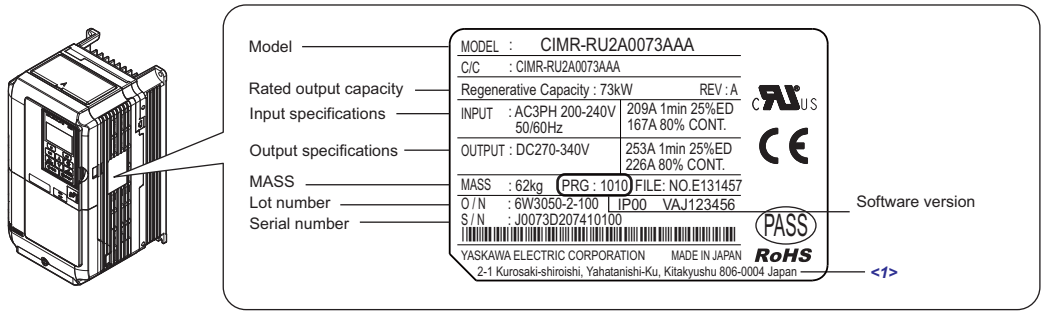
Failure to comply may result in ESD damage to circuitry.

1.2 Model Numbers and Nameplates

Perform the following tasks after receiving the regenerative unit:

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

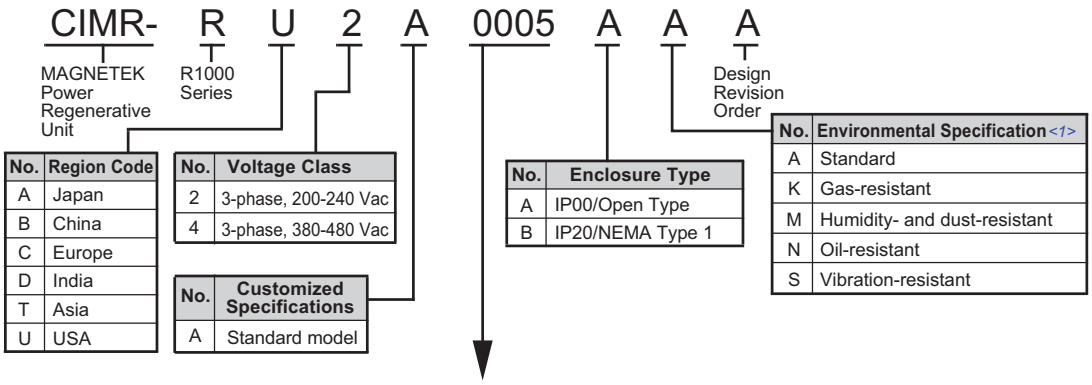
◆ Nameplate



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

Figure 1.1 Regenerative Unit Nameplate Information Example

◆ Model Numbers



No.	Region Code
A	Japan
B	China
C	Europe
D	India
T	Asia
U	USA

No.	Voltage Class
2	3-phase, 200-240 Vac
4	3-phase, 380-480 Vac

No.	Customized Specifications
A	Standard model

No.	Enclosure Type
A	IP00/Open Type
B	IP20/NEMA Type 1

No.	Environmental Specification <1>
A	Standard
K	Gas-resistant
M	Humidity- and dust-resistant
N	Oil-resistant
S	Vibration-resistant

Three-Phase 200 V Class

Model	Rated Output Capacity (HP)
03P5	5
0005	7
0007	9
0010	13
0014	19
0017	23
0020	27
0028	38
0035	47
0053	71
0073	98
0105	141

Three-Phase 400 V Class

Model	Rated Output Capacity (HP)
03P5	5
0005	7
0007	9
0010	13
0014	19
0017	23
0020	27
0028	38
0035	47
0043	58
0053	71
0073	98
0105	141
0150	201
0210	282
0300	402

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

1.3 Regenerative Unit Models and Enclosure Types

Two types of enclosures are offered for R1000 regenerative units:

- IP00/Open Type enclosure models are designed for installation in an enclosure panel that serves to protect personnel from injury caused by accidentally touching live parts.
- IP20/NEMA Type 1 enclosure models mount to an indoor wall or in an enclosure panel. Removing the top protective cover from a IP20/NEMA Type 1 enclosure drive voids NEMA Type 1 protection while retaining IP20 conformity.

Table 1.1 describes regenerative unit enclosures and models.

Table 1.1 Models and Enclosure Types

Voltage Class	Enclosure Type	
	IP20/NEMA Type 1	IP00/Open Type
Three-Phase 200 V Class	2A03P5	2A0035
	2A0005	2A0053
	2A0007	2A0073
	2A0010	2A0105
	2A0014	–
	2A0017	–
	2A0020	–
	2A0028	–
Three-Phase 400 V Class	4A03P5	4A0035
	4A0005	4A0043
	4A0007	4A0053
	4A0010	4A0073
	4A0014	4A0105
	4A0017	4A0150
	4A0020	4A0210
	4A0028	4A0300

There are R1000 kits available from Magnetek that include the R1000 regenerative unit, power reactor, current suppression reactor, fuses, and fuse blocks.

Table 1.2 lists the Drive models and the kit part numbers; please refer to *Replacement Parts on page 202* for the contents of each kit.

Table 1.2 R1000 Kits

Voltage Class	R1000 Models	Kit Part Number
Three-Phase 200 V Class	RU2A03P5FAA	R1000-230-0100
	RU2A0005FAA	R1000-230-0150
	RU2A0007FAA	R1000-230-0200
	RU2A0010FAA	R1000-230-0300
	RU2A0014FAA	R1000-230-0400
	RU2A0017FAA	R1000-230-0500
	RU2A0020FAA	R1000-230-0600
	RU2A0028FAA	R1000-230-0800
	RU2A0035AAA	R1000-230-1000
	RU2A0053AAA	R1000-230-1500
	RU2A0073AAA	R1000-230-2000
	RU2A0105AAA	R1000-230-3000

Voltage Class	R1000 Models	Kit Part Number
Three-Phase 400 V Class	RU4A03P5FAA	R1000-460-0050
	RU4A0005FAA	R1000-460-0075
	RU4A0007FAA	R1000-460-0100
	RU4A0010FAA	R1000-460-0150
	RU4A0014FAA	R1000-460-0200
	RU4A0017FAA	R1000-460-0250
	RU4A0020FAA	R1000-460-0300
	RU4A0028FAA	R1000-460-0400
	RU4A0035AAA	R1000-460-0500
	RU4A0043AAA	R1000-460-0600
	RU4A0053AAA	R1000-460-0750
	RU4A0073AAA	R1000-460-1000
	RU4A0105AAA	R1000-460-1500
	RU4A0150AAA	R1000-460-2500
	RU4A0210AAA	R1000-460-3000
	RU4A0300AAA	R1000-460-4500

There are also two options for pre-assembled Drive kits that include the R1000 regenerative unit, power reactor, current suppression reactor, fuses, and fuse block. The options are the enclosed cabinet version (ENC-R1000-x-xxxx) and the open panel version (PNL-R1000-x-xxxx); they are pre-wired to reduce the risk of mis-wiring the drive.

Table 1.3 lists the Drive models and the kit part numbers; please refer to *Pre-Assembled R1000 Kit Dimensions on page 32* for the dimensions of each kit.

Table 1.3 Pre-Assembled R1000 Kits

Voltage Class	R1000 Models	Pre-Assembled Kit Part Number
Three-Phase 200 V Class	RU2A0014FAA	ENC-R1000-2-0400
		PNL-R1000-2-0400
	RU2A0020FAA	ENC-R1000-2-0600
		PNL-R1000-2-0600
	RU2A0028FAA	ENC-R1000-2-0800
		PNL-R1000-2-0800
	RU2A0035AAA	ENC-R1000-2-1000
		PNL-R1000-2-1000
Three-Phase 400 V Class	RU4A0028FAA	ENC-R1000-4-0400
		PNL-R1000-4-0400
	RU4A0043AAA	ENC-R1000-4-0600
		PNL-R1000-4-0600
	RU4A0053AAA	ENC-R1000-4-0750
		PNL-R1000-4-0750
	RU4A0073AAA	ENC-R1000-4-1000
		PNL-R1000-4-1000

2

Mechanical Installation

This chapter explains how to properly mount and install the regenerative unit.

2.1 Section Safety

⚠ WARNING

Fire Hazard

Ensure proper cooling when installing an IP00/IP20 regenerative unit in a closed panel or cabinet.

Ensure the air temperature entering the regenerative unit is 50 °C (122 °F) or cooler by use of a cooling fan or air conditioner. Failure to comply could result in overheating and fire.

Crush Hazard

Only allow qualified personnel to operate a crane or hoist to transport the unit.

Failure to comply may result in serious injury or death from falling equipment.

Use a dedicated lifter when transporting the unit by a lifter.

Failure to comply may result in serious injury or death from falling equipment.

Only use vertical suspension to temporarily lift the unit during installation to an enclosure panel.

Do not use vertical suspension to transport the unit.

Failure to comply may result in serious injury or death from falling equipment.

Use screws to securely affix the unit front cover, terminal blocks, and other unit components prior to vertical suspension.

Failure to comply may result in serious injury or death from falling equipment.

Do not subject the unit to vibration or impact greater than 1.96 m/s^2 (0.2 G) while it is suspended by the cables.

Failure to comply may result in serious injury or death from falling equipment.

Do not attempt to flip the unit over or leave the unit unattended while it is suspended by the wires.

Failure to comply may result in serious injury or death from falling equipment.

⚠ CAUTION

Crush Hazard

Do not carry the unit by the front cover or the terminal cover.

Failure to comply may result in minor or moderate injury from the main body of the unit falling.

2.2 Mechanical Installation

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

◆ Installation Environment

Install the regenerative unit in an environment matching the specifications in ***Table 2.1*** to help prolong the optimum performance life of the regenerative unit.

Table 2.1 Installation Environment

Environment	Conditions
Installation Area	Indoors
Ambient Temperature	IP00/Open Type enclosure: -10 °C to +50 °C (14 °F to 122 °F) IP20/NEMA Type 1 enclosure: -10 °C to +40 °C (14 °F to 104 °F) Regenerative unit reliability improves in environments without wide temperature fluctuations. When using the regenerative unit in an enclosure panel, install a cooling fan or air conditioner in the area to ensure that the air temperature inside the enclosure does not exceed the specified levels. Do not allow ice to develop on the regenerative unit.
Humidity	95% RH or less and free of condensation
Storage Temperature	-20 °C to +60 °C (-4 °F to +140 °F)
Surrounding Area	Install the regenerative unit in an area free from: • oil mist and dust • metal shavings, oil, water, or other foreign materials • radioactive materials • combustible materials (e.g., wood) • harmful gases and liquids • excessive vibration • chlorides • direct sunlight.
Altitude	1000 m (3281 ft) or lower, up to 3000 m (9843 ft) with derating. Refer to ***Derating Data on page 153*** for details.
Vibration	10 to 20 Hz at 9.8 m/s², 20 to 55 Hz at 5.9 m/s² (2A03P5 to 2A0053, 4A03P5 to 4A0073) 10 to 20 Hz at 9.8 m/s², 20 to 55 Hz at 2.0 m/s² (2A0073, 2A0105, 4A0105 to 4A0300)
Orientation	Install the regenerative unit vertically to maintain maximum cooling effects.

WARNING! ***Fire Hazard.*** *When installing an IP00/IP20 regenerative unit in a closed panel or cabinet, sufficiently cool the panel or cabinet with a cooling fan or air conditioner so that the air temperature entering the regenerative unit is 50 °C (122 °F) or cooler. Failure to comply could result in overheating and fire.*

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

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

◆ Installation Orientation and Spacing

Install the regenerative unit upright as illustrated in ***Figure 2.1*** to maintain proper cooling.

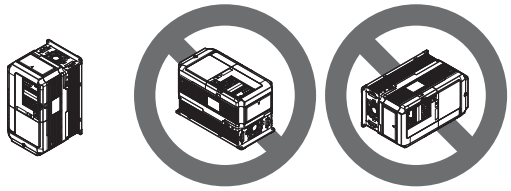
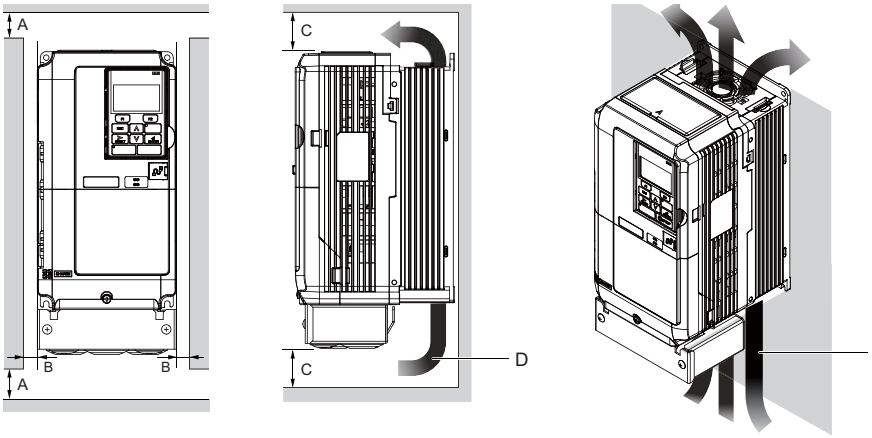


Figure 2.1 Correct Installation Orientation

■ Single Regenerative Unit Installation

Figure 2.2 shows the installation distance required to maintain sufficient space for airflow and wiring. Install the heatsink against a closed surface to avoid diverting cooling air around the heatsink.

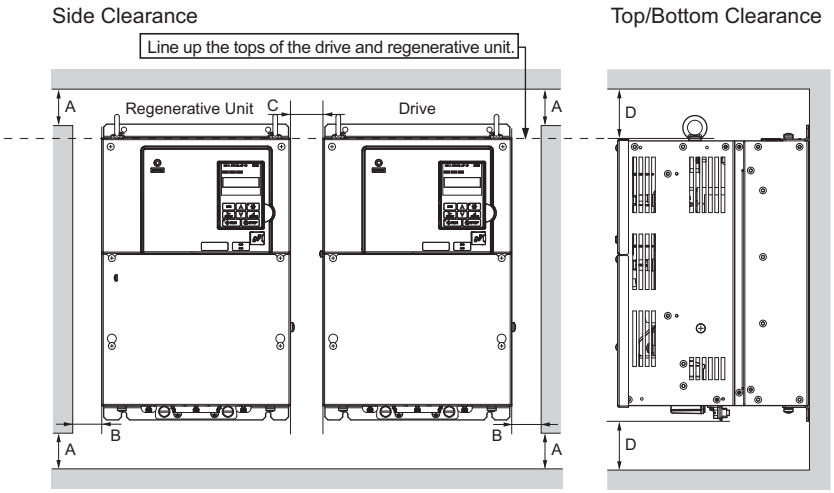


A – 50 mm minimum
B – 30 mm minimum
C – 120 mm minimum
D – Airflow direction

Figure 2.2 Correct Installation Spacing (Single)

■ Parallel Mounting with Drive

When installing the regenerative unit beside a drive, mount the devices according to *Figure 2.3*.



A – 50 mm minimum
B – 30 mm minimum
C – 60 mm minimum
D – 120 mm minimum

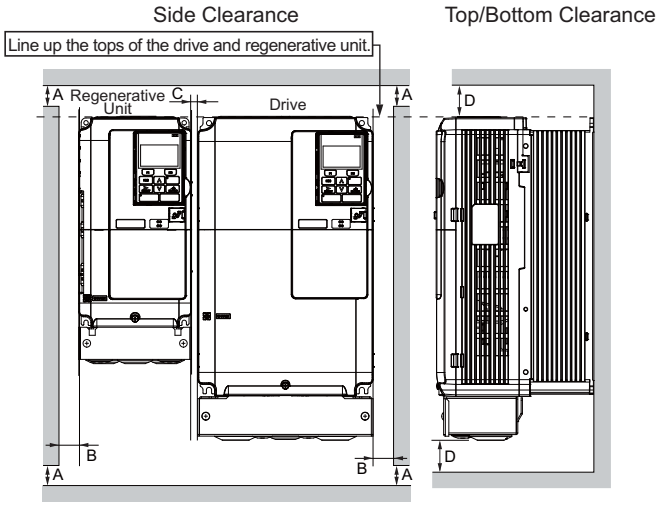
Figure 2.3 Space Between Regenerative Unit and Drive (Parallel Mounting)

■ Side-by-Side Installation with Drive

Models 2A03P5 to 2A0028, 4A03P5 to 4A0028 can take advantage of Side-by-Side installation.

When installing the regenerative unit beside a drive, mount the devices according to ***Figure 2.4*** and set L8-35, Installation Method Selection, to 1 (Side-by-Side Mounting).

When mounting regenerative units with the minimum clearance of 2 mm according to ***Figure 2.5***, set parameter L8-35 to 1 while considering derating. Refer to ***Parameter Tables on page 157*** for details.



A – 50 mm minimum **C – 2 mm minimum**
B – 30 mm minimum **D – 120 mm minimum**

Figure 2.4 Space Between Regenerative Unit and Drive (Side-by-Side)

Note: Align the tops of the regenerative unit and the drives when installing the regenerative unit and the drives of different heights in the same enclosure panel. Leave space between the tops and bottoms of stacked regenerative unit and drives for easier cooling fan replacement.

■ Installation Screws

Refer to ***Exterior and Mounting Dimensions on page 28*** for the sizes of the installation screws.

◆ Precautions and Instructions for Installation

Read the following precautions and instructions before installing models 2A0073, 2A0105, and 4A0210 to 4A0300.

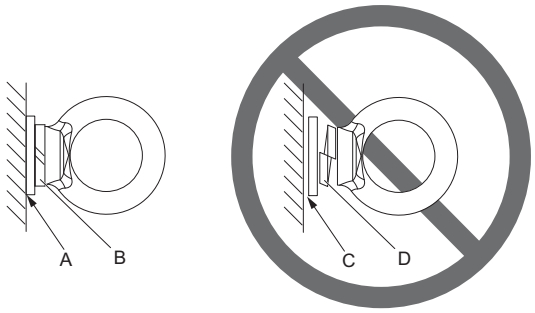
WARNING! *Crush Hazard. Observe the following instructions and precautions. Failure to comply could result in serious injury or death from falling equipment.*

- *Only use vertical suspension to temporarily lift the regenerative unit during installation to an enclosure panel.*
- *Do not use vertical suspension to transport the regenerative unit.*
- *Use screws to securely affix the regenerative unit front cover, terminal blocks, and other regenerative unit components prior to vertical suspension.*
- *Do not subject the regenerative unit to vibration or impact greater than 1.96 m/s² (0.2 G) while it is suspended by the wires.*
- *Do not attempt to flip the regenerative unit over while it is suspended by the wires.*
- *Do not leave the regenerative unit unattended while it is suspended by the wires.*

■ Horizontal Suspension of Models 2A0073, 2A0105, and 4A0105 to 4A0300

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

NOTICE: *Damage to Equipment. When lifting the regenerative unit, confirm that the spring washer is fully closed. Failure to comply may deform or damage the regenerative unit when lifted.*



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

Figure 2.5 Details of Spring Washers

■ Vertical Suspension of Models 2A0073, 2A0105, and 4A0105 to 4A0300

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

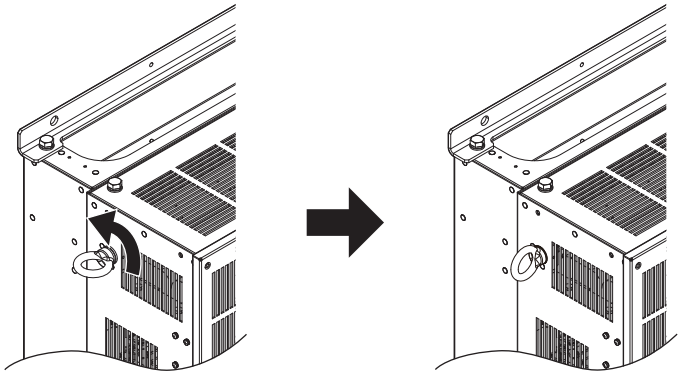


Figure 2.6 Adjusting Angle of Eye Bolts

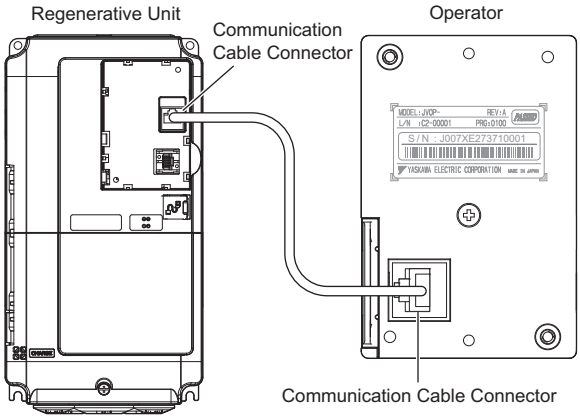
1. Gradually take up the slack in the wires and hoist the regenerative unit after the wires are stretched tight.
2. Lower the regenerative unit when ready to install in the enclosure panel. Stop lowering the regenerative unit when it is near the floor then begin lowering the regenerative unit again very slowly until the regenerative unit is placed correctly.

◆ Digital Operator Remote Usage

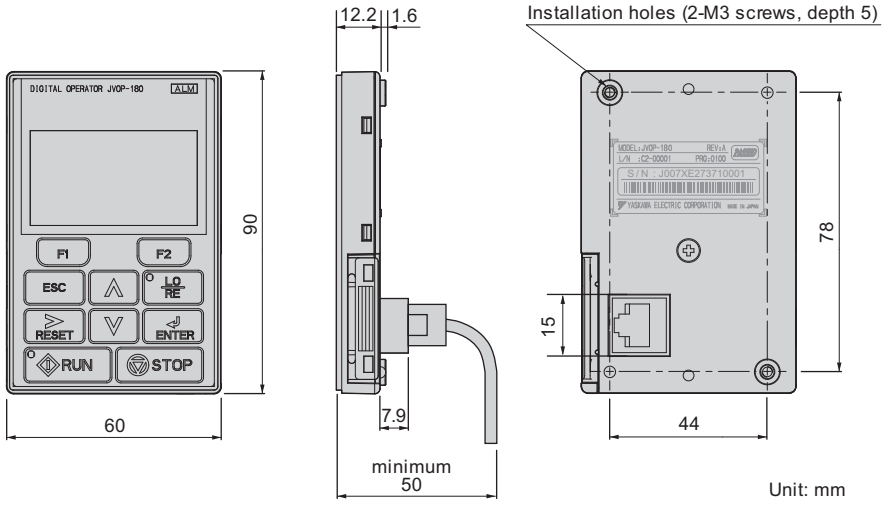
■ Remote Operation

The digital operator mounted on the regenerative unit can be removed and connected to the regenerative unit using an extension cable up to 3 m long to facilitate operation when the regenerative unit is installed in a location where it can not be easily accessed.

The digital operator can also be permanently mounted in remote locations such as panel doors using an extension cable and an installation support set (depending on the installation type).



■ Digital Operator Dimensions



<1> If you install the digital operator in a control panel or other enclosure, use the optional connection cable.

Figure 2.7 Digital Operator Dimensions

■ Installation Types and Required Materials

The digital operator mounts to an enclosure two different ways:

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

Table 2.2 Digital Operator Installation Methods and Required Tools

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

<1> If there are welding studs in the control panel, use the Installation Support Set B (for threaded studs).

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

◆ Exterior and Mounting Dimensions

Use ***Table 2.3*** to find the regenerative unit dimension drawings.

Table 2.3 Models and Types

Protective Design	Regenerative Unit Model		Page
	Three-Phase 200 V Class	Three-Phase 400 V Class	
IP20/NEMA Type 1 Enclosure	2A03P5 2A0005 2A0007 2A0010 2A0014 2A0017 2A0020 2A0028	4A03P5 4A0005 4A0007 4A0010 4A0014 4A0017 4A0020 4A0028	*29*
IP00/Open Type Enclosure	2A0035 2A0053 2A0073 2A0105	4A0035 4A0043 4A0053 4A0073 4A0105 4A0150 4A0210 4A0300	*30*

■ IP20/NEMA Type 1 Enclosure Models

Note: Removing the top protective cover or bottom conduit bracket from an IP20/NEMA Type 1 enclosure drive voids NEMA Type 1 protection while maintaining IP20 conformity.

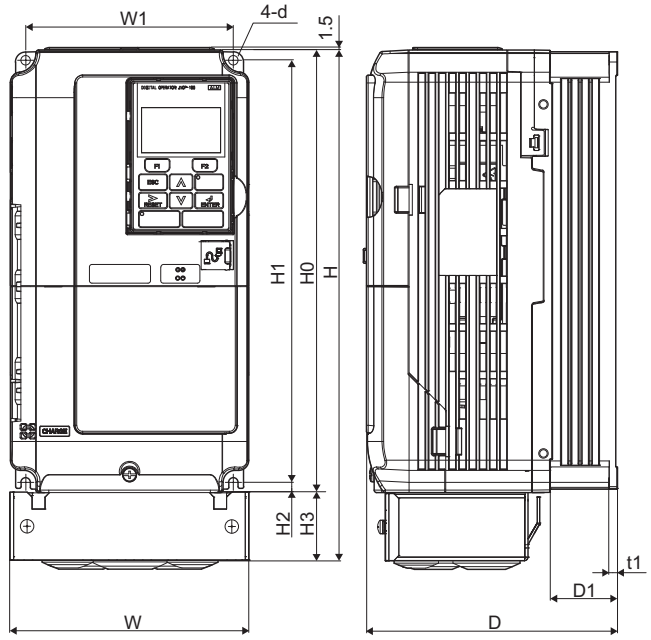


Figure 1

Table 2.4 Dimensions for IP20/NEMA Type 1 Enclosure: 200 V Class

Model	Figure	Dimensions mm (in)											Weight kg (lb)
		W	H	D	W1	H0	H1	H2	H3	D1	t1	d	
2A03P5	1	140 (5.5)	300 (11.8)	167 (6.6)	122 (4.8)	260 (10.2)	248 (9.8)	6 (0.2)	40 (1.6)	55 (2.2)	5 (0.2)	M5	4 (9)
2A0005	1	140 (5.5)	300 (11.8)	167 (6.6)	122 (4.8)	260 (10.2)	248 (9.8)	6 (0.2)	40 (1.6)	55 (2.2)	5 (0.2)	M5	4 (9)
2A0007	1	140 (5.5)	300 (11.8)	167 (6.6)	122 (4.8)	260 (10.2)	248 (9.8)	6 (0.2)	40 (1.6)	55 (2.2)	5 (0.2)	M5	4 (9)
2A0010	1	180 (7.1)	340 (13.4)	187 (7.4)	160 (6.3)	300 (11.8)	284 (11.2)	8 (0.3)	40 (1.6)	75 (3.0)	5 (0.2)	M5	6 (13)
2A0014	1	180 (7.1)	340 (13.4)	187 (7.4)	160 (6.3)	300 (11.8)	284 (11.2)	8 (0.3)	40 (1.6)	75 (3.0)	5 (0.2)	M5	6 (13)
2A0017	1	220 (8.7)	400 (15.8)	197 (7.8)	192 (7.6)	350 (13.8)	335 (13.2)	8 (0.3)	50 (2.0)	78 (3.1)	5 (0.2)	M6	9 (20)
2A0020	1	220 (8.7)	400 (15.8)	197 (7.8)	192 (7.6)	350 (13.8)	335 (13.2)	8 (0.3)	50 (2.0)	78 (3.1)	5 (0.2)	M6	9 (20)
2A0028	1	220 (8.7)	400 (15.8)	197 (7.8)	192 (7.6)	350 (13.8)	335 (13.2)	8 (0.3)	50 (2.0)	78 (3.1)	5 (0.2)	M6	9 (20)

Table 2.5 Dimensions for IP20/NEMA Type 1 Enclosure: 400 V Class

Model	Figure	Dimensions mm (in)											Weight kg (lb)
		W	H	D	W1	H0	H1	H2	H3	D1	t1	d	
4A03P5	1	140 (5.5)	300 (11.8)	167 (6.6)	122 (4.8)	260 (10.2)	248 (9.8)	6 (0.2)	40 (1.6)	55 (2.2)	5 (0.2)	M5	4 (9)
4A0005	1	140 (5.5)	300 (11.8)	167 (6.6)	122 (4.8)	260 (10.2)	248 (9.8)	6 (0.2)	40 (1.6)	55 (2.2)	5 (0.2)	M5	4 (9)
4A0007	1	140 (5.5)	300 (11.8)	167 (6.6)	122 (4.8)	260 (10.2)	248 (9.8)	6 (0.2)	40 (1.6)	55 (2.2)	5 (0.2)	M5	4 (9)
4A0010	1	180 (7.1)	340 (13.4)	187 (7.4)	160 (6.3)	300 (11.8)	284 (11.2)	8 (0.3)	40 (1.6)	75 (3.0)	5 (0.2)	M5	5 (11)
4A0014	1	180 (7.1)	340 (13.4)	187 (7.4)	160 (6.3)	300 (11.8)	284 (11.2)	8 (0.3)	40 (1.6)	75 (3.0)	5 (0.2)	M5	5 (11)
4A0017	1	220 (8.7)	400 (15.8)	197 (7.8)	192 (7.6)	350 (13.8)	335 (13.2)	8 (0.3)	50 (2.0)	78 (3.1)	5 (0.2)	M6	8 (18)
4A0020	1	220 (8.7)	400 (15.8)	197 (7.8)	192 (7.6)	350 (13.8)	335 (13.2)	8 (0.3)	50 (2.0)	78 (3.1)	5 (0.2)	M6	8 (18)
4A0028	1	220 (8.7)	400 (15.8)	197 (7.8)	192 (7.6)	350 (13.8)	335 (13.2)	8 (0.3)	50 (2.0)	78 (3.1)	5 (0.2)	M6	9 (20)

■ IP00/Open Type Enclosure Models

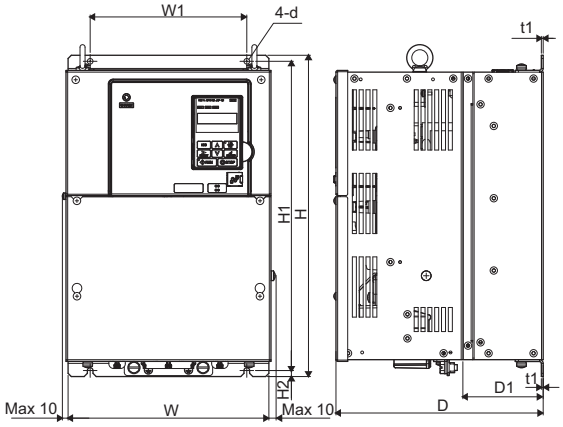


Figure 1

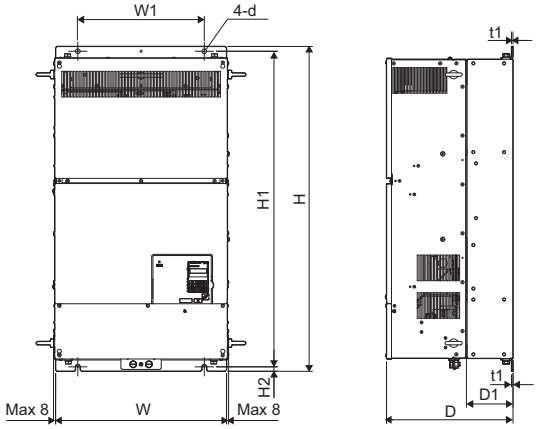


Figure 2

Table 2.6 Dimensions for IP00/Open Type Enclosure: 200 V Class

Model	Figure	Dimensions mm (in)									Weight kg (lb)
		W	H	D	W1	H1	H2	D1	t1	d	
2A0035	1	275 (10.8)	450 (17.7)	258 (10.2)	220 (8.7)	435 (17.1)	7.5 (0.3)	100 (3.9)	2.3 (0.1)	M6	21 (46)
2A0053	1	325 (12.8)	550 (21.7)	283 (11.1)	260 (10.2)	535 (21.1)	7.5 (0.3)	110 (4.3)	2.3 (0.1)	M6	33 (73)
2A0073	2	450 (17.7)	705 (27.8)	330 (13.0)	325 (12.8)	680 (26.8)	12.5 (0.5)	130 (5.1)	3.2 (0.1)	M10	62 (137)
2A0105	2	500 (19.7)	800 (31.5)	350 (13.8)	370 (14.6)	773 (30.4)	13 (0.5)	130 (5.1)	4.5 (0.2)	M12	81 (179)

Table 2.7 Dimensions for IP00/Open Type Enclosure: 400 V Class

Model	Figure	Dimensions mm (in)									Weight kg (lb)
		W	H	D	W1	H1	H2	D1	t1	d	
4A0035	1	275 (10.8)	450 (17.7)	258 (10.2)	220 (8.7)	435 (17.1)	7.5 (0.3)	100 (3.9)	2.3 (0.1)	M6	20 (44)
4A0043	1	275 (10.8)	450 (17.7)	258 (10.2)	220 (8.7)	435 (17.1)	7.5 (0.3)	100 (3.9)	2.3 (0.1)	M6	20 (44)
4A0053	1	325 (12.8)	550 (21.7)	283 (11.1)	260 (10.2)	535 (21.1)	7.5 (0.3)	110 (4.3)	2.3 (0.1)	M6	33 (73)
4A0073	1	325 (12.8)	550 (21.7)	283 (11.1)	260 (10.2)	535 (21.1)	7.5 (0.3)	110 (4.3)	2.3 (0.1)	M6	33 (73)
4A0105	2	450 (17.7)	705 (27.8)	330 (13.0)	325 (12.8)	680 (26.8)	12.5 (0.5)	130 (5.1)	3.2 (0.1)	M10	62 (137)
4A0150	2	450 (17.7)	705 (27.8)	330 (13.0)	325 (12.8)	680 (26.8)	12.5 (0.5)	130 (5.1)	3.2 (0.1)	M10	62 (137)
4A0210	2	500 (19.7)	800 (31.5)	350 (13.8)	370 (14.6)	773 (30.4)	13 (0.5)	130 (5.1)	4.5 (0.2)	M12	86 (190)
4A0300	2	500 (19.7)	800 (31.5)	350 (13.8)	370 (14.6)	773 (30.4)	13 (0.5)	130 (5.1)	4.5 (0.2)	M12	87 (192)

■ Pre-Assembled R1000 Kit Dimensions

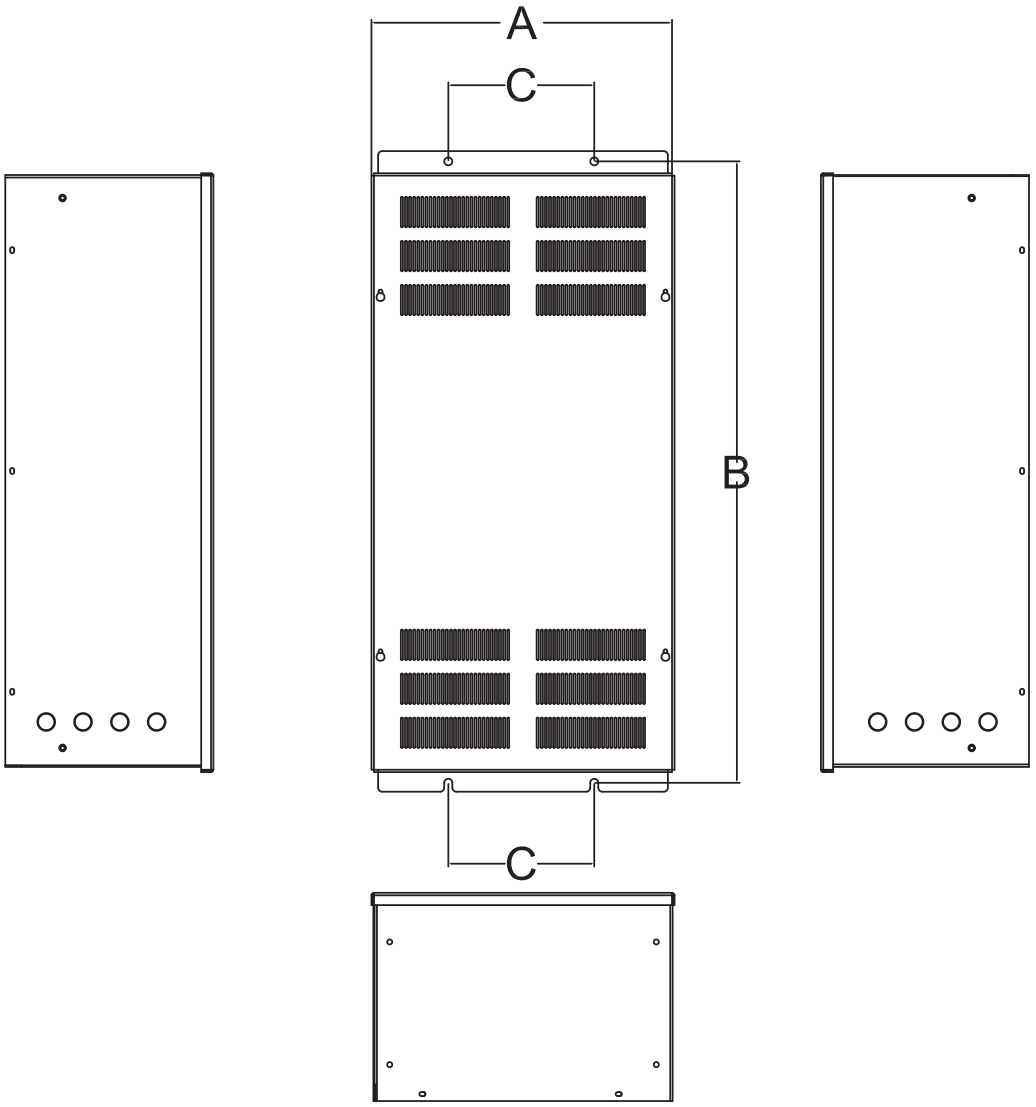


Table 2.8 Dimensions for Pre-Assembled R1000 Kits: 200 V Class

Model	Dimensions mm (in)			
	A	B	C	depth
ENC-R1000-2-0400	47.06 (18.53)	94.62 (37.25)	30.5 (12.0)	32.33 (12.73)
ENC-R1000-2-0600	47.06 (18.53)	94.62 (37.25)	30.5 (12.0)	32.33 (12.73)
ENC-R1000-2-0800	47.06 (18.53)	94.62 (37.25)	30.5 (12.0)	32.33 (12.73)
ENC-R1000-2-1000	47.06 (18.53)	120 (47.25)	22.9 (9.0)	32.33 (12.73)
PNL-R1000-2-0400	47.06 (18.53)	94.62 (37.25)	30.5 (12.0)	32.33 (12.73)
PNL-R1000-2-0600	47.06 (18.53)	94.62 (37.25)	30.5 (12.0)	32.33 (12.73)
PNL-R1000-2-0800	47.06 (18.53)	94.62 (37.25)	30.5 (12.0)	32.33 (12.73)
PNL-R1000-2-1000	47.06 (18.53)	120 (47.25)	22.9 (9.0)	32.33 (12.73)

Table 2.9 Dimensions for Pre-Assembled R1000 Kits: 400 V Class

Model	Dimensions mm (in)			
	A	B	C	depth
ENC-R1000-4-0400	47.06 (18.53)	94.62 (37.25)	30.5 (12.0)	32.33 (12.73)
ENC-R1000-4-0600	47.06 (18.53)	120 (47.25)	22.9 (9.0)	32.33 (12.73)
ENC-R1000-4-0750	47.06 (18.53)	120 (47.25)	22.9 (9.0)	32.33 (12.73)
ENC-R1000-4-1000	47.06 (18.53)	120 (47.25)	22.9 (9.0)	32.33 (12.73)
PNL-R1000-4-0400	47.06 (18.53)	94.62 (37.25)	30.5 (12.0)	32.33 (12.73)
PNL-R1000-4-0600	47.06 (18.53)	120 (47.25)	22.9 (9.0)	32.33 (12.73)
PNL-R1000-4-0750	47.06 (18.53)	120 (47.25)	22.9 (9.0)	32.33 (12.73)
PNL-R1000-4-1000	47.06 (18.53)	120 (47.25)	22.9 (9.0)	32.33 (12.73)

3

Electrical Installation

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

3.1 Section Safety

⚠ DANGER

Electrical Shock Hazard

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

Failure to comply will result in death or serious injury.

⚠ WARNING

Electrical Shock Hazard

Do not operate equipment with covers removed.

Failure to comply could result in death or serious injury.

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

Always use a type B ground fault circuit interrupter GFCI according to IEC/EN 60755 when a protective residual current monitor/detection device is installed for indirect or direct shock hazard protection.

The regenerative unit can cause a residual current with a DC component in the protective earthing conductor.

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

Failure to comply could result in death or serious injury.

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

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

Failure to comply could result in death or serious injury.

Do not allow unqualified personnel to perform work on the unit.

Failure to comply could result in death or serious injury.

Installation, maintenance, inspection, and servicing must be performed only by authorized personnel familiar with installation, adjustment, and maintenance of this equipment.

Do not touch any terminals before the capacitors have fully discharged.

Failure to comply could result in death or serious injury.

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

Fire Hazard

Tighten all terminal screws to the specified tightening torque.

Loose electrical connections could result in death or serious injury by fire due to overheating of electrical connections.

⚠ WARNING

Do not use improper combustible materials.

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

Do not install the unit to a combustible surface. Never place combustible materials on the unit.

Do not use an improper voltage source.

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

Verify that the rated voltage of the unit matches the voltage of the incoming power supply before applying power.

When installing options, perform all wiring exactly as specified in the wiring diagrams provided.

Failure to do so can result in fire. Improper wiring may damage option components.

⚠ CAUTION

Crush Hazard

Do not carry the unit by the front cover or the terminal cover.

Failure to comply may result in minor or moderate injury from the main body of the unit falling.

NOTICE

Observe proper electrostatic discharge procedures (ESD) when handling the unit and circuit boards.

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

Do not use unshielded cable for control wiring.

Failure to comply may cause electrical interference resulting in poor system performance. Use shielded, twisted-pair wires and ground the shield to the shield ground terminal E (G) of the unit.

Do not modify the unit circuitry.

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

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

Check all the wiring to ensure that all connections are correct after installing the unit and connecting any other devices.

Failure to comply could result in damage to the unit.

Check all the wiring to ensure that all connections are correct after installing the regenerative unit and connecting any other devices.

Failure to comply could result in damage to the regenerative unit.

3.2 Standard Connection Diagram

Connect the regenerative unit and peripheral devices as shown in ***Figure 3.1***. It is possible to set and run the regenerative unit via the digital operator without connecting digital I/O wiring. This section does not discuss regenerative unit operation; Refer to ***Start-Up Programming & Operation on page 69*** for instructions on operating the regenerative unit. Refer to ***Drive Connection Example on page 78*** for connection with a drive.

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

NOTICE: *If unsuitable wiring is performed, the regenerative unit could be damaged. Implement protection for branches and short-circuits according to all national and local standards.*

NOTICE: *Do not connect AC control circuit ground to regenerative unit enclosure. Improper grounding can cause control circuit malfunction.*

NOTICE: *The minimum load for the relay outputs M1-M2, M3-M4, M5-M6 and MA-MB-MC is 10 mA.*

NOTICE: *When installing a noise filter on the regenerative unit power supply, use a reactor-type noise filter (without a capacitor), such as a zero phase reactor, and install it after the MCCB on the power supply side. Do not install a filter with a built-in capacitor as the harmonic components may cause the capacitor to overheat or may damage the capacitor.*

NOTICE: *When installing a breaker or contactor on the regenerative unit side for an emergency shutoff, confirm that the CHARGE indicators on the drive and regenerative unit are not lit before closing the breaker or contactor on the regenerative unit output (DC) side. If the power supply is turned on while there is a voltage charge, an overcurrent will flow and the device may be damaged. Always confirm that the breaker or contactor on the regenerative unit output (DC) side is turned on before applying power to the regenerative unit.*

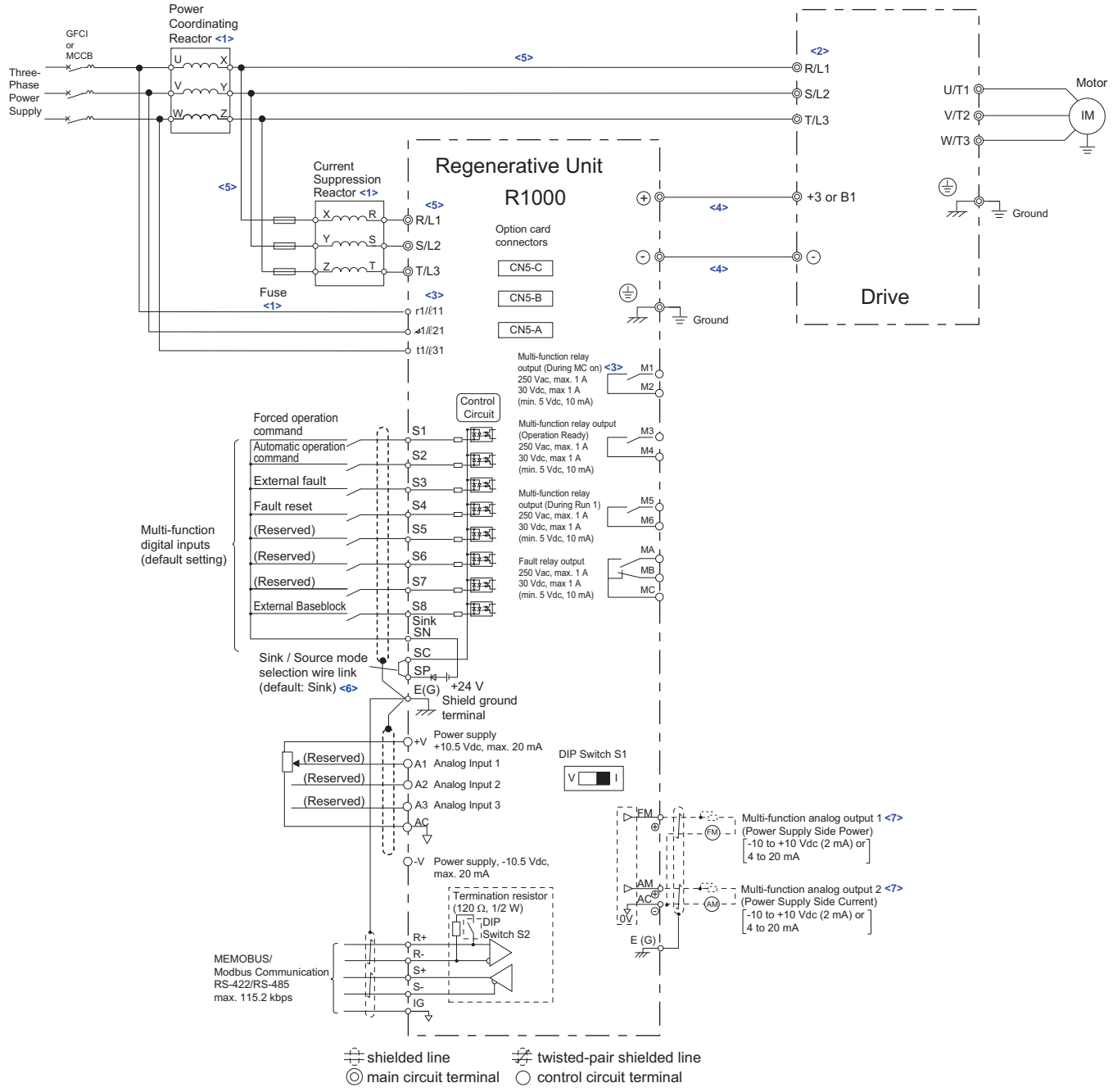


Figure 3.1 Standard Connection Diagram (example: model 2A0007)

<1> Use the specified AC reactor and fuse. Non-specified devices may cause erroneous operation.
<2> Always take the power supply for the drive's AC power supply terminals (R/L1, S/L2, and T/L3) from the secondary side of the power coordinating reactor.
<3> Always take the power supply for the unit's power supply voltage detection inputs (r1/ℓ11, ⏅1/ℓ21, and t1/ℓ31) from the primary side of the power coordinating reactor.
<4> Do not use a DC bus line that is longer than 5 m (16.4 ft) to connect the regenerative unit and drive.
<5> Do not use a line longer than 10 m (32.8 ft) to connect the power coordinating reactor and the regenerative unit.
<6> This figure shows an example of a sequence input to S1 through S8 using a non-powered relay or an NPN transistor. Install the wire link between terminals SC-SP for Sink mode and SC-SN for Source mode. Leave it out for external power supply. Never short terminals SP and SN as doing so will damage the regenerative unit.
<7> Multi-function analog outputs work with devices such as analog frequency meters, ammeters, voltmeters, and wattmeters. They are not intended for use as a feedback-type signal.

3.3 Main Circuit Connection Diagram

Refer to diagrams in this section when wiring the main circuit of the regenerative unit. Connections may vary based on regenerative unit capacity. The DC power supply for the main circuit also provides power to the control circuit.

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

◆ 2A03P5 to 2A0053, and 4A03P5 to 4A0073

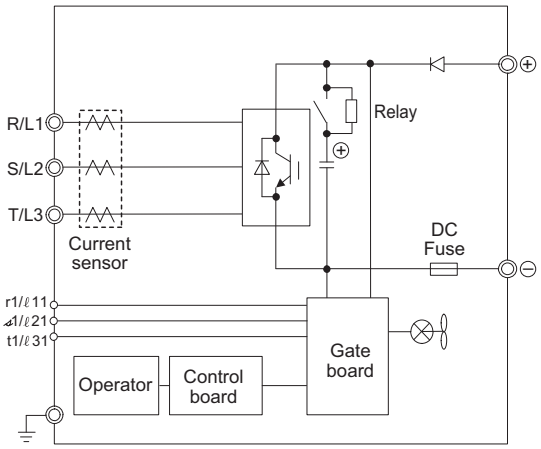


Figure 3.2 Connecting Main Circuit Terminals

◆ 2A0073, 2A0105, and 4A0105 to 4A0300

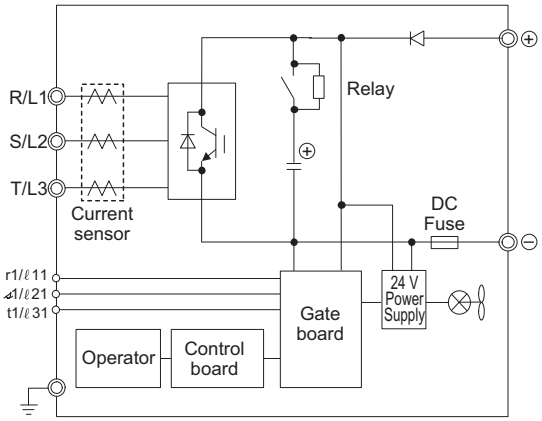


Figure 3.3 Connecting Main Circuit Terminals

3.4 Terminal Block Configuration

Refer to the terminal block configuration diagrams in *Table 3.1* for the location of the main circuit terminal block.

Table 3.1 Terminal Block Configuration

Model		Figure
200 V Class Models	2A03P5	*Figure 3.4*
	2A0005	*Figure 3.4*
	2A0007	*Figure 3.4*
	2A0010	*Figure 3.5*
	2A0014	*Figure 3.5*
	2A0017	*Figure 3.6*
	2A0020	*Figure 3.6*
	2A0028	*Figure 3.6*
	2A0035	*Figure 3.7*
	2A0053	*Figure 3.8*
	2A0073	*Figure 3.10*
	2A0105	*Figure 3.11*
400 V Class Models	4A03P5	*Figure 3.4*
	4A0005	*Figure 3.4*
	4A0007	*Figure 3.4*
	4A0010	*Figure 3.5*
	4A0014	*Figure 3.5*
	4A0017	*Figure 3.6*
	4A0020	*Figure 3.6*
	4A0028	*Figure 3.6*
	4A0035	*Figure 3.7*
	4A0043	*Figure 3.7*
	4A0053	*Figure 3.9*
	4A0073	*Figure 3.9*
	4A0105	*Figure 3.10*
	4A0150	*Figure 3.10*
	4A0210	*Figure 3.11*
	4A0300	*Figure 3.11*

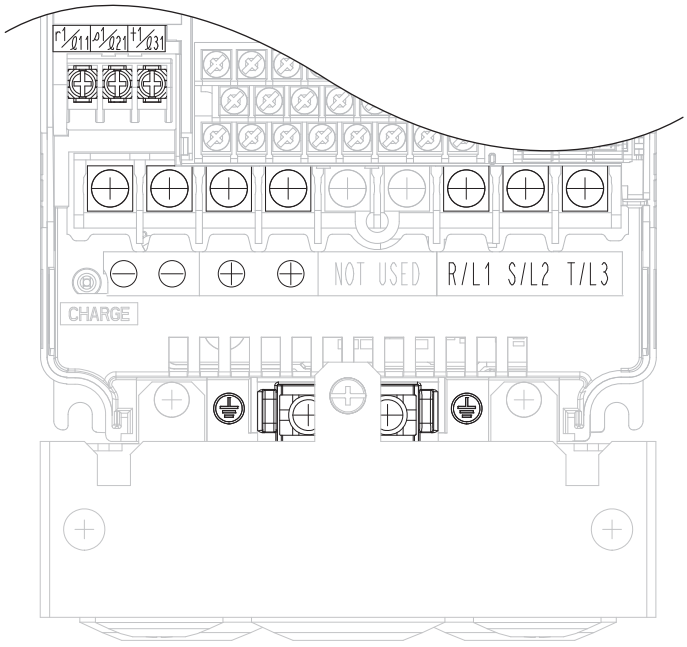


Figure 3.4 Main Circuit Terminal Block Configuration (Models 2A03P5 to 2A0007, 4A03P5 to 4A0007)

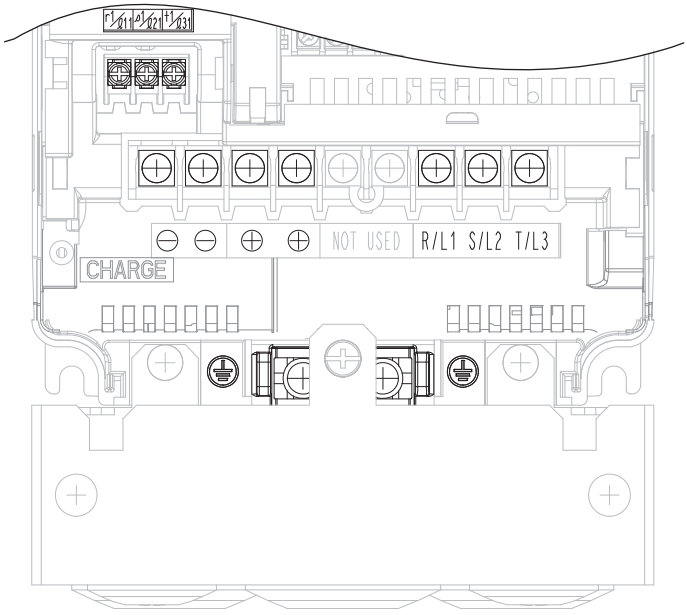


Figure 3.5 Main Circuit Terminal Block Configuration (Models 2A0010, 2A0014, 4A0010, 4A0014)

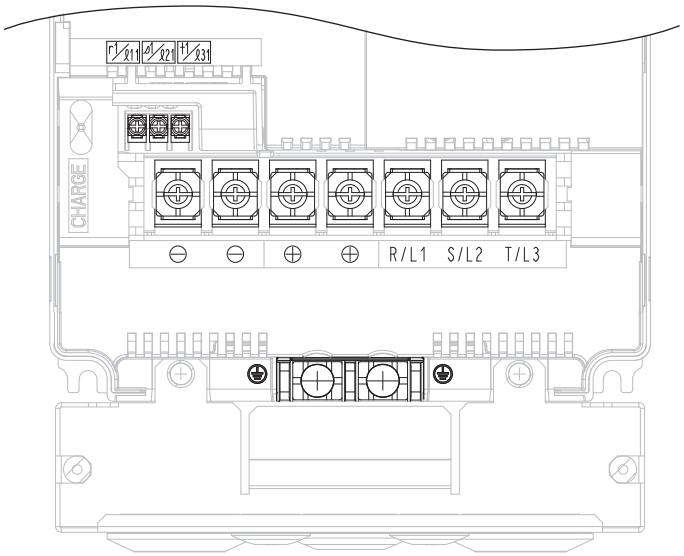


Figure 3.6 Main Circuit Terminal Block Configuration (Models 2A0017 to 2A0028, 4A0017 to 4A0028)

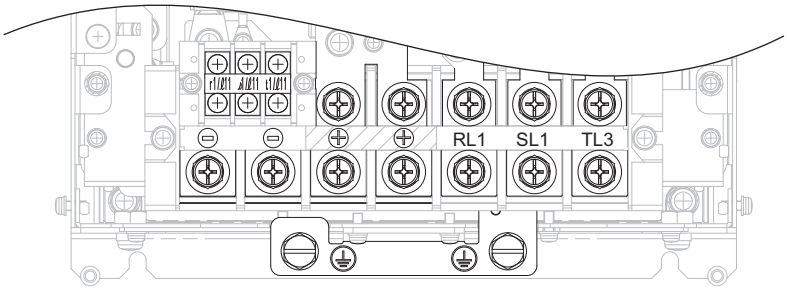


Figure 3.7 Main Circuit Terminal Block Configuration (Models 2A0035, 4A0035, 4A0043)

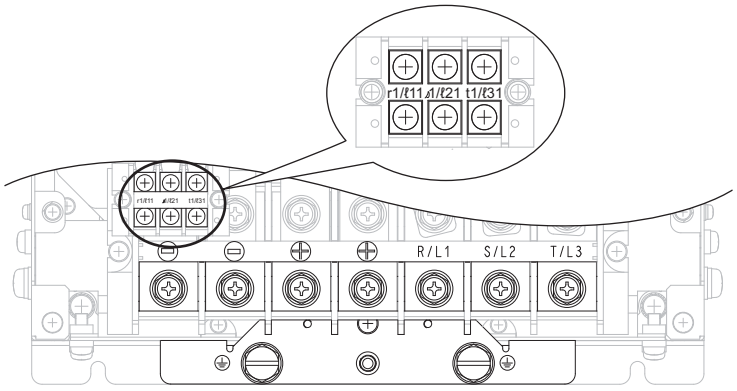


Figure 3.8 Main Circuit Terminal Block Configuration (Models 2A0053)

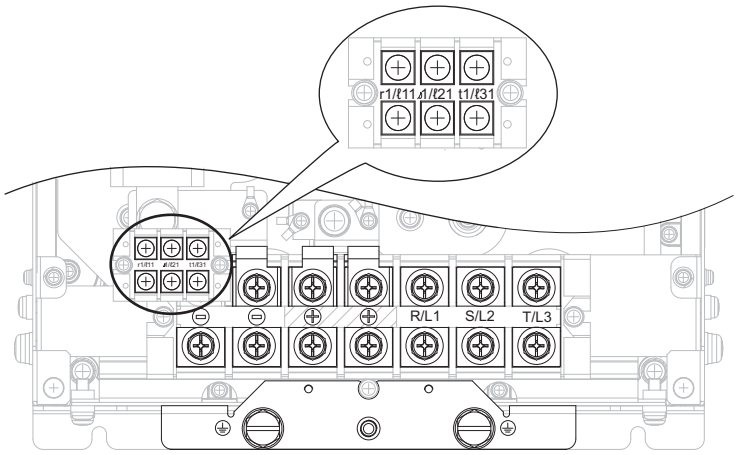


Figure 3.9 Main Circuit Terminal Block Configuration (Models 4A0053, 4A0073)

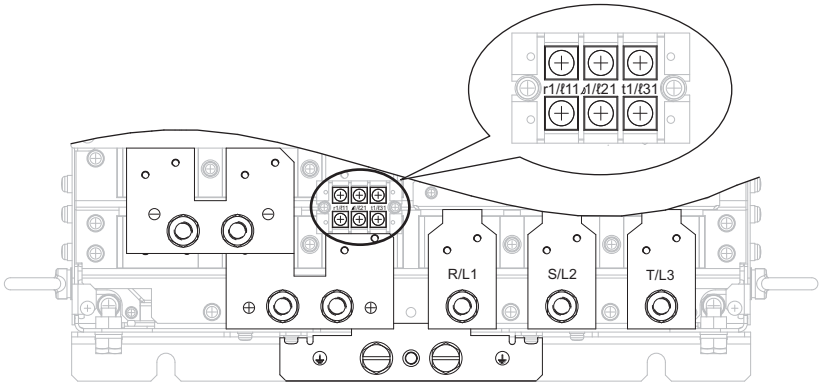


Figure 3.10 Main Circuit Terminal Block Configuration (Models 2A0073, 4A0105, 4A0150)

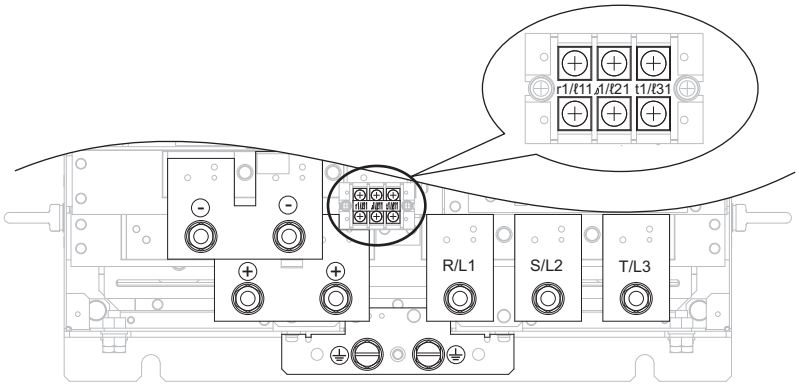


Figure 3.11 Main Circuit Terminal Block Configuration (Models 2A0105, 4A0210, 4A0300)

3.5 Terminal Cover

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

◆ Models 2A03P5 to 2A0028, 4A03P5 to 4A0028 (IP20/NEMA Type 1)

■ Removing the Terminal Cover

Loosen the terminal cover screw using a #2 Phillips screwdriver. Screw sizes vary by regenerative unit model.
Then, push in on the tab located on the bottom of the terminal cover and gently pull forward to remove the terminal cover.

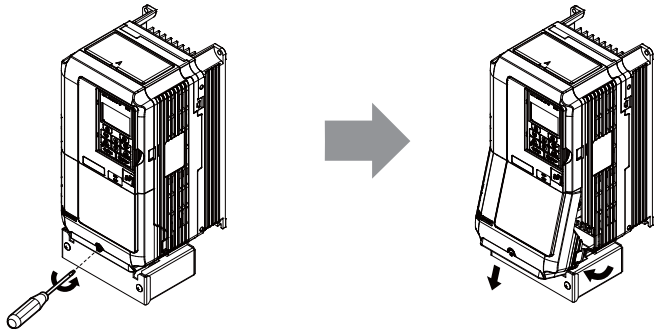
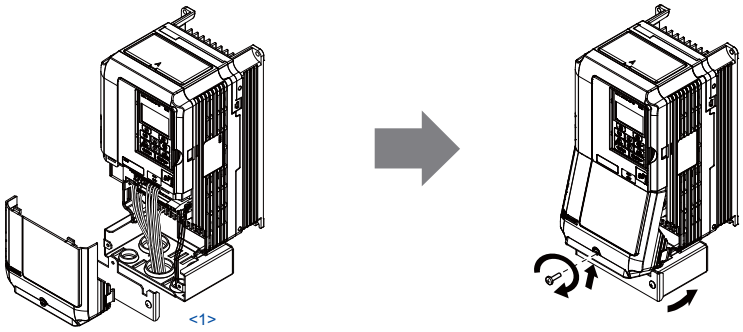


Figure 3.12 Removing the Terminal Cover on an IP20/NEMA Type 1 Enclosure Model

■ Reattaching the Terminal Cover

Power lines and signal wiring should pass through the opening provided. Refer to ***Wiring the Main Circuit Terminal on page 56*** and ***Wiring the Control Circuit Terminal on page 62*** for details on wiring.
Reattach the terminal cover after completing the wiring to the regenerative unit and other devices.



<1> Connect ground wiring first, followed by the main circuit, and then wire the control circuit. Power lines and signal wiring exit through the opening provided.

Figure 3.13 Reattaching the Terminal Cover on an IP20/NEMA Type 1 Enclosure Model

◆ Models 2A0035 to 2A0105, 4A0035 to 4A0300 (IP00/Open Type enclosure)

■ Removing the Terminal Cover

1. Loosen the screws on the terminal cover, then pull forward on the terminal cover to free it from the regenerative unit.

Note: Models 2A0073, 2A0105, and 4A0105 to 4A0300 have three mounting screws above the terminal cover.

CAUTION! *Do not completely remove the cover screws, just loosen them. If the cover screws are removed completely, the terminal cover may fall off causing an injury.*
Larger capacity regenerative units have large and heavy terminal covers. Remove and attach these covers with care.

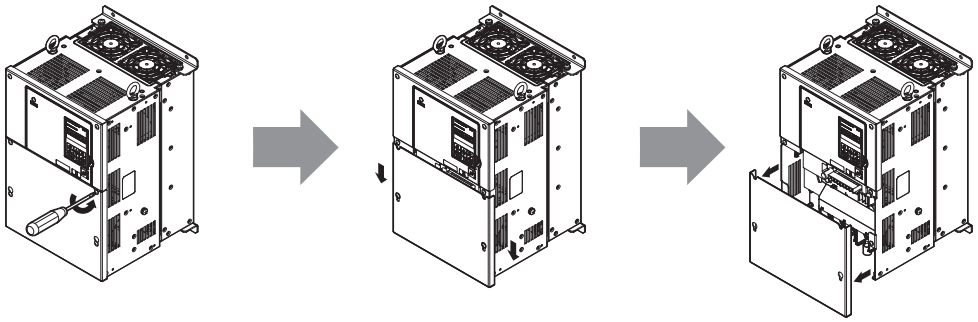
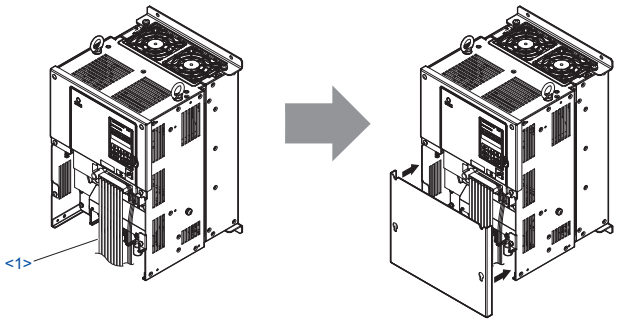


Figure 3.14 Removing the Terminal Cover on an IP00/Open Type enclosure Model

■ Reattaching the Terminal Cover

After wiring the terminal board and other devices, double-check connections and reattach the terminal cover. Refer to ***Wiring the Main Circuit Terminal on page 56*** and ***Wiring the Control Circuit Terminal on page 62*** for details on wiring.



<1> Connect ground wiring first, followed by the main circuit, and then wire the control circuit. Power lines and signal wiring exit through the opening provided.

Figure 3.15 Reattaching the Terminal Cover on an IP00/Open Type enclosure Model

3.6 Digital Operator and Front Cover

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

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

◆ Removing/Reattaching the Digital Operator

While pressing on the tab located on the right side of the digital operator, pull the digital operator forward to remove it from the regenerative unit.
Insert the digital operator into the opening in the top cover while aligning it with the notches on the left side of the opening. Next, press gently on the right side of the operator until it clicks into place.

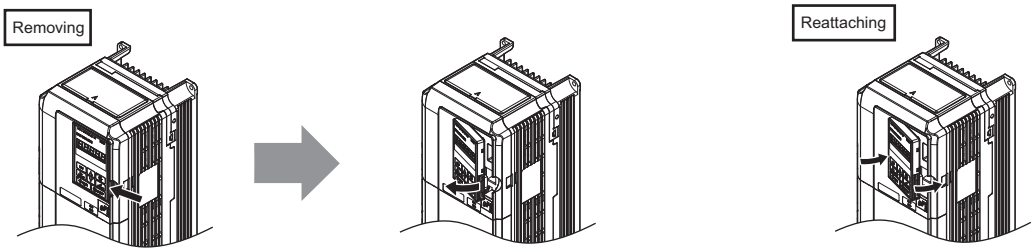


Figure 3.16 Removing/Reattaching the Digital Operator

◆ Removing/Reattaching the Front Cover

■ Removing the Front Cover

Models 2A03P5 to 2A0028, and 4A03P5 to 4A0028

After removing the terminal cover and the digital operator, loosen the screw that affixes the front cover (models 2A03P5 to 2A0007, and 4A03P5 to 4A0007 do not use a screw to affix the front cover). Pinch in on the tabs found on each side of the front cover, then pull forward to remove it from the regenerative unit.

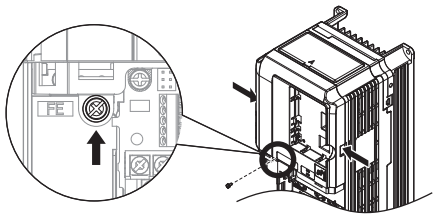


Figure 3.17 Remove the Front Cover (2A03P5 to 2A0028, 4A03P5 to 4A0028)

Models 2A0035 to 2A0105, and 4A0035 to 4A0300

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

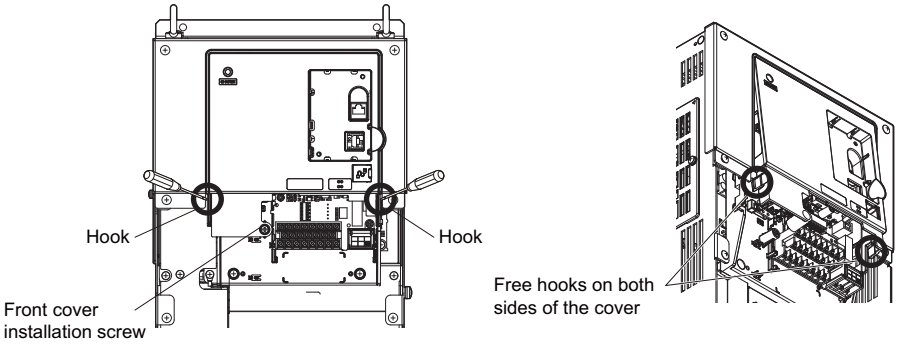


Figure 3.18 Remove the Front Cover (2A0035 to 2A0105, and 4A0035 to 4A0300)

4. Unhook the left side of the front cover then swing the left side towards you as shown in ***Figure 3.16*** until the cover comes off.

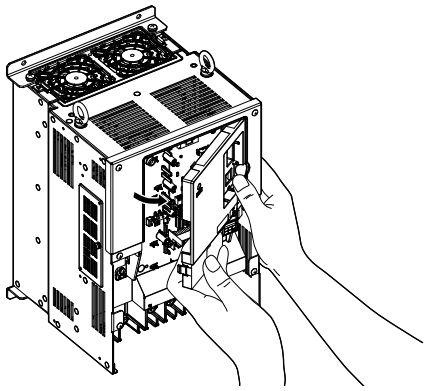


Figure 3.19 Remove the Front Cover (2A0035 to 2A0105, and 4A0035 to 4A0300)

■ Reattaching the Front Cover

Models 2A03P5 to 2A0028, 4A03P5 to 4A0028

Reverse the instructions given in ***Models 2A03P5 to 2A0028, 4A03P5 to 4A0028 (IP20/NEMA Type 1) on page 45*** to reattach the front cover. Pinch inwards on the hooks found on each side of the front cover while guiding it back into the regenerative unit. Make sure it clicks firmly into place.

Models 2A0035 to 2A0105, and 4A0035 to 4A0300

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

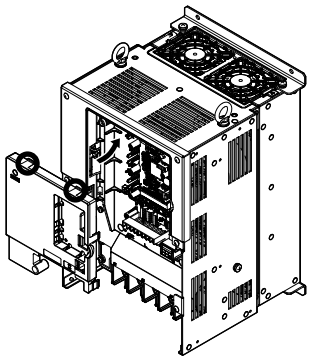


Figure 3.20 Reattach the Front Cover (2A0035 to 2A0105, and 4A0035 to 4A0300)

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

3.7 Top Protective Cover

Models 2A03P5 to 2A0028, 4A03P5 to 4A0028 are designed to IP20/NEMA Type 1 specifications with a protective cover on the top. Removing this top protective cover or the bottom conduit bracket from an IP20/NEMA Type 1 enclosure models voids the NEMA Type 1 protection while maintaining IP20 conformity.

◆ Removing and Reattaching the Top Protective Cover

Insert the tip of a straight-edge screwdriver into the small opening located on the front edge of the top protective cover. Gently apply pressure as shown in the figure below to free the cover from the regenerative unit. Insert the two small protruding hooks on the rear side of the top protective cover into the provided mounting holes near the back of the regenerative unit, then press down on the front side of the top protective cover to fasten the cover into place.

Note: Removing the top protective cover or the bottom conduit bracket from an IP20/NEMA Type 1 enclosure drive voids the NEMA Type 1 protection while maintaining IP20 conformity.

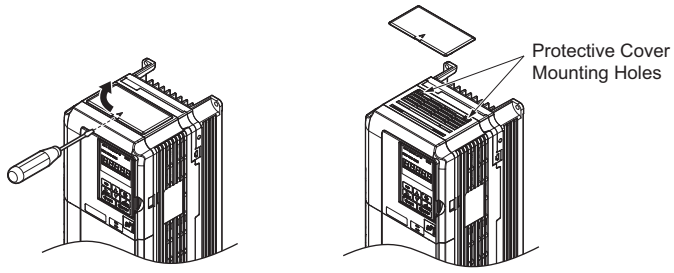


Figure 3.21 Removing and Reattaching the Top Protective Cover

3.8 Main Circuit Wiring

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

NOTICE: *Do not switch the regenerative unit input power supply on and off frequently. Frequently switching the unit on and off shortens the life of the DC bus capacitors, and can cause premature unit failure. For the full performance life, refrain from switching the unit on and off more than once every 30 minutes.*

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

◆ Main Circuit Terminal Functions

Table 3.2 Main Circuit Terminal Functions

Terminal		Type	Function	Page
200 V Class / 400 V Class	Model	2A03P5 to 2A0105 / 4A03P5 to 4A0300		
R/L1		Main circuit power supply input	These are the power supply input terminals that connect to the input reactor.	38
S/L2				
T/L3				
r1/ℓ11		Power supply voltage detection inputs	These terminals are to detect the power supply voltage order and voltage levels.	38
꜀1/ℓ21				
t1/ℓ31				
⊖		DC voltage input	These terminals input a DC voltage	–
⊕				
⏚		For 200 V class: 100 Ω or less For 400 V class: 10 Ω or less	Grounding terminal	56

Table 3.3 Power Cross Reference from RC5 to R1000

Power Signal Function	R1000 Terminals	RC5 Terminals
Main Circuit Power Supply Inputs	R/L1	R/L1
	S/L2	S/L2
	T/L3	T/L3
Power Supply Voltage Detection Inputs	r1/ℓ11	r1/ℓ11
	꜀1/ℓ21	꜀1/ℓ21
	t1/ℓ31	t1/ℓ31
DC Voltage Input	⊕	⊕
	⊖	⊖
Grounding	⏚	⏚

◆ Protecting Main Circuit Terminals

■ Insulation Caps or Sleeves

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

◆ Wire Gauges and Tightening Torque

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

Note: **1.** Wire gauge recommendations based on continuous current ratings using 75°C 600 Vac vinyl-sheathed wire assuming ambient temperature within 40°C.
2. Use terminals ⊕ and ⊖ when connecting the drive to the regenerative unit.

Consider the amount of voltage drop when selecting wire gauges. Increase the wire gauge when the voltage drop is greater than 2% of motor rated voltage. Ensure the wire gauge is suitable for the terminal block. Use the following formula to calculate the amount of voltage drop:
Line drop voltage (V) = $\sqrt{3}$ × wire resistance (Ω/km) × wire length (m) × current (A) × 10^{-3}

Refer to *UL Standards Compliance on page 182* for information on UL compliance.

The wire gauges listed in*Table 3.4* and *Table 3.5* are Magnetek recommendations. Refer to local codes for proper wire gauge selections.

■ Three-Phase 200 V Class

Table 3.4 Wire Gauge and Torque Specifications (Three-Phase 200 V Class)

Model	Terminal	For Asia <1>		For U.S.A. <2>		For Europe and China <3>		Screw Size	Tightening Torque N·m (lb·in.)
		Recomm. Gauge mm²	Applicable Gauge mm²	Recomm. Gauge AWG	Applicable Gauge AWG	Recomm. Gauge mm²	Applicable Gauge mm²		
2A03P5	R/L1,S/L2,T/L3	3.5	3.5 to 14	12	12 to 6	4	4 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
	⊖, ⊕	3.5	3.5 to 14	12	12 to 6	4	4 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
	r1/ℓ11, ꜀1/ℓ21,t1/ℓ31	2	2	14	14	2.5	2.5	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	2	2 to 8	12	12 to 8	4	4 to 10	M5	2.0 to 2.5 (17.7 to 22.1)
2A0005	R/L1,S/L2,T/L3	3.5	3.5 to 14	12	12 to 6	4	4 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
	⊖, ⊕	3.5	3.5 to 14	10	10 to 6	4	4 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
	r1/ℓ11, ꜀1/ℓ21,t1/ℓ31	2	2	14	14	2.5	2.5	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	2	2 to 8	12	12 to 8	4	4 to 10	M5	2.0 to 2.5 (17.7 to 22.1)
2A0007	R/L1,S/L2,T/L3	3.5	3.5 to 14	12	12 to 6	4	4 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
	⊖, ⊕	3.5	3.5 to 14	10	10 to 6	4	4 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
	r1/ℓ11, ꜀1/ℓ21,t1/ℓ31	2	2	14	14	2.5	2.5	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	3.5	3.5 to 8	10	10 to 8	4	4 to 10	M5	2.0 to 2.5 (17.7 to 22.1)
2A0010	R/L1,S/L2,T/L3	5.5	5.5 to 14	10	10 to 6	4	4 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
	⊖, ⊕	14	14	6	6	16	16	M4	2.1 to 2.3 (18.6 to 20.4)
	r1/ℓ11, ꜀1/ℓ21,t1/ℓ31	2	2	14	14	2.5	2.5	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	5.5	5.5 to 14	8	8 to 6	4	4 to 16	M6	2.0 to 2.5 (17.7 to 22.1)
2A0014	R/L1,S/L2,T/L3	8	8 to 14	8	8 to 6	6	6 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
	⊖, ⊕	14	14	6	6	16	16	M4	2.1 to 2.3 (18.6 to 20.4)
	r1/ℓ11, ꜀1/ℓ21,t1/ℓ31	2	2	14	14	2.5	2.5	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	5.5	5.5 to 14	8	8 to 6	6	6 to 16	M6	2.0 to 2.5 (17.7 to 22.1)

Model	Terminal	For Asia <1>		For U.S.A. <2>		For Europe and China <3>		Screw Size	Tightening Torque N·m (lb·in.)
		Recomm. Gauge mm²	Applicable Gauge mm²	Recomm. Gauge AWG	Applicable Gauge AWG	Recomm. Gauge mm²	Applicable Gauge mm²		
2A0017	R/L1,S/L2,T/L3	14	14 to 38	8	8 to 1	10	10 to 25	M6	3.6 to 4.0 (31.9 to 35.4)
	⊖, ⊕	14	14 to 38	4	4 to 1	16	16 to 25	M6	3.6 to 4.0 (31.9 to 35.4)
	r1/ℓ11, 𝓈1/ℓ21,t1/ℓ31	2	2	14	14	2.5	2.5	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	5.5	5.5 to 22	8	8 to 4	10	10 to 25	M6	5.4 to 6.0 (47.8 to 53.1)
2A0020	R/L1,S/L2,T/L3	14	14 to 38	6	6 to 1	10	10 to 25	M6	3.6 to 4.0 (31.9 to 35.4)
	⊖, ⊕	22	22 to 38	4	4 to 1	16	16 to 25	M6	3.6 to 4.0 (31.9 to 35.4)
	r1/ℓ11, 𝓈1/ℓ21,t1/ℓ31	2	2	14	14	2.5	2.5	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	8	8 to 22	6	6 to 4	10	10 to 25	M6	5.4 to 6.0 (47.8 to 53.1)
2A0028	R/L1,S/L2,T/L3	22	22 to 38	4	4 to 1	16	16 to 35	M6	3.6 to 4.0 (31.9 to 35.4)
	⊖, ⊕	30	30 to 38	2	2 to 1	25	25 to 35	M6	3.6 to 4.0 (31.9 to 35.4)
	r1/ℓ11, 𝓈1/ℓ21,t1/ℓ31	2	2	14	14	2.5	2.5	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	14	14 to 22	6	6 to 4	16	16 to 25	M6	5.4 to 6.0 (47.8 to 53.1)
2A0035	R/L1,S/L2,T/L3	38	38 to 70	2	2 to 2/0	25	25 to 70	M8	5.4 to 6.0 (47.8 to 53.1)
	⊖, ⊕	38	38 to 70	1/0	1/0 to 2/0	35	35 to 70	M8	5.4 to 6.0 (47.8 to 53.1)
	r1/ℓ11, 𝓈1/ℓ21,t1/ℓ31	2	2 to 5.5	14	14 to 10	2.5	2.5 to 6	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	22	22	4	4	16	16 to 25	M8	9.0 to 11.0 (79.7 to 97.4)
2A0053	R/L1,S/L2,T/L3	50	50 to 150	2/0	2/0 to 250	50	50 to 95	M8	13.5 to 15.0 (119,5 to 132,8)
	⊖, ⊕	80	80 to 150	4/0	4/0 to 250	70	70 to 95	M8	13.5 to 15.0 (119,5 to 132,8)
	r1/ℓ11, 𝓈1/ℓ21,t1/ℓ31	2	2 to 5.5	14	14 to 10	2.5	2.5 to 6	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	22	22 to 60	3	3 to 2	25	25 to 35	M10	18.0 to 23.0 (159 to 204)
2A0073	R/L1,S/L2,T/L3	80	80 to 150	1/0 × 2P	1/0 to 300	70	70 to 150	M12	32.0 to 40.0 (283 to 354)
	⊖, ⊕	125	125 to 150	3/0 × 2P	3/0 to 300	120	120 to 150	M12	32.0 to 40.0 (283 to 354)
	r1/ℓ11, 𝓈1/ℓ21,t1/ℓ31	2	2 to 5.5	14	14 to 10	2.5	2.5 to 6	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	60	60 to 150	1/0	1/0 to 300	35	35 to 150	M12	32.0 to 40.0 (283 to 354)

Model	Terminal	For Asia <1>		For U.S.A. <2>		For Europe and China <3>		Screw Size	Tightening Torque N·m (lb·in.)
		Recomm. Gauge mm²	Applicable Gauge mm²	Recomm. Gauge AWG	Applicable Gauge AWG	Recomm. Gauge mm²	Applicable Gauge mm²		
2A0105	R/L1,S/L2,T/L3	80 × 2P	80 to 325	3/0 × 2P	3/0 to 600	95 × 2P	95 to 240	M12	32.0 to 40.0 (283 to 354)
	⊖, ⊕	150 × 2P	150 to 325	300 × 2P	300 to 600	150 × 2P	150 to 240	M12	32.0 to 40.0 (283 to 354)
	r1/ℓ11, ꜀1/ℓ21,t1/ℓ31	2	2 to 5.5	14	14 to 10	2.5	2.5 to 6	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	60	60 to 180	1/0	1/0 to 300	70	70 to 240	M12	32.0 to 40.0 (283 to 354)

<1> Gauges listed here are for use in Japan.
<2> Gauges listed here are for use in the United States.
<3> Gauges listed here are for use in Europe and China.

Table 3.5 Three-Phase 400 V Class

Model	Terminal	For Asia <1>		For U.S.A. <2>		For Europe and China <3>		Screw Size	Tightening Torque N·m (lb·in.)
		Recomm. Gauge mm²	Applicable Gauge mm²	Recomm. Gauge AWG	Applicable Gauge AWG	Recomm. Gauge mm²	Applicable Gauge mm²		
4A03P5	R/L1,S/L2,T/L3	3.5	3.5 to 14	10	10 to 6	4	4 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
	⊖, ⊕	3.5	3.5 to 14	12	12 to 6	4	4 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
	r1/ℓ11, ꜀1/ℓ21,t1/ℓ31	2	2	14	14	2.5	2.5	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	2	2 to 8	12	12 to 10	4	4 to 6	M5	2.0 to 2.5 (17.7 to 22.1)
4A0005	R/L1,S/L2,T/L3	3.5	3.5 to 14	10	10 to 6	4	4 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
	⊖, ⊕	3.5	3.5 to 14	12	12 to 6	4	4 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
	r1/ℓ11, ꜀1/ℓ21,t1/ℓ31	2	2	14	14	2.5	2.5	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	2	2 to 8	12	12 to 10	4	4 to 6	M5	2.0 to 2.5 (17.7 to 22.1)
4A0007	R/L1,S/L2,T/L3	3.5	3.5 to 14	12	12 to 6	4	4 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
	⊖, ⊕	3.5	3.5 to 14	12	12 to 6	4	4 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
	r1/ℓ11, ꜀1/ℓ21,t1/ℓ31	2	2	14	14	2.5	2.5	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	2	2 to 8	10	10	4	4 to 6	M5	2.0 to 2.5 (17.7 to 22.1)
4A0010	R/L1,S/L2,T/L3	3.5	3.5 to 14	12	12 to 6	4	4 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
	⊖, ⊕	5.5	5.5 to 14	10	10 to 6	6	6 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
	r1/ℓ11, ꜀1/ℓ21,t1/ℓ31	2	2	14	14	2.5	2.5	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	3.5	3.5 to 14	10	10 to 6	4	4 to 16	M6	2.0 to 2.5 (17.7 to 22.1)

Model	Terminal	For Asia <1>		For U.S.A. <2>		For Europe and China <3>		Screw Size	Tightening Torque N·m (lb·in.)
		Recomm. Gauge mm²	Applicable Gauge mm²	Recomm. Gauge AWG	Applicable Gauge AWG	Recomm. Gauge mm²	Applicable Gauge mm²		
4A0014	R/L1,S/L2,T/L3	3.5	3.5 to 14	10	10 to 6	4	4 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
	⊖, ⊕	5.5	5.5 to 14	10	10 to 6	6	6 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
	r1/ℓ11, 𝓈1/ℓ21,t1/ℓ31	2	2	14	14	2.5	2.5	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	3.5	3.5 to 14	10	10 to 6	4	4 to 16	M6	2.0 to 2.5 (17.7 to 22.1)
4A0017	R/L1,S/L2,T/L3	8	8 to 38	10	10 to 1	10	10 to 25	M6	3.6 to 4.0 (31.9 to 35.4)
	⊖, ⊕	14	14 to 38	6	6 to 1	16	16 to 25	M6	3.6 to 4.0 (31.9 to 35.4)
	r1/ℓ11, 𝓈1/ℓ21,t1/ℓ31	2	2	14	14	2.5	2.5	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	5.5	5.5 to 22	8	8 to 6	10	10 to 16	M6	5.4 to 6.0 (47.8 to 53.1)
4A0020	R/L1,S/L2,T/L3	8	8 to 38	8	8 to 1	10	10 to 25	M6	3.6 to 4.0 (31.9 to 35.4)
	⊖, ⊕	14	14 to 38	6	6 to 1	16	16 to 25	M6	3.6 to 4.0 (31.9 to 35.4)
	r1/ℓ11, 𝓈1/ℓ21,t1/ℓ31	2	2	14	14	2.5	2.5	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	5.5	5.5 to 22	8	8 to 6	10	10 to 16	M6	5.4 to 6.0 (47.8 to 53.1)
4A0028	R/L1,S/L2,T/L3	8	8 to 38	8	8 to 1	10	10 to 25	M6	3.6 to 4.0 (31.9 to 35.4)
	⊖, ⊕	14	14 to 38	6	6 to 1	16	16 to 25	M6	3.6 to 4.0 (31.9 to 35.4)
	r1/ℓ11, 𝓈1/ℓ21,t1/ℓ31	2	2	14	14	2.5	2.5	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	5.5	5.5 to 22	8	8 to 6	10	10 to 16	M6	5.4 to 6.0 (47.8 to 53.1)
4A0035	R/L1,S/L2,T/L3	14	14 to 70	6	6 to 2/0	10	10 to 70	M8	5.4 to 6.0 (47.8 to 53.1)
	⊖, ⊕	14	14 to 70	3	3 to 2/0	16	16 to 70	M8	5.4 to 6.0 (47.8 to 53.1)
	r1/ℓ11, 𝓈1/ℓ21,t1/ℓ31	2	2 to 5.5	14	14 to 10	2.5	2.5 to 6	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	8	8 to 22	6	6	10	10 to 16	M8	9.0 to 11.0 (79.7 to 97.4)
4A0043	R/L1,S/L2,T/L3	14	14 to 70	4	4 to 2/0	10	10 to 70	M8	5.4 to 6.0 (47.8 to 53.1)
	⊖, ⊕	22	22 to 70	2	2 to 2/0	16	16 to 70	M8	5.4 to 6.0 (47.8 to 53.1)
	r1/ℓ11, 𝓈1/ℓ21,t1/ℓ31	2	2 to 5.5	14	14 to 10	2.5	2.5 to 6	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	14	14 to 22	6	6	10	10 to 16	M8	9.0 to 11.0 (79.7 to 97.4)

Model	Terminal	For Asia <1>		For U.S.A. <2>		For Europe and China <3>		Screw Size	Tightening Torque N·m (lb·in.)
		Recomm. Gauge mm²	Applicable Gauge mm²	Recomm. Gauge AWG	Applicable Gauge AWG	Recomm. Gauge mm²	Applicable Gauge mm²		
4A0053	R/L1,S/L2,T/L3	22	22 to 70	4	4 to 2/0	16	16 to 70	M8	5.4 to 6.0 (47.8 to 53.1)
	⊖, ⊕	30	30 to 70	2	2 to 2/0	25	25 to 70	M8	5.4 to 6.0 (47.8 to 53.1)
	r1/ℓ11, 𝓈1/ℓ21,t1/ℓ31	2	2 to 5.5	14	14 to 10	2.5	2.5 to 6	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	14	14 to 60	6	6 to 4	16	16 to 25	M10	18.0 to 23.0 (159 to 204)
4A0073	R/L1,S/L2,T/L3	30	30 to 70	2	2 to 2/0	25	25 to 70	M8	5.4 to 6.0 (47.8 to 53.1)
	⊖, ⊕	50	50 to 70	1/0	1/0 to 2/0	50	50 to 70	M8	5.4 to 6.0 (47.8 to 53.1)
	r1/ℓ11, 𝓈1/ℓ21,t1/ℓ31	2	2 to 5.5	14	14 to 10	2.5	2.5 to 6	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	22	22 to 60	4	4	16	16 to 25	M10	18.0 to 23.0 (159 to 204)
4A0105	R/L1,S/L2,T/L3	50	50 to 150	2/0	2/0 to 300	50	50 to 150	M10	18.0 to 23.0 (159 to 204)
	⊖, ⊕	80	80 to 150	4/0	4/0 to 300	70	70 to 150	M10	18.0 to 23.0 (159 to 204)
	r1/ℓ11, 𝓈1/ℓ21,t1/ℓ31	2	2 to 5.5	14	14 to 10	2.5	2.5 to 6	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	38	38 to 150	1	1 to 300	25	25 to 150	M10	18.0 to 23.0 (159 to 204)
4A0150	R/L1,S/L2,T/L3	100	100 to 150	250	250 to 300	95	95 to 240	M12	32.0 to 40.0 (283 to 354)
	⊖, ⊕	150	150 to 325	3/0 × 2P	3/0 to 600	150	150 to 240	M12	32.0 to 40.0 (283 to 354)
	r1/ℓ11, 𝓈1/ℓ21,t1/ℓ31	2	2 to 5.5	14	14 to 10	2.5	2.5 to 6	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	60	60 to 150	1/0	1/0 to 300	25	25 to 150	M12	32.0 to 40.0 (283 to 354)
4A0210	R/L1,S/L2,T/L3	80 × 2P	80 to 325	3/0 × 2P	3/0 to 600	95 × 2P	95 to 240	M12	32.0 to 40.0 (283 to 354)
	⊖, ⊕	80 × 2P	80 to 325	4/0 × 2P	4/0 to 600	95 × 2P	95 to 150	M12	32.0 to 40.0 (283 to 354)
	r1/ℓ11, 𝓈1/ℓ21,t1/ℓ31	2	2 to 5.5	14	14 to 10	2.5	2.5 to 6	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	60	60 to 180	2/0	2/0 to 350	95	95 to 240	M12	32.0 to 40.0 (283 to 354)
4A0300	R/L1,S/L2,T/L3	100 × 2P	100 to 325	250 × 2P	250 to 600	95 × 2P	95 to 240	M12	32.0 to 40.0 (283 to 354)
	⊖, ⊕	150 × 2P	150 to 325	400 × 2P	400 to 600	120 × 2P	120 to 150	M12	32.0 to 40.0 (283 to 354)
	r1/ℓ11, 𝓈1/ℓ21,t1/ℓ31	2	2 to 5.5	14	14 to 10	2.5	2.5 to 6	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	60 × 2P	60 to 180	4/0	4/0 to 350	95	95 to 240	M12	32.0 to 40.0 (283 to 354)

<1> Gauges listed here are for use in Japan.
<2> Gauges listed here are for use in the United States.
<3> Gauges listed here are for use in Europe and China.

◆ Ground Wiring

Follow the precautions below when wiring the ground for one regenerative unit or a series of regenerative units.

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

WARNING! *Electrical Shock Hazard. Be sure to ground the regenerative unit ground terminal (200 V class: ground to 100 Ω or less; 400 V class: ground to 10 Ω or less). Improper equipment grounding could result in death or serious injury by contacting ungrounded electrical equipment.*

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

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

NOTICE: *If devices, such as office equipment, that is sensitive to noise are installed in the same location, separate the ground wires and use independent grounds or noise filters to prevent noise from entering the devices through the ground wire. Otherwise, the office equipment may fail.*

Note:
1. Connect the regenerative units to power supply transformers on a 1:1 basis and use independent grounds. Otherwise the regenerative units or the devices may fail to operate.
2. If other devices are installed in the same location, connect them while observing the grounding standards for each device. Otherwise the regenerative units or the devices may fail to operate.

Do not loop the ground wire of the regenerative unit and the drive.

■ Wiring the Main Circuit Terminal

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

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

■ Main Circuit Connection Diagram

Refer to ***Main Circuit Connection Diagram on page 40*** when wiring terminals on the main power circuit of the regenerative unit.

3.9 Control Circuit Wiring

NOTICE: *Do not connect AC control circuit ground to regenerative unit enclosure. Improper regenerative unit grounding can cause control circuit malfunction.*

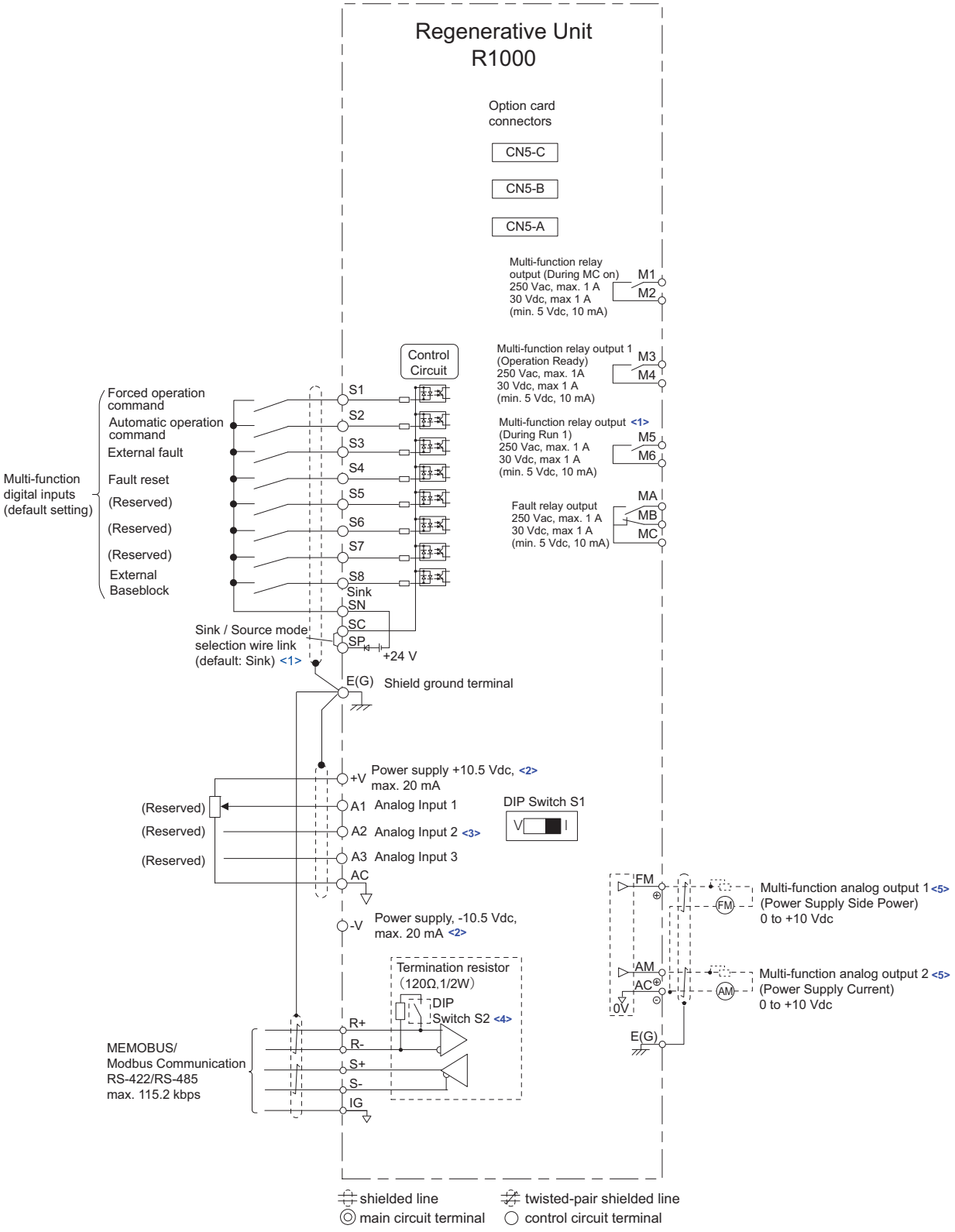


Figure 3.22 Control Circuit Wiring

<1> The default setting is for Sinking Mode. Control is possible with no-voltage contacts or NPN transistors. For details, refer to ***Control I/O Connections on page 64***.
<2> The maximum output current capacity for the +V and -V terminals on the control circuit is 20 mA. Never short terminals +V, -V, and AC, as it can cause erroneous operation or damage the regenerative unit.
<3> Set DIP switch S1 to select between a voltage or current input signal to terminal A2. The default setting is for current input. For details, refer to ***Terminal A2 Input Signal Selection on page 64***.
<4> Set DIP switch S2 to the ON position to enable the termination resistor in a MEMOBUS/Modbus network.
<5> Monitor outputs work with devices such as analog frequency meters, ammeters, voltmeters, and wattmeters. They are not intended for use as a feedback-type signal.

◆ Control Circuit Terminal Block Functions

Parameters determine which functions apply to the multi-function digital inputs (S1 to S8), multi-function relay outputs (M1, M2, M3, M4, M5, M6), and multi-function analog monitor outputs (FM, AM). The default setting is listed next to each terminal name in ***Table 3.6***.

NOTICE: *Install an MC on the power supply side of the regenerative unit when the drive should not automatically restart after power loss. To get the full performance life out of the electrolytic capacitors and circuit relays, refrain from switching the power supply off and on more than once every 30 minutes. Frequent use can damage the regenerative unit.*

■ Input Terminals

Table 3.6 lists the input terminals on the regenerative unit. Text in parenthesis indicates the default setting for each multi-function input.

Table 3.6 Control Circuit Input Terminals

Type	No.	Terminal Name (Function)	Function (Signal Level) Default Setting	Page
Multi-Function Digital Inputs	S1	Multi-function input 1 (Forced operation command)	• Photocoupler • 24 Vdc, 8 mA • Set the S3 jumper to select between sinking, sourcing mode, and the power supply. Refer to ***Control I/O Connections on page 64***.	***161***
	S2	Multi-function input 2 (Automatic operation command)		
	S3	Multi-function input 3 (External fault)		
	S4	Multi-function input 4 (Fault reset)		
	S5	Multi-function input 5 (Reserved)		
	S6	Multi-function input 6 (Reserved)		
	S7	Multi-function input 7 (Reserved)		
	S8	Multi-function input 8 (External Baseblock)		
	SC	Multi-function input common		
	SP	Digital input power supply +24 Vdc	24 Vdc power supply for digital inputs, 150 mA max (only when not using digital input option DI-A3) **NOTICE:** *Do not jumper or short terminals SP and SN. Failure to comply will damage the regenerative unit.*	
	SN	Digital input power supply 0 V		

Type	No.	Terminal Name (Function)	Function (Signal Level) Default Setting	Page
Analog Inputs	+V	Analog reference input	10.5 Vdc (max allowable current 20 mA)	–
	-V	Analog reference input	-10.5 Vdc (max allowable current 20 mA)	–
	A1	Multi-function analog input 1 (Reserved)	-10 to 10 Vdc, 0 to 10 Vdc (input impedance: 20 kΩ)	*163*
	A2	Multi-function analog input 2 (Reserved)	• -10 to 10 Vdc, 0 to 10 Vdc (input impedance: 20 kΩ) • 4 to 20 mA, 0 to 20 mA (input impedance: 250 Ω) • Voltage or current input must be selected by DIP switch S1 and H3-09.	*164*
	A3	Multi-function analog input 3 (Reserved)	• -10 to 10 Vdc, 0 to 10 Vdc (input impedance: 20 kΩ) • Use DIP switch S4 on the terminal board to select between analog and PTC input.	*164*
	AC	Frequency reference common	0 V	–
	E (G)	Ground for shielded lines and option cards	–	–

■ Output Terminals

Table 3.7 lists the output terminals on the regenerative unit. Text in parenthesis indicates the default setting for each multi-function output.

Table 3.7 Control Circuit Output Terminals

Type	No.	Terminal Name (Function)	Function (Signal Level) Default Setting	Page
Fault Relay Output	MA	N.O. output (Fault)	30 Vdc, 10 mA to 1 A; 250 Vac, 10 mA to 1 A Minimum load: 5 Vdc, 10 mA	*162*
	MB	N.C. output (Fault)		
	MC	Fault output common		
Multi-Function Relay Output <1>	M1	Multi-function relay output (During MC on)	30 Vdc, 10 mA to 1 A; 250 Vac, 10 mA to 1 A Minimum load: 5 Vdc, 10 mA	*162*
	M2			
	M3	Multi-function relay output (Operation Ready)	30 Vdc, 10 mA to 1 A; 250 Vac, 10 mA to 1 A Minimum load: 5 Vdc, 10 mA	
	M4			
	M5	Multi-function relay output (During Run 1)		
	M6			
Monitor Output	FM	Analog monitor output 1 (Power Supply Side Power)	-10 to +10 Vdc, or 0 to +10 Vdc	*165*
	AM	Analog monitor output 2 (Power Supply Side Current)		
	AC	Monitor common	0 V	–

<1> Refrain from assigning functions to digital relay outputs that involve frequent switching, as doing so may shorten relay performance life. Switching life is estimated at 200,000 times (assumes 1 A, resistive load).

Table 3.8 Control Cross Reference from RC5 to R1000

Type	Control Signal Function	R1000 Terminals	RC5 Terminals
Inputs	Forced Operation	S1	S1
	Automatic Operation	S2	S2
	External Fault	S3	S3
	Fault Reset	S4	S4
	24V HOT	SP	SP
	24V common	SN	SC
	Photocoupler internal common	SC	SS

Type	Control Signal Function	R1000 Terminals	RC5 Terminals
Photocoupler Outputs	Operation Ready	--	M1
		--	M2
	During Run 1	--	M3
		--	M4
Multi-Function Relay Output	During MC On	M1	--
		M2	--
	Operation Ready	M3	--
		M4	--
	During Run 1	M5	--
		M6	--
Relay Output	FAULT	MA	MA
		MB	MB
		MC	MC
Analog Output	Input Current	AM	AM
	Analog Common	AC	AC

◆ Terminal Configuration

The control circuit terminals are arranged as shown in ***Figure 3.23***.

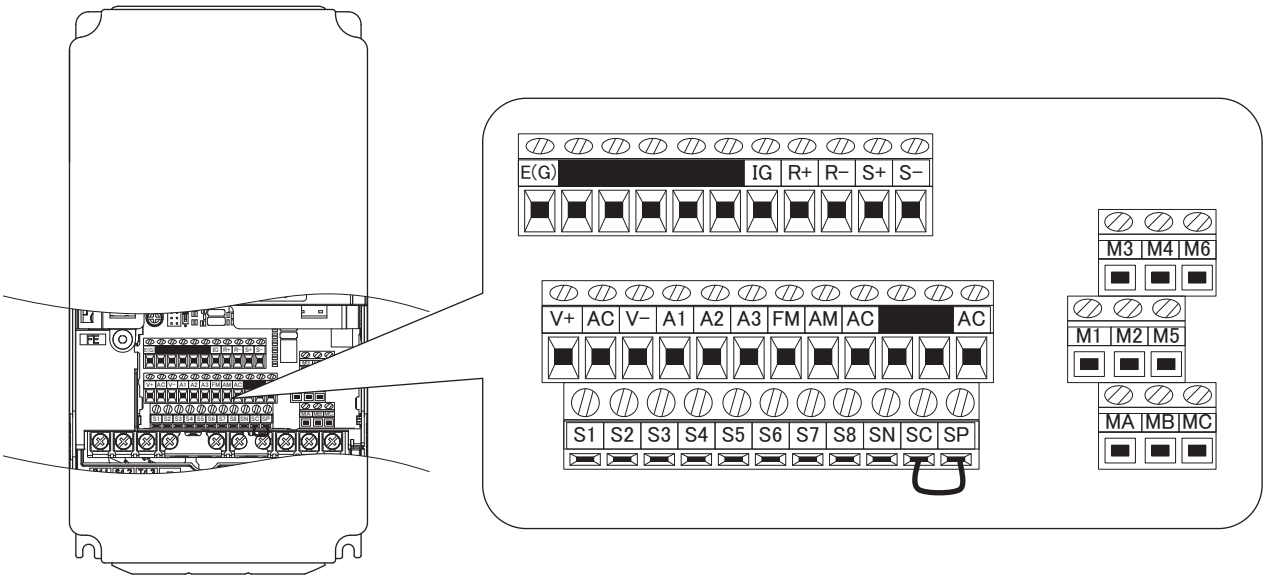


Figure 3.23 Control Circuit Terminal Arrangement

■ Wire Size and Torque Specifications

Select appropriate wire type and gauges from ***Table 3.9***.

For simpler and more reliable wiring, use crimp ferrules on the wire ends. Refer to ***Table 3.10*** for ferrule terminal types and sizes.

Table 3.9 Wire Gauge and Torque Specifications

Terminal	Screw Size	Tightening Torque N·m (lb·in.)	Bare Wire Terminal		Ferrule-Type Terminal		Wire Type
			Recomm. Gauge mm² (AWG)	Applicable Gauge mm² (AWG)	Recomm. Gauge mm² (AWG)	Applicable Gauge mm² (AWG)	
FM, AC, AM, SC, SP, SN, A1, A2, A3, +V, -V, S1 to S8, MA, MB, MC, M1 to M6	M3.5	0.8 to 1.0 (7.1 to 8.6)	0.75 (18)	0.5 to 2 (20 to 14)	–	–	Shielded wire, etc.
E (G)	M3.5	0.8 to 1.0 (7.1 to 8.6)	1.25 (12)	0.5 to 2 (20 to 14)			
IG, R+, R-, S+, S-	M2	0.22 to 0.25 (1.9 to 2.2)	0.75 (18)	Stranded wire: 0.25 to 1.0 (24 to 17) Solid wire: 0.25 to 1.5 (24 to 16)	0.5 (20)	0.25 to 0.5 (24 to 20)	

■ Ferrule-Type Wire Terminals

Magnetek recommends using CRIMPFOX 6, a crimping tool manufactured by PHOENIX CONTACT, to prepare wire ends with insulated sleeves before connecting to the regenerative unit. See ***Table 3.10*** for dimensions.

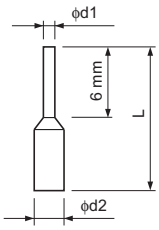


Figure 3.24 Ferrule Dimensions

Table 3.10 Ferrule Terminal Types and Sizes

Size mm² (AWG)	Type	L (mm)	d1 (mm)	d2 (mm)	Manufacturer
0.25 (24)	AI 0.25–6YE	10.5	0.8	2	PHOENIX CONTACT
0.34 (22)	AI 0.34–6TQ	10.5	0.8	2	
0.5 (20)	AI 0.5–6WH	14	1.1	2.5	

◆ Wiring the Control Circuit Terminal

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

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

NOTICE: *Separate control circuit wiring from main circuit wiring (terminals R/L1, S/L2, T/L3, r1/ℓ11, ⏦1/ℓ21, t1/ℓ31, ⊖, ⊕) and other high-power lines. Improper wiring practices could result in regenerative unit malfunction due to electrical interference.*

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

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

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

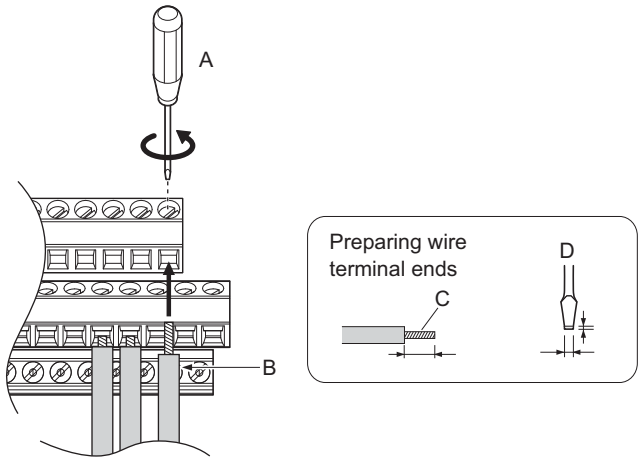
NOTICE: *Connect the shield of shielded cable to the appropriate ground terminal. Improper equipment grounding could result in regenerative unit or equipment malfunction or nuisance trips.*

Wire the control circuit only after terminals have been properly grounded and main circuit wiring is complete.
Prepare the ends of the control circuit wiring as shown in ***Figure 3.25***. Refer to ***Figure 3.27*** for the treatment of the ends of the shield wire.

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

NOTICE: *Use shielded twisted-pair cables as indicated to prevent operating faults. Failure to comply may cause electrical interference resulting in poor system performance due to improper wiring practices. Use shielded, twisted-pair cables and ground the shield to the shield ground terminal E (G) of the regenerative unit.*

Connect control wires as shown in ***Figure 3.25*** and ***Figure 3.26***.



A – Loosen screw to insert wire.

B – Single wire or stranded wire

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

D – Blade depth of 0.4 mm or less

E – Blade width of 2.5 mm or less

Figure 3.25 Terminal Board Wiring Guide

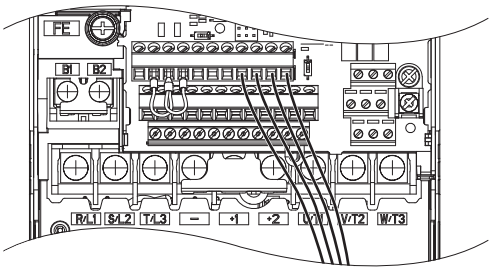
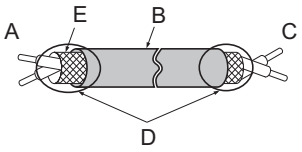


Figure 3.26 Terminal Board Location Inside the Regenerative Unit

For the control circuit wires, use shielded twisted-pair wires that have been prepared as shown in ***Figure 3.27***.



A – Regenerative unit side

B – Insulation

C – Control device side

D – Shield sheath (insulate with tape)

E – Shield

Figure 3.27 Preparing the Ends of Shielded Cables

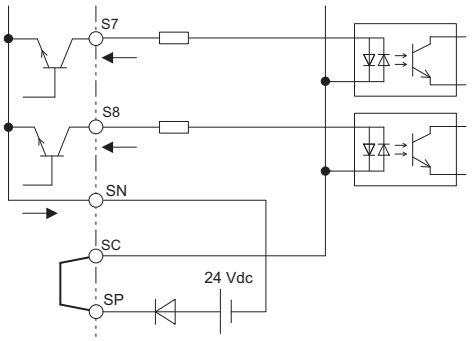
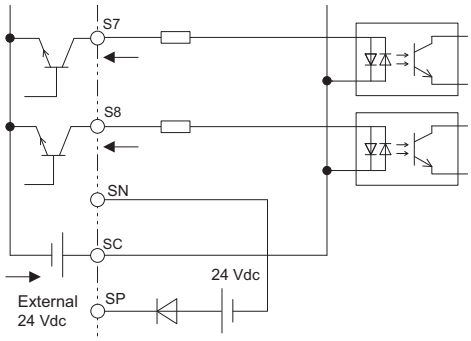
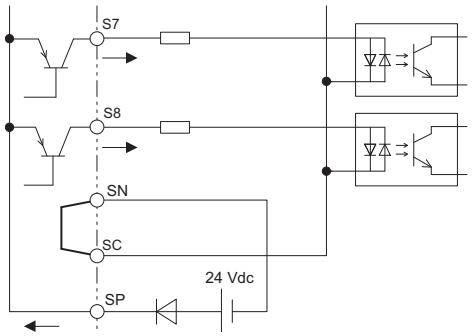
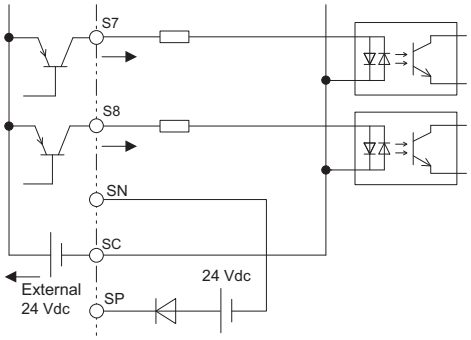
NOTICE: *The analog signal wiring between the regenerative unit and the operator station or peripheral equipment should not exceed 50 meters when using an analog signal from a remote source. Failure to comply could result in poor system performance.*

3.10 Control I/O Connections

Use the wire jumper between terminals SC and SP or SC and SN to select between Sink mode, Source mode or external power supply for the digital inputs S1 to S8 as shown in ***Table 3.11*** (Default: Sink mode, internal power supply).

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

Table 3.11 Digital Input Sink / Source / External Power Supply Selection

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

◆ Terminal A2 Input Signal Selection

Terminal A2 can be used to input either a voltage or a current signal. Select the signal type using switch S1 as explained in ***Table 3.12***. Set parameter H3-09 accordingly as shown in ***Table 3.13***. Refer to ***Figure 3.28*** for locating switch S1.

To set the DIP switch, use tweezers or a tool with a tip width of approximately 0.8 mm.

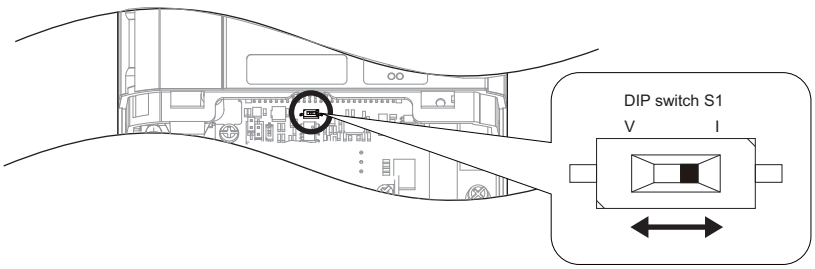


Figure 3.28 DIP Switch S1

Table 3.12 DIP Switch S1 Settings

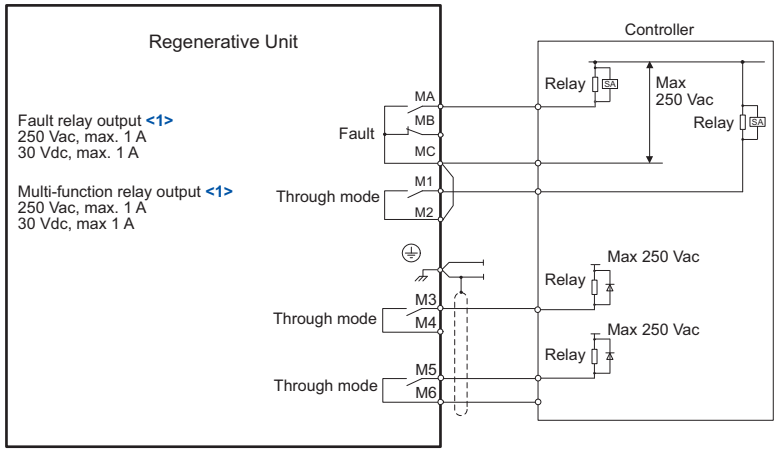
Setting	Description
V (left position)	Voltage input (-10 to +10 V or 0 to 10 V)
I (right position)	Current input (4 to 20 mA or 0 to 20 mA): default setting

Table 3.13 Parameter H3-09 Details

No.	Parameter Name	Description	Setting Range	Default Setting
H3-09	Terminal A2 signal level selection	Selects the signal level for terminal A2. 0: 0 to 10 Vdc 1: -10 to 10 Vdc 2: 4 to 20 mA 3: 0 to 20 mA	0 to 3	2

◆ Using the Contact Outputs

Figure 3.29 illustrates the use of multi-function relay outputs and the fault relay outputs.



<1> Minimum load: 5 Vdc, 10 mA

Figure 3.29 Contact Outputs

◆ Connect to a PC

This regenerative unit is equipped with a USB port (type-B).
The regenerative unit can connect to a USB port on a PC using a USB 2.0, AB-type cable (sold separately). After connecting the regenerative unit to a PC, Magnetek DriveWizard Industrial software can be used to monitor regenerative unit performance and manage parameter settings. Contact Magnetek for more information on DriveWizard Industrial.

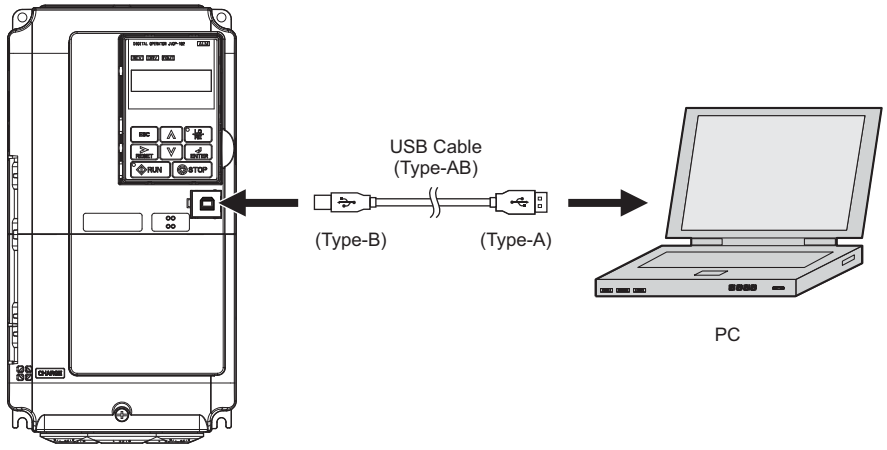


Figure 3.30 Connecting to a PC (USB)

3.11 Wiring Checklist

☑	No.	Item	Page
Regenerative Unit, Peripherals, Option Cards			
☐	1	Check regenerative unit model number to ensure receipt of correct model.	*17*
☐	2	Make sure you have the correct peripheral devices.	–
☐	3	Check the option card model number.	–
Installation Area and Physical Setup			
☐	4	Ensure that the area surrounding the regenerative unit complies with specifications.	*23*
Power Supply Voltage, Output Voltage			
☐	5	The voltage from the power supply should be within the input voltage specification range of the regenerative unit.	–
☐	6	The total load must be within the output specifications of the regenerative unit.	*18*
☐	7	A power supply with a capacity (kVA) that is larger than the rated input capacity of the regenerative unit must be used.	–
☐	8	The ratings must be correct.	*18*
Main Circuit Wiring			
☐	9	Confirm proper branch circuit protection as specified by national and local codes.	–
☐	10	Properly wire the regenerative unit.	*41*
☐	11	Suitable wires must be used to wire the power supply and regenerative unit.	*50*
☐	12	Properly ground the regenerative unit. Review page *56*.	*56*
☐	13	Tighten control circuit and grounding terminal screws. Refer to *Wire Gauges and Tightening Torque on page 50*	*50*
Control Circuit Wiring			
☐	14	Use twisted-pair line for all regenerative unit control circuit wiring.	*62*
☐	15	Ground the shields of shielded wiring to the GND ⏚ terminal.	*39*
☐	16	Properly wire any option cards.	–
☐	17	Check for any other wiring mistakes. Only use a multimeter to check wiring.	–
☐	18	Properly fasten regenerative unit control circuit terminal screws. Refer to *Wire Size and Torque Specifications on page 60*.	*60*
☐	19	Pick up all wire clippings.	–
☐	20	Ensure that no frayed wires on the terminal block are touching other terminals or connections.	–
☐	21	Properly separate control circuit wiring and main circuit wiring.	–
☐	22	The line between the input-side AC reactor and regenerative unit must be 10 m or shorter and the DC bus line between the regenerative unit and drive must be 5 m or shorter.	–

4

Start-Up Programming & Operation

This chapter explains the functions of the digital operator and how to program the regenerative unit for initial operation.

4.1 Section Safety

⚠ DANGER

Electrical Shock Hazard

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

Failure to comply will result in death or serious injury.

⚠ WARNING

Electrical Shock Hazard

Do not operate equipment with covers removed.

Failure to comply could result in death or serious injury.

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

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

Failure to comply could result in death or serious injury.

4.2 Using the Digital Operator

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

◆ LCD Display

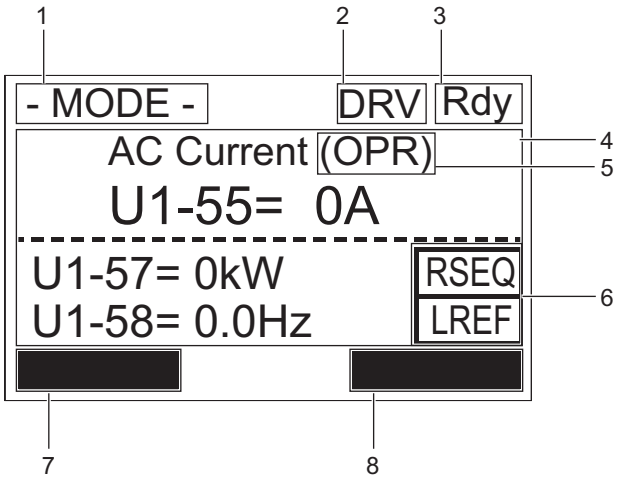


Figure 4.1 LCD Display

Table 4.1 Display and Contents

No.	Name	Display	Content
1	Operation Mode Menus	MODE	Displayed when in Mode Selection.
		MONITR	Displayed when in Monitor Mode.
		VERIFY	Indicates the Verify Menu.
		PRMSET	Displayed when in Parameter Setting Mode.
		SETUP	Displayed when in Setup Mode.
2	Mode Display Area	DRV	Displayed when in Drive Mode.
		PRG	Displayed when in Programming Mode.
3	Ready	Rdy	Indicates the regenerative unit is ready to run.
4	Data Display	–	Displays specific data and operation data.
5	DC Bus Voltage Feedback Reference Assignment <1>	OPR	Displayed when the DC bus voltage feedback Reference is assigned to the LCD Operator Option.
		AI	Displayed when the DC bus voltage feedback Reference is assigned to the Analog Input.
		COM	Displayed when the DC bus voltage feedback Reference is assigned to the MEMOBUS/Modbus Communication Inputs.
		OP	Displayed when the DC bus voltage feedback Reference is assigned to a Option regenerative unit.
6	LO/RE Display <2>	RSEQ	Displayed when the reference is supplied from a remote source.
		LSEQ	Displayed when the reference is supplied from the operator keypad.
		RREF	Displayed when the frequency reference is supplied from a remote source.
		LREF	Displayed when the frequency reference is supplied from the operator keypad.
7	Function Key 1 (F2)	HELP	Pressing F2 displays the Help menu.
		←	Pressing F2 scrolls the cursor to the left.
		HOME	Pressing F2 returns to the top menu (DC bus voltage feedback Reference).
		ESC	Pressing F2 returns to the previous display.

No.	Name	Display	Content
8	Function Key 2 (F1)	DATA	Pressing F1 scrolls to the next display.
		→	Pressing F1 scrolls the cursor to the right.
		RESET	Pressing F1 resets the existing regenerative unit fault or error.

<1> Displayed when in DC bus voltage feedback Reference Mode.
<2> Displayed when in DC bus voltage feedback Reference Mode and Monitor Mode.

◆ ALARM (ALM) LED Displays

Table 4.2 ALARM (ALM) LED Status and Contents

State	Content	Display
Illuminated	When the regenerative unit detects a fault.	
Flashing	• When an alarm occurs. • When oPE is detected.	
Off	Normal operation (no fault or alarm).	

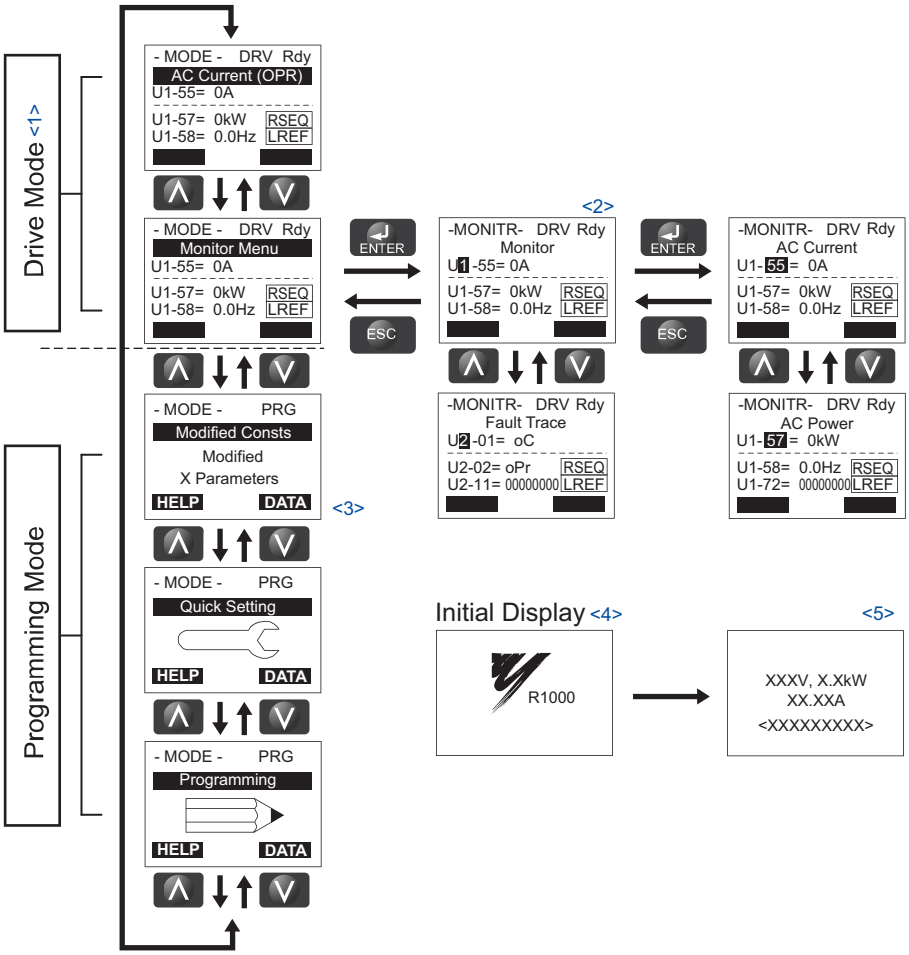
◆ LO/RE LED and RUN LED Indications

Table 4.3 LO/RE LED and RUN LED Indications

LED	Lit	Flashing	Off
	When source of the Run command is assigned to the digital operator (LOCAL)	–	When a device other than the operator is selected for Run command control (REMOTE)
	During run	Stopped for an operation interlock. <1>	During stop
Examples			

<1> The indicator flashes in the following cases:
・When REMOTE operation is restored after inputting a Run command from an external terminal during LOCAL operation.
・A Run command was input from an external terminal in any mode other than Drive Mode.
・The STOP key on the digital operator was pressed during REMOTE operation.

◆ Menu Structure for Digital Operator



<1> Pressing RUN will start the regenerative unit operation.
<2> Flashing characters are shown as X.
<3> "X" characters are used as examples in this manual. The LCD Operator will display the actual setting values.
<4> The DC bus voltage feedback reference appears after the initial display that shows the product name.
<5> The information that appears on the display will vary depending on the regenerative unit.

Figure 4.2 Digital Operator Menu and Screen Structure

4.3 The Drive and Programming Modes

The regenerative unit has a Drive Mode and a Programming Mode.

Drive Mode: In Drive Mode the user can operate the regenerative unit, monitor operating status (DC bus voltage, DC current reference, etc.).

Programming Mode: In Programming Mode the user can edit and verify parameter settings. When the regenerative unit is in Programming Mode it will not accept a Run command unless b1-08 is set to 1.

◆ Navigating the Drive and Programming Modes (Default Setting)

NOTICE: *Check the following items before you turn on the power supply.*

- *Is the power supply voltage correct?*
  200 V Class: 200 to 240 Vac 50/60 Hz
  400 V Class: 380 to 480 Vac 50/60 Hz
- *Are the regenerative unit and the control devices connected properly (e.g., is the phase order correct)?*
- *Is the phase order correct between the main circuit terminals (R/L1, S/L2, and T/L3) on the regenerative unit and the power supply voltage detection terminals (r1/ℓ11, s1/ℓ21, and t1/ℓ31).*
- *Are the control circuit terminals on the regenerative unit connected properly to the control devices?*
- *Are the Run Commands for the regenerative unit and the control devices turned off?*

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

■ Drive Mode Details

The following actions are possible in the Drive Mode:

- Run and stop the regenerative unit
- Monitor the operation status of the regenerative unit (DC bus voltage feedback, Power Supply Side Voltage, Power supply side current, etc.)
- View information on an alarm
- View a history of alarms that have occurred

Note: The regenerative unit must be in Drive Mode to operate. Change to another mode when the regenerative unit is stopped.

■ Programming Mode Details

The following actions are possible in the Programming Mode:

- **Verify Mode:** View a list of parameters that have been changed from the default values.
- **Setup Mode:** Access a list of commonly used parameters to simplify setup. Refer to ***Setup Group Parameters on page 74***.
- **Parameter Setting Mode:** Access and edit all parameter settings.

Setup Group Parameters

Parameters most likely to be changed are assigned to the group of User Parameters, A2-01 through A2-32. User Parameters are part of the Setup Group, which provides quicker access by eliminating the need to scroll through multiple menus.

Table 4.4 lists the default settings of the A2-☐☐ parameters.

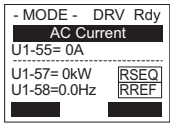
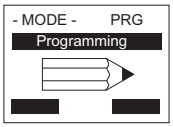
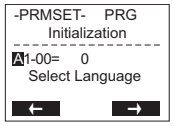
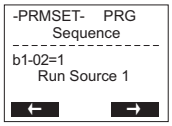
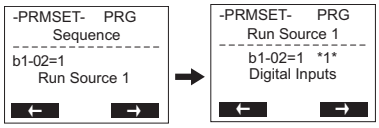
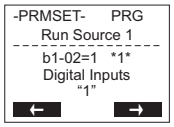
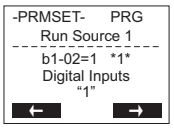
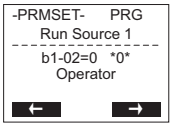
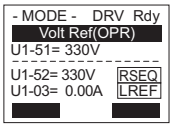
Note: Parameter b1-02 is displayed in Setup Mode regardless of A2-☐☐ parameter settings.

Table 4.4 Setup Group Parameters

A2-☐☐	Default	Name
A2-01	b1-02	Run Command Selection 1
A2-02	b1-21	Operator Operation Mode

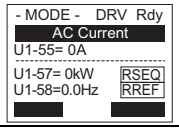
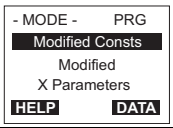
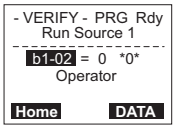
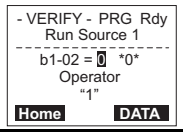
◆ Changing Parameter Settings or Values

This example explains changing b1-02 (Run Command Selection) from 01 to 00.

Step			Display/Result
1.	Turn on the power to the regenerative unit. The initial display appears.	→	
2.	Press the ∧ or ∨ key until the Parameter Setting Mode screen appears.	→	
3.	Press the ENTER key to enter the parameter menu tree.	→	
4.	Press ∧ or ∨ key to select the B parameter group.	→	
5.	Press ENTER two times.	→	
6.	Press ENTER to view the current setting value (1). "1" Flashes.	→	
7.	Press the ∨ key and enter 0.	→	
8.	Press ENTER and the regenerative unit will confirm the change.	→	
9.	The display automatically returns to the screen shown in Step 4.	→	
10.	Press the ESC key until back at the initial display.	→	

◆ Verifying Parameter Changes: Verify Mode

The Verify Mode lists edited parameters from the Programming Mode. The Verify Mode helps determine which settings have been changed, and is particularly useful when replacing a regenerative unit. If no settings have been changed, the Verify Mode will read “None”. The Verify Mode also allows users to quickly access and re-edit any parameter settings that have been changed.

Step			Display/Result
1.	Turn on the power to the regenerative unit. The initial display appears.	➞	
2.	Press ∧ or ∨ until the display shows the top of the Verify Menu.	➞	
3.	Press ENTER to enter the list of parameters that have been edited from their original default settings. If parameters other than b1-02 have been changed, use the ∧ or ∨ key to scroll until b1-02 appears.	➞	
4.	Press the ENTER key to access the setting value.	➞	

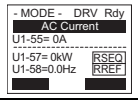
◆ Switching Between LOCAL and REMOTE

LOCAL mode is when the regenerative unit is set to accept the Run command from the digital operator RUN key. REMOTE mode is when the regenerative unit is set to accept the Run command from an external device.

Switch the operation between LOCAL and REMOTE using the LO/RE key on the digital operator or via a digital input.

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

■ Using the LO/RE Key on the Digital Operator

Step			Display/Result
1	Turn on the power to the regenerative unit. The initial display appears.	➞	
2	Press LO/RE. The LO/RE light will light up. The regenerative unit is now in LOCAL. To set the regenerative unit for REMOTE operation, press the key again.	➞	 LO/RE ➞ LO/RE

■ Using Input Terminals S1 through S8 to Switch between LOCAL and REMOTE

It is possible to switch between LOCAL and REMOTE modes using one of the digital input terminals S1 through S8 (set the corresponding parameter H1-☐☐ to “1”).

Setting H1-☐☐ to 1 disables the LO/RE key on the digital operator.

4.4 Powering Up the Regenerative Unit

◆ Powering Up the Regenerative Unit and Operation Status Display

■ Powering Up the Regenerative Unit

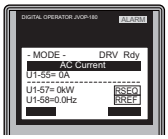
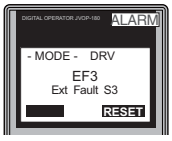
Review the following checklist before turning the power on.

NOTICE: *Equipment Damage. Check the following items before applying power to the unit. Failure to comply could result in damage to the regenerative unit.*

Item to Check	Description
Power supply voltage	Check the power supply voltage. 200 V class: Three-phase 200 to 240 Vac 50/60 Hz 400 V class: Three-phase 380 to 480 Vac 50/60 Hz
	Properly wire the power supply input terminals (R/L1, S/L2, and T/L3).
	Properly wire the phase order of the power supply input terminals (R/L1, S/L2, and T/L3) and the power supply voltage detection terminals (r1/ℓ11, s1/ℓ21, and t1/ℓ31).
	Check for proper grounding of regenerative unit.
Regenerative unit output terminals and drive terminals	Properly connect the DC voltage output terminals (⊕/⊖) on the regenerative unit to the DC power supply input terminals (⊕/⊖) on the drive. Be particularly careful to correctly connect the ⊕ and ⊖ terminals.
Control circuit terminals	Properly connect the control circuit terminals on the regenerative unit to other control devices.
Regenerative unit control terminal status	Turn off the Run Commands for the regenerative unit and the peripheral control devices.
Power coordinating reactor, current suppression reactor, and fuse connections to regenerative unit	Properly connect the Power coordinating reactor, current suppression reactor, and fuse to regenerative unit as shown in the Standard Connection Diagram.

■ Status Display

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

Status	Name	Description
Normal Operation		The data display area displays the DC bus voltage feedback reference. DRV is lit.
Fault	 Example: External Fault	Data displayed varies by the type of fault. Refer to ***Troubleshooting on page 85*** for more information. DRV and ALM are lit.

4.5 Operation with the Drive Connected

◆ Drive Connection Example

Refer to *Standard Connection Diagram on page 38* for details.

◆ Timing Chart for Turning the Power Supply On and Off

Figure 4.3 is a timing chart for turning the power supply on and off.

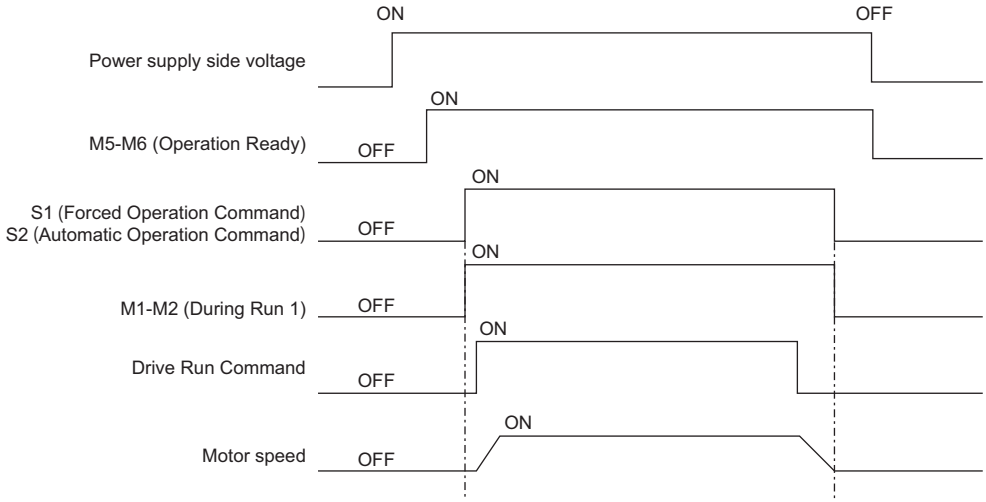


Figure 4.3 Timing Chart for Power ON and Run Command Sequence

Observe the following precautions when you perform operation with the regenerative unit connected to the drive.

- After turning on the power supply to the regenerative unit, wait for the Operation Ready signal on the multi-function contact output to turn on and then input the Run Command for the regenerative unit.
- Confirm that the regenerative unit is operating (i.e., confirm that During Run 1 is on) and then turn on the Run Command for the drive.
- To stop the regenerative unit, turn off the Run Command to the drive, confirm that the motor has stopped, and then input the Stop Command.
- Wait for the regenerative unit to stop and the During Run 1 multi-function contact output to turn off, then turn off the power supply.

◆ Operation Command Selection

The automatic operation command and forced operation command are available in the regenerative unit.

Select one of the operation commands according to the application.

Note: Select forced operation command when the motor vibrates during automatic operation.

■ Automatic Operation Command

When the multifunction input terminal S2 (H1-02 = 3D (default setting)) is “closed”, the regenerative unit detects any increase/decrease of the bus voltage and performs an automatic run/stop.

The regenerative unit stops after the minimum operation time set to C7-16 has passed when the bus voltage is less than the acceptable voltage set to the operation start/stop level.

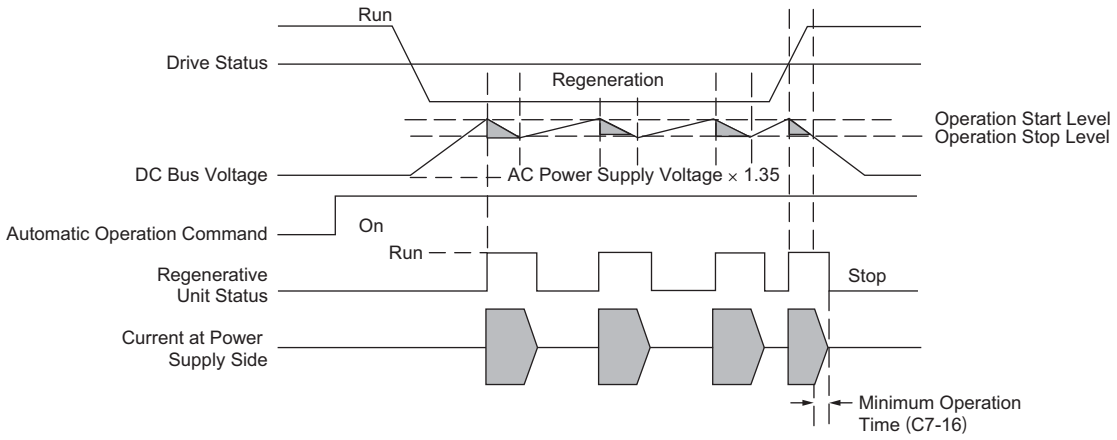


Figure 4.4 Automatic Operation Command Time Chart

■ Forced Operation Command

When the multi-function input terminal S1 (H1-01 = 3C (default setting)) is “closed”, the regenerative unit starts operation. When the terminal S1 is “open”, the regenerative unit stops operation after the minimum operation time has passed.

Note: When forced operation command is selected, use a sequence so that the operation commands of the regenerative unit and the drive are input at the same time.

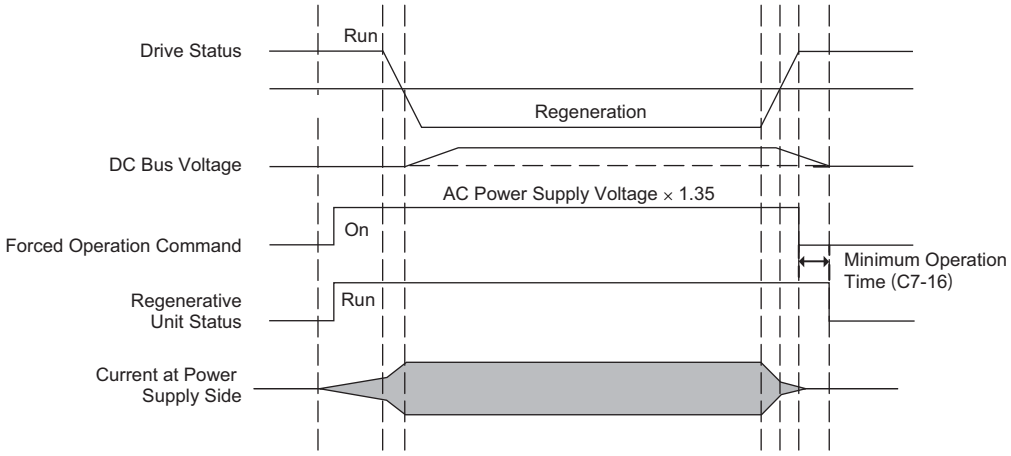


Figure 4.5 Forced Operation Command Time Chart

◆ Interlocks

■ Stopping the Regenerative Unit for Faults in Peripheral Devices

If an external device fails or a fault occurs, the fault contact output on the regenerative unit is activated to stop operation. To use an external fault, set H1-☐☐ (terminal S1 to S8 function selection) to one of the values from ***Table 4.5***.
When an external fault is input, EF☐ is displayed on the digital operator.
The ☐ in EF☐ is the number of the terminal where the external fault signal was input.

Example: If an external fault signal is input to the S3 terminal, EF3 is displayed.

Select the number to set for H1-☐☐ according to the combination of the following three conditions:

- Use an input contact for a signal from the peripheral device.
- Use detection of an external fault.
- Stop operation (as the operation selection when an external fault is detected).

Table 4.5 shows the relationship between the combination of conditions and the set value of H1-☐☐.

Table 4.5 Combination of Conditions

Setting Value	Input Contact <1>		Detection <2>		Operation Selection	
	N.O. Contact	N.C. Contact	Always Detect	Detect Only during Operation	Stop Unit (Fault)	Continue Operation (Minor Fault)
24	O	–	O	–	O	–
25	–	O	O	–	O	–
26	O	–	–	O	O	–
27	–	O	–	O	O	–
2C	O	–	O	–	–	O
2D	–	O	O	–	–	O
2E	O	–	–	O	–	O
2F	–	O	–	O	–	O

<1> When using an input contact, set whether to detect a fault when the signal opens or closes. (N.O.: External fault when closed, N.C.: External fault when open)
<2> When using detection of a fault, set whether to always detect faults or to detect them only during operation.

4.6 Verifying Parameter Settings and Backing Up Changes

Use the Verify Mode to check all changes to parameter settings. Refer to *Verifying Parameter Changes: Verify Mode on page 76*.

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

◆ Backing Up Parameter Values: o2-03

Setting o2-03 to 1 saves all parameter settings to the regenerative unit internal memory. The regenerative unit can now recall all the saved parameters by performing a User Initialization (A1-03 = 1110).

No.	Parameter Name	Description	Setting Range	Default Setting
o2-03	User Defaults	Lets the user create a set of default settings for a User Initialization. 0: Saved/Not Set 1: Set Defaults - Saves current parameter settings as the default values for a User Initialization. 2: Clear All - Clears the currently saved user settings. After saving the user parameter set value, the items of 1110 (User Initialization) are displayed in A1-03 (User Parameter Default Value).	0 to 2	0
A1-03	Initialize Parameters	Selects a method to initialize the parameters. 0: No Initialize 1110: User Initialization (The user must first program and store desired settings using parameter o2-03) 2220: 2-Wire Initialization (parameter initialized prior to shipment) 5550: oPE4 Fault reset	0, 0110, 2220, 5550	0

◆ Parameter Access Level: A1-01

Setting the Access Level for “Operation only” (A1-01 = 0) allows the user to access parameters A1-☐☐ and U☐-☐☐ only.

Other parameters are not displayed.

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

No.	Parameter Name	Description	Setting Range	Default Setting
A1-01	Access Level Selection	Selects which parameters are accessible via the digital operator. 0: Operation only. A1-01, A1-04, and A1-06 can be set and monitored, and U☐-☐☐ parameters can also be viewed. 1: User Parameters. Only recently changed parameters from application parameters A2-01 to A2-16 and A2-17 to A2 -32 can be set and monitored. 2: Advanced Access Level. All parameters can be set and monitored.	0 to 2	2

No.	Parameter Name	Description	Setting Range	Default Setting
A2-01 to A2-32	User Parameters 1 to 32	Parameters selected by the user are saved as User Parameters, including recently viewed parameters and parameters specifically selected for quick access. If parameter A2-33 is set to 1, recently viewed parameters will be listed between A2-17 and A2-32. Parameters A2-01 through A2-16 must be manually selected by the user. If A2-33 is set to 0, recently viewed parameters will not be saved to the group of User Parameters. A2-☐☐ parameters are now available for manual programming.	A1-00 to o4-19	–
A2-33	User Parameter Automatic Selection	0: Parameters A2-01 through A2-32 are reserved for the user to create a group of User Parameters. 1: Save history of recently viewed parameters. Recently edited parameters will be saved to A2-17 through A2-32 for quick access. The most recently changed parameter is saved to A2-17. The second most recently changed parameter is saved to A2-18, etc.	0,1	0

◆ Password Settings: A1-04, A1-05

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

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

◆ Copy Function

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

- **LCD Operator (standard in all models)**
  The LCD operator used to operate the regenerative unit supports copying, importing, and verifying parameter settings. Refer to *o3: Copy Function on page 169* for details.
- **LED Operator**
  The optional LED operator also supports copying, importing, and verifying parameter settings. Refer to the manual supplied with the LED operator for instructions.
- **USB Copy Unit and CopyUnitManager**
  The copy unit is an external option connected to the regenerative unit to copy parameter settings from one regenerative unit and save those settings to another regenerative unit. Refer to the manual supplied with the USB Copy Unit for instructions.

  Note: Connect the USB Copy Unit to the RS-422/RS-485 communication port on the regenerative unit.

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

■ Copying Procedure for the LCD Operator

The LCD operator can perform the following operations by changing the o3-01(Copy Function Selection) parameter in the regenerative unit.

Read (o3-01 = 1)

Copies all parameters from the regenerative unit to the LCD operator.

Note: There is a limit to the number of read operations that you can perform from the LCD operator. As a guide, do not perform more than 100,000 read operations.

Copy (o3-01 = 2)

Copies all parameters from the LCD operator to the regenerative unit.

Verify (o3-01 = 3)

Compares the parameters in the regenerative unit with the parameter settings saved on the LCD operator for matches.

4.7 Test Run Checklist

Review the checklist before performing a test run. Check each item that applies.

☑	No.	Checklist	Page
☐	1	Thoroughly read the manual before performing a test run.	–
☐	2	Check the ***Wiring Checklist on page 67***.	***67***
☐	3	Set the correct power supply voltage.	***77***
☐	4	Turn on the power supply to the regenerative unit and drive.	***77***
☐	5	Correctly sequence the Run commands.	***78***
☐	6	The DRV should light after giving a Run command.	–
☐	7	To give Run command from the digital operator, press LO/RE key to set to LOCAL.	***71***, ***76***
☐	8	To give Run command from the control circuit terminals, press the LO/RE to set REMOTE. (The LO/RE indicator is lit off while REMOTE is set.)	***76***

5

Troubleshooting

This chapter provides descriptions of the regenerative unit faults, alarms, errors, related displays, and guidance for troubleshooting. This chapter can also serve as a reference guide for tuning the regenerative unit during a trial run.

5.1 Section Safety

⚠ WARNING

Electrical Shock Hazard

If a fuse is open or ground fault circuit interrupter GFCI is tripped, check the wiring and the selection of the peripheral devices.

Contact your supplier if the cause cannot be identified. Failure to comply may result in electrical shock by indirect or direct contact. The regenerative unit can cause a residual current with a DC component in the protective earthing conductor.

After blowing a fuse or ground fault circuit interrupter GFCI is tripped, do not attempt to restart the unit or operate peripheral devices until five minutes pass and CHARGE lamp is OFF.

Failure to comply could result in death, serious injury, and damage to the unit.

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

Failure to comply could result in death or serious injury.

Before servicing, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. The charge indicator LED will extinguish when the DC bus voltage is below 50 Vdc. To prevent electric shock, wait for at least the time specified on the warning label; after all indicators are OFF, measure for unsafe voltages to confirm the unit is safe prior to servicing.

Do not operate equipment with covers removed.

Failure to comply could result in death or serious injury.

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

Do not touch terminals before the capacitors have fully discharged.

Failure to comply could result in death or serious injury.

Before servicing, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. The charge indicator LED will extinguish when the DC bus voltage is below 50 Vdc. To prevent electric shock, wait for at least the time specified on the warning label; after all indicators are OFF, measure for unsafe voltages to confirm the unit is safe prior to servicing.

Do not allow unqualified personnel to perform work on the unit.

Failure to comply could result in death or serious injury.

Installation, maintenance, inspection and servicing must be performed only by authorized personnel familiar with installation, adjustment and maintenance this equipment.

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

Failure to comply could result in death or serious injury.

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

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

Failure to comply could result in death or serious injury.

5.2 Alarms, Faults, and Errors

◆ Types of Alarms, Faults, and Errors

Check the digital operator for information about possible faults if the regenerative unit fails to operate.

If problems occur that are not covered in this manual, contact the nearest Magnetek representative with the following information:

- Regenerative unit model
- Software version
- Date of purchase
- Description of the problem

Table 5.1 contains descriptions of the various types of alarms, faults, and errors that may occur while operating the regenerative unit.

If the regenerative unit fails, contact your Magnetek representative or the nearest Magnetek sales office.

Table 5.1 Types of Alarms, Faults, and Errors

Type	Response
Faults	When the regenerative unit detects a fault: • The digital operator displays text indicating the specific fault and the ALM indicator LED remains lit until the fault is reset. • The fault interrupts regenerative unit output. • Some faults allow the user to select the stopping method when the fault occurs. • Fault output terminals MA-MC will close, and MB-MC will open. • The regenerative unit will remain inoperable until the fault is cleared. Refer to ***Fault Reset Methods on page 113***.
Minor Faults and Alarms	When the regenerative unit detects an alarm or a minor fault: • The digital operator displays text indicating the specific alarm or minor fault, and the ALM indicator LED flashes. • A multi-function contact output set to be tripped by a minor fault (H2-□□ = 10) closes. If the output is set to be tripped by an alarm, the contact will not close. Remove the cause of the problem to reset a minor fault or alarm.
Operation Errors	An operation error occurs when parameter settings conflict or do not match hardware settings (such as with an option card). When the regenerative unit detects an operation error: • The digital operator displays text indicating the specific error. • Multi-function contact outputs do not operate. The regenerative unit will not operate until the error has been reset. Correct the settings that caused the operation error to clear the error.
Copy Function Errors	Copy Function Errors occur when using the digital operator or the USB Copy Unit to copy, read, or verify parameter settings. • The digital operator displays text indicating the specific error. • Multi-function contact outputs do not operate. Pressing any key on the digital operator will clear the fault. Investigate the cause of the problem (such as model incompatibility) and try again.

◆ Alarm and Error Displays

■ Faults

Table 5.2 gives an overview of possible fault codes. Conditions such as overvoltages can trip faults and alarms. It is important to distinguish between faults and alarms to determine the proper corrective actions. When the regenerative unit detects a fault, the ALM indicator LED lights, the fault code appears on the digital operator, and the fault contact MA-MB-MC triggers. An alarm is present if the ALM LED blinks and the fault code on the digital operator flashes. Refer to *Minor Faults and Alarms on page 89* for a list of alarm codes.

Table 5.2 Fault Displays

Digital Operator Display		Name	Page
LED	LCD		
Aov	Aov	Power Supply Overvoltage	91
AUv	AUv	Power Supply Undervoltage	91
bUS	bUS	Option Communication Error	91
CE	CE	MEMOBUS/Modbus Communication Error	92
CoF	CoF	Current Offset Fault	92
CPF00, CPF01	CPF00, CPF01	Control Circuit Error	92
CPF02	CPF02	A/D Conversion Error	92
CPF03	CPF03	Control Board Connection Error	92
CPF06	CPF06	EEPROM Memory Data Error	93
CPF07	CPF07	Terminal Board Connection Error	93
CPF08	CPF08	Terminal Board Connection Error	93
CPF11, CPF22 <1>	CPF11 to CPF22	Control Circuit Error	92
CPF23	CPF23	Control Board Connection Error	93
CPF24	CPF24	Unit Capacity Detect Fault	93
CPF26 to CPF35, CPF40 to CPF45	CPF26 to CPF35, CPF40 to CPF45	Control Circuit Error	92
E5	E5	MECHATROLINK Watchdog Timer Error	93
EF0	EF0	Option Card External Fault	93
EF1 to EF8	EF1 to EF8	External Fault (input terminal S1 to S8)	94
Err	Err	EEPROM Write Error	94

Digital Operator Display		Name	Page
LED	LCD		
FAn	Fan	Internal Circulation Fan Fault	94
Fdv	Fdv	Power Supply Frequency Fault	94
FUA	FUA	AC Fuse Blowout	95
FUd	FUd	DC Fuse Blowout	95
nSE	nSE	Node Setup Error	95
oC	oC	Overcurrent	95
oFA00 to oFA43	oFA00 to oFA43	Option Card Fault (CN5-A)	96
oFb00 to oFb17	oFb00 to oFb17	Option Card Fault (CN5-B)	96
oFC00 to oFC55	oFC00 to oFC55	Option Card Fault (CN5-C)	97
oH	oH	Heatsink Overheat	98
oH1	oH1	Overheat 1	98
oL2	oL2	Overload	98
oPr	oPr	Operator Connection Fault	98
ov	ov	Overvoltage	99
PF2	PF2	Input Power Supply Fault	99
PF3	PF3	Input Phase Loss Detection	99
SC	SC	IGBT Short Circuit or Ground Fault	99
SrC	SrC	Phase Order Fault	100
Uv1	Uv1	Main Circuit Undervoltage	100
Uv2	Uv2	Control Power Supply Undervoltage	100
Uv3	Uv3	Soft Charge Circuit Fault	101

<1> Displayed as CPF00 when occurring at regenerative unit power up. When one of the faults occurs after successfully starting the regenerative unit, the display will show CPF01. Displayed as CPF20 when occurring at regenerative unit power up. When one of the faults occurs after successfully starting the regenerative unit, the display will show CPF21.

■ Minor Faults and Alarms

Refer to ***Table 5.3*** for an overview of possible alarm codes. Conditions such as overvoltages can trip faults and alarms. It is important to distinguish between faults and alarms to determine the proper corrective actions. When the regenerative unit detects an alarm, the ALM indicator LED blinks and the alarm code display flashes. Most alarms trigger a digital output programmed for alarm output (H2-☐☐ = 10). A fault (not an alarm) is present if the ALM LED lights without blinking. Refer to ***Faults on page 88*** for information on fault codes.

Table 5.3 Minor Fault and Alarm Displays

Digital Operator Display		Name	Minor Fault Output (H2-☐☐ = 10)	Page
LED	LCD			
AEr	AEr	Station Number Setting Error	YES	***102***
Aou	Aov	Power Supply Overvoltage	YES	***102***
AUu	AUv	Power Supply Undervoltage	YES	***102***
bb	bb	Baseblock	No output	***102***
bUS	bUS	Option Card Communications Error	YES	***103***
CALL	CALL	Serial Communication Transmission Error	YES	***103***
CE	CE	MEMOBUS/Modbus Communication Error	YES	***103***
CoF	CoF	Current Offset Fault	YES	***104***
CrST	CrST	Cannot Reset	YES	***104***
CyC	CyC	MECHATROLINK Communications Cycle Setting Error	YES	***104***
E5	E5	MECHATROLINK Watchdog Timer Error	YES	***104***
EF0	EF0	Option Card External Fault	YES	***104***
EF1 to EF8	EF1 to EF8	External Fault (input terminal S1 to S8)	YES	***105***
FAn	Fan	Internal Circulation Fan Fault	YES	***105***
Fdu	Fdv	Power Supply Frequency Fault	YES	***105***
HCA	HCA	Current Alarm	YES	***106***
LT-1	LT-1	Cooling Fan Maintenance Time	No output <1>	***106***
LT-2	LT-2	Capacitor Maintenance Time	No output <1>	***106***
LT-3	LT-3	Capacitor Maintenance Time	No output <1>	***106***
oH	oH	Heatsink Overheat	YES	***106***
oL2	oL2	Overload	YES	***107***
ou	ov	Overvoltage	YES	***107***
PAUu	PAUv	Power Supply Undervoltage Pre-alarm	YES	***107***
PF3	PF3	Input Phase Loss Detection	YES	***108***
PFdu	PFDv	Power Supply Frequency Pre-Alarm	YES	***108***
SE	SE	MEMOBUS/Modbus Test Mode Fault	YES	***108***
SrC	SRC	Phase Order Fault	YES	***108***
Uu	Uv	Undervoltage	YES	***108***

<1> Output when H2-☐☐ = 2F.

■ Operation Errors

Table 5.4 Operation Error Displays

Digital Operator Display		Name	Page
LED	LCD		
Err	Err	EEPROM Write Error	*110*
oPE01	oPE01	Unit Capacity Setting Error	*110*
oPE02	oPE02	Parameter Setting Range Error	*110*
oPE03	oPE03	Multi-Function Input Setting Error	*110*
oPE04	oPE04	Terminal Board Mismatch Error	*111*
oPE05	oPE05	Run Command Selection Error	*111*
oPE07	oPE07	Multi-Function Analog Input Selection Error	*111*
oPE30	oPE30	Incorrect Input Voltage Adjustment	*111*

■ Errors and Displays When Using the Copy Function

Table 5.5 Copy Errors

Digital Opera		Name	Page
LED	LCD		
CoPy	CoPy	Writing parameter settings (flashing)	*112*
CPyE	CPyE	Error writing data	*112*
CSEr	CSEr	Copy unit error	*112*
dFPS	dFPS	Model mismatch	*112*
End	End	Task complete	*112*
iFEr	iFEr	Communication error	*112*
ndAT	ndAT	Model, voltage class, capacity mismatch	*112*
rdEr	rdEr	Error reading data	*112*
rEAd	rEAd	Reading parameter settings (flashing)	*112*
vAEr	vAEr	Voltage class, capacity mismatch	*112*
vFyE	vFyE	Parameter setting mismatch	*112*
vrFy	vrFy	Comparing parameter settings (flashing)	*112*

5.3 Fault Detection

◆ Fault Displays, Causes, and Possible Solutions

Table 5.6 Detailed Fault Displays, Causes, and Possible Solutions

Digital Operator Display		Fault Name	Details
Aov	Aov	Power Supply Overvoltage	The input power supply voltage became equal to or higher than the Input Power Supply Overvoltage Detection Level (L8-36). 200 V Class: Approximately 277 Vac 400 V Class: Approximately 554 Vac
Cause			**Possible Solution**
The input power supply voltage is too high.			Reduce the voltage to within the range in the power supply specifications.
Digital Operator Display		**Fault Name**	**Details**
AUv	AUv	Power Supply Undervoltage	The input power supply voltage became equal to or lower than the Input Power Supply Undervoltage Detection Level. 200 V Class: Approximately 150 Vac 400 V Class: Approximately 300 Vac
Cause			**Possible Solution**
The capacity of the power supply is too small.			Increase the capacity of the power supply.
The AC fuse is open.			A transistor inside the regenerative unit was destroyed. The input wiring is ground-faulted or short-circuited. Or, the drive output is ground-faulted or short-circuited, which destroyed the output transistor. Consult with your Magnetek representative or the nearest Magnetek sales office.
The distortion in the power supply is too large.			Lower the impedance of the input power supply wiring.
A phase loss occurred in the input power supply.			Check the input power supply for phase loss or an imbalance in the interphase voltages. Investigate and correct the cause and then reset the fault.
Digital Operator Display		**Fault Name**	**Details**
bUS	bUS	Option Communication Error	• The connection was lost after establishing initial communication. • Only detected when the run command frequency reference is assigned to an option card.
Cause			**Possible Solution**
No signal was received from the PLC.			Check for faulty wiring. • Correct the wiring. • Check for disconnected cables and short circuits and repair as needed.
Faulty communications wiring or an existing short circuit.			
Communication data error occurred due to noise.			Check the various options available to minimize the effects of noise. • Counteract noise in the control circuit, main circuit, and ground wiring. • Ensure that other equipment such as switches or relays do not cause noise. Use surge absorbers if necessary. • Use only recommended cables or other shielded line. Ground the shield on the controller side or the regenerative unit input power side. • Separate all communication wiring from drive power lines. Install an EMC noise filter to the regenerative unit power supply input.
The option card is damaged.			Replace the option card if there are no problems with the wiring and the error continues to occur.
The option card is not properly connected to the regenerative unit.			The connector pins on the option card do not line up properly with the connector pins on the regenerative unit. Reinstall the option card.

Digital Operator Display		Fault Name	Details
CE	CE	MEMOBUS/Modbus Communication Error	Control data was not received for the CE detection time set to H5-09.
Cause			**Possible Solution**
Faulty communications wiring or an existing short circuit.			Check for faulty wiring. • Correct the wiring. • Check for disconnected cables and short circuits and repair as needed.
Communication data error occurred due to noise.			Check the various options available to minimize the effects of noise. • Counteract noise in the control circuit, main circuit, and ground wiring. • Use only recommended cables or other shielded line. Ground the shield on the controller side or the regenerative unit input power side. • Ensure that other equipment such as switches or relays do not cause noise. Use surge suppressors if required. • Separate all communication wiring from drive power lines. Install an EMC noise filter to the regenerative unit power supply input.
Digital Operator Display		**Fault Name**	**Details**
CoF	CoF	Current Offset Fault	A fault occurred in adjustment of the automatic current offset when the power supply was turned on.
Cause			**Possible Solution**
An error occurred in the power supply detection circuit.			Cycle the power supply and check operation. If the fault occurs again, replace the board or regenerative unit. For information on board replacement, consult with your Magnetek representative or the nearest Magnetek sales office.
Digital Operator Display		**Fault Name**	**Details**
CPF00, CPF01	CPF00, CPF01 <1>	Control Circuit Error	A fault occurred in the control circuit.
CPF11 to CPF22	CPF11 to PF22 <1>		
CPF26 to CPF35	CPF26 to CPF35		
Cause			**Possible Solution**
There is a self-diagnostic error in the control circuit.			• Cycle power to the regenerative unit. • If the problem continues, replace the control board or the entire regenerative unit. Contact Magnetek or a Magnetek representative for instructions on replacing the control board.
Connector on the operator is damaged.			Replace the operator.
Digital Operator Display		**Fault Name**	**Details**
CPF02	CPF02	A/D Conversion Error	An A/D conversion error or control circuit error occurred.
Cause			**Possible Solution**
Control circuit is damaged.			Cycle power to the regenerative unit. If the problem continues, replace the control board or the entire regenerative unit. Contact Magnetek or a Magnetek representative for instructions on replacing the control board.
Digital Operator Display		**Fault Name**	**Details**
CPF03	CPF03	Control Board Connection Error	Connection error between the control board and the regenerative unit
Cause			**Possible Solution**
There is a connection error.			Turn off the power and check the connection between the control board and the regenerative unit. If the problem continues, replace the control board or the entire regenerative unit. Contact Magnetek or a Magnetek representative for instructions on replacing the control board.

Regenerative unit fails to operate properly due to noise interference.	Check the various options available to minimize the effects of noise. • Counteract noise in the control circuit, main circuit, and ground wiring. • Use only recommended cables or other shielded line. Ground the shield on the controller side or the regenerative unit input power side. • Ensure that other equipment such as switches or relays do not cause noise. Use surge suppressors if required. • Separate all communication wiring from regenerative unit power lines. Install an EMC noise filter to the regenerative unit power supply input.

Digital Operator Display		Fault Name	Details
CPF06	CPF06	EEPROM Memory Data Error	Error in the data saved to EEPROM
Cause			**Possible Solution**
There is an error in EEPROM control circuit.			Turn off the power and check the connection between the control board and the regenerative unit. If the problem continues, replace the control board or the entire regenerative unit. Contact Magnetek or a Magnetek representative for instructions on replacing the control board.
The power supply was switched off while parameters were being saved to the regenerative unit.			Reinitialize the regenerative unit (A1-03 = 2220, 3330).

Digital Operator Display		Fault Name	Details
CPF07	CPF07	Terminal Board Connection Error	There is a faulty connection in the removable terminal block.
CPF08	CPF08		
Cause			**Possible Solution**
There is a faulty connection between the terminal board and the control board.			• Turn off the power and reconnect the terminal board. • If the problem continues, replace the control board or the entire regenerative unit. Contact Magnetek or a Magnetek representative for instructions on replacing the control board.

Digital Operator Display		Fault Name	Details
CPF23	CPF23	Control Board Connection Error	Connection error between the control board and the regenerative unit
Cause			**Possible Solution**
Hardware is damaged.			Turn off the power and check the connection between the control board and the regenerative unit. If the problem continues, replace the control board or the entire regenerative unit. Contact Magnetek or a Magnetek representative for instructions on replacing the control board.

Digital Operator Display		Fault Name	Details
CPF24	CPF24	Unit Capacity Detect Fault	The regenerative unit capacity cannot be detected correctly (regenerative unit capacity is checked when the regenerative unit is powered up).
Cause			**Possible Solution**
Hardware is damaged.			If the problem continues, replace the control board or the entire regenerative unit. Contact Magnetek or a Magnetek representative for instructions on replacing the control board.

Digital Operator Display		Fault Name	Details
E5	E5	MECHATROLINK Watchdog Timer Error	The watchdog timed out.
Cause			**Possible Solution**
Data has not been received from the PLC.			Execute DISCONNECT or ALM_CLR, then issue a CONNECT command or SYNC_SET command and proceed to phase 3. Refer to the MECHATROLINK Option Technical Manual for more details on troubleshooting.

Digital Operator Display		Fault Name	Details
EF0	EF0	Option Card External Fault	An external fault condition is present.
Cause			**Possible Solution**
An external fault was received from the PLC and F6-03 is set to a value other than 3.			• Remove the cause of the external fault. • Remove the external fault input from the PLC.

Problem with the PLC program			Check the PLC program and correct problems.
Digital Operator Display		**Fault Name**	**Details**
EF1	EF1	External Fault (input terminal S1)	External fault at multi-function input terminal S1.
EF2	EF2	External Fault (input terminal S2)	External fault at multi-function input terminal S2.
EF3	EF3	External Fault (input terminal S3)	External fault at multi-function input terminal S3.
EF4	EF4	External Fault (input terminal S4)	External fault at multi-function input terminal S4.
EF5	EF5	External Fault (input terminal S5)	External fault at multi-function input terminal S5.
EF6	EF6	External Fault (input terminal S6)	External fault at multi-function input terminal S6.
EF7	EF7	External Fault (input terminal S7)	External fault at multi-function input terminal S7.
EF8	EF8	External Fault (input terminal S8)	External fault at multi-function input terminal S8.
Cause			**Possible Solution**
An external device tripped an alarm function.			Remove the cause of the external fault and reset the fault.
Wiring is incorrect.			• Properly connect the signal lines to the terminals assigned for external fault detection (H1-☐☐ = 20 to 2B). • Reconnect the signal line.
Multi-function contact input setting is incorrect.			• Check for unused terminals set for H1-☐☐ = 20 to 2B (External Fault). • Change the terminal settings.
Digital Operator Display		**Fault Name**	**Details**
Err	Err	EEPROM Write Error	Data cannot be written to the EEPROM
Cause			**Possible Solution**
Electrical noise has corrupted data while writing to the EEPROM.			• Press “ENTER” on the digital operator. • Correct the parameter setting. • Cycle power to the regenerative unit.
Hardware problem			If the problem continues, replace the control board or the entire regenerative unit. Contact Magnetek or a Magnetek representative for instructions on replacing the control board.
Digital Operator Display		**Fault Name**	**Details**
FAn	Fan	Internal Circulation Fan Fault	Fan or magnetic contactor failure
Cause			**Possible Solution**
Internal circulation fan malfunctioned.			• Cycle power to the regenerative unit. • Check for fan operation. • Verify the cumulative operation time of the fan with monitor U4-03, and verify the cumulative operation time of the fan maintenance timer with U4-04. • If the cooling fan has exceeded its expected performance life or is damaged in any other way, follow the replacement instructions in ***Cooling Fans on page 123***.
Fault detected in the internal circulation fan or magnetic contactor to the power supply.			
Digital Operator Display		**Fault Name**	**Details**
Fdv	Fdv	Power Supply Frequency Fault	The input power supply frequency exceeded the allowable frequency fluctuation.
Cause			**Possible Solution**
A momentary power loss occurred.			Investigate and correct the cause and then reset the fault. Refer to ***Diagnosing and Resetting Faults on page 113***.
An input power supply wiring terminal is loose.			
The fluctuation in the voltage of the input power supply is too large.			

The AC power supply fuse is open.	• A transistor inside the regenerative unit was destroyed. • The input wiring or drive output has ground faulted or short circuited. Contact your Magnetek representative or the nearest Magnetek sales office.

Digital Operator Display		Fault Name	Details
FUA	FUA	AC Fuse Blowout	The power supply fuse is open.
Cause			**Possible Solution**
The power supply fuse is open.			• A transistor inside the regenerative unit was destroyed. • The input wiring or drive output has ground faulted or short circuited. Contact your Magnetek representative or the nearest Magnetek sales office.

Digital Operator Display		Fault Name	Details
FUd	FUd	DC Fuse Blowout	The DC regenerative unit output fuse is open.
Cause			**Possible Solution**
The main transistor failed.			Replace the regenerative unit.
The DC circuit fuse is open.			
The drive failed.			Replace the drive. For information on drive replacement, consult with your Magnetek representative or the nearest Magnetek sales office.

Digital Operator Display		Fault Name	Details
nSE	nSE	Node Setup Error	A terminal assigned to the node setup function closed during run.
Cause			**Possible Solution**
The node setup terminal closed during run.			Stop the regenerative unit when using the node setup function.
A Run command was issued while the node setup function was active.			

Digital Operator Display		Fault Name	Details
oC	oC	Overcurrent	Regenerative unit sensors detected an output current greater than the specified overcurrent level.
Cause			**Possible Solution**
One of the cables has shorted out or there is a grounding problem.			• Check the motor cables. • Remove the short circuit and reapply power to the regenerative unit.
			• Check the resistance between the motor cables and the ground terminal ⏚. • Replace damaged cables.
The load is too heavy.			• Measure the current flowing into the regenerative unit. • Replace the regenerative unit with a larger capacity regenerative unit if the current value exceeds the rated current. • Determine if there is sudden fluctuation in the current level. • Reduce the load to avoid sudden changes in the current level or switch to a larger regenerative unit.
Regenerative unit fails to operate properly due to noise interference.			• Review the possible solutions provided for handling noise interference. • Review the section on handling noise interference on page 393 and check the control circuit lines, main circuit lines, and ground wiring.
The wiring of the power supply voltage detection circuits (r1/ℓ11, s1/ℓ21, t1/ℓ31) and the wiring of the main circuit terminals (R/L1, S/L2, and T/L3) is not correct.			Correct the wiring.
The voltage on the power supply side is very low.			• Check the wiring. Correct the wiring. • Check the load on the power supply of peripheral devices that are connected to the same power supply line. Reduce the load.

Digital Operator Display		Fault Name	Details
oFA00	oFA00	Option Card Connection Error at Option Port CN5-A	Option compatibility error
Cause			**Possible Solution**
The option card installed into port CN5-A is incompatible with the regenerative unit.			Check if the regenerative unit supports the option card to be installed. Contact Magnetek for assistance.
Digital Operator Display		**Fault Name**	**Details**
oFA01	oFA01	Option Card Fault at Option Port CN5-A	Option not properly connected
Cause			**Possible Solution**
The option card connection to port CN5-A is faulty.			Turn off the power and reconnect the option card.
Digital Operator Display		**Fault Name**	**Details**
oFA02	oFA02	Same Type of Option Card Already Connected	The combination of the option cards that are connected is not correct.
Cause			**Possible Solution**
The same option cards or the same type of option cards are connected to CN5-A, CN5-B, and CN5-C.			Connect the option cards correctly.
Digital Operator Display		**Fault Name**	**Details**
oFA05 to oFA06	oFA05 to oFA06	Option Card Error Occurred at Option Port CN5-A	There is a fault in the option card.
oFA10, oFA11	oFA10, oFA11		
oFA12 to oFA17	oFA12 to oFA17	Option Card Connection Error (CN5-A)	
oFA30 to oFA43	oFA30 to oFA43	Communication Option Card Connection Error (CN5-A)	
Cause			**Possible Solution**
Option card or hardware is damaged.			• Cycle power to the regenerative unit. • If the problem continues, replace the control board or the entire regenerative unit. Contact Magnetek or a Magnetek representative for instructions on replacing the control board.
Digital Operator Display		**Fault Name**	**Details**
oFb00	oFb00	Option Card Fault at Option Port CN5-B	Option compatibility error
Cause			**Possible Solution**
The option card installed into port CN5-B is incompatible with the regenerative unit.			Make sure the regenerative unit supports the option card to be installed. Contact Magnetek for assistance.
Digital Operator Display		**Fault Name**	**Details**
oFb01	oFb01	Option Card Fault at Option Port CN5-B	Option not properly connected
Cause			**Possible Solution**
The option card connection to port CN5-B is faulty.			Turn off the power and reconnect the option card.

Digital Operator Display		Fault Name	Details
oFb02	oFb02	Option Card Fault at Option Port CN5-B	Same type of option card is currently connected
Cause			**Possible Solution**
An option card of the same type is already installed in option port CN5-A.			Only one of each option card type can only be installed simultaneously. Make sure only one type of option card is connected.
Digital Operator Display		**Fault Name**	**Details**
oFb03 to oFb11	oFb03 to oFb11	Option card error occurred at Option Port CN5-B	There is a fault in the option card.
oFb12 to oFb17	oFb12 to oFb17	Option card error occurred at Option Port CN5-B	
Cause			**Possible Solution**
Option card or hardware is damaged.			• Cycle power to the regenerative unit. • If the problem continues, replace the control board or the entire regenerative unit. Contact Magnetek or a Magnetek representative for instructions on replacing the control board.
Digital Operator Display		**Fault Name**	**Details**
oFC00	oFC00	Option Card Connection Error at Option Port CN5-C	Option compatibility error
Cause			**Possible Solution**
The option card installed into port CN5-C is incompatible with the regenerative unit.			Confirm that the regenerative unit supports the option card to be installed. Contact Magnetek for assistance.
Digital Operator Display		**Fault Name**	**Details**
oFC01	oFC01	Option Card Fault at Option Port CN5-C	Option not properly connected
Cause			**Possible Solution**
The option card connection to port CN5-C is faulty.			Turn the power off and reconnect the option card.
Digital Operator Display		**Fault Name**	**Details**
oFC02	oFC02	Option Card Fault at Option Port CN5-C	Same type of option card is currently connected
Cause			**Possible Solution**
An option card of the same type is already installed in option port CN5-A or CN5-B.			Only one of each option card type can only be installed simultaneously. Make sure only one type of option card is connected.
Digital Operator Display		**Fault Name**	**Details**
oFC03 to oFC11	oFC03 to oFC11	Option Card Error Occurred at Option Port CN5-C	There is a fault in the option card.
oFC12 to oFC17	oFC12 to oFC17	Option Card Error Occurred at Option Port CN5-C	
Cause			**Possible Solution**
Option card or hardware is damaged.			• Cycle power to the regenerative unit. • If the problem continues, replace the control board or the entire regenerative unit. Contact Magnetek or a Magnetek representative for instructions on replacing the control board.

Digital Operator Display		Fault Name	Details
oFC50 to oFC55	oFC50 to oFC55	Option Card Error Occurred at Option Port CN5-C	Option card is damaged
Cause			**Possible Solution**
Option card or hardware is damaged.			Refer to the option manual for details.

Digital Operator Display		Fault Name	Details
oH	oH	Heatsink Overheat	The heatsink temperature exceeded the overheat pre-alarm level set to L8-02. The default value for L8-02 is determined by o2-04 (Unit Model Selection).
Cause			**Possible Solution**
Surrounding temperature is too high.			• Check the temperature surrounding the regenerative unit. Verify temperature is within regenerative unit specifications. • Improve the air circulation within the enclosure panel. • Install a fan or air conditioner to cool the surrounding area. • Remove anything near the regenerative unit that might be producing excessive heat.
Load is too heavy.			• Measure the output current. • Decrease the load.
Internal cooling fan is stopped.			• Replace the cooling fan. Refer to page *124* for details. • After replacing the cooling fan, set parameter o4-03 to 0 to reset the cooling fan maintenance.

Digital Operator Display		Fault Name	Details
oH1	oH1	Overheat 1	The heatsink temperature exceeded the regenerative unit overheat level. Overheat level is determined by o2-04 (Unit Model Selection).
Cause			**Possible Solution**
Surrounding temperature is too high.			• Check the temperature surrounding the regenerative unit. • Improve the air circulation within the enclosure panel. • Install a fan or air conditioner to cool the surrounding area. • Remove anything near the regenerative unit that might be producing excessive heat.
Load is too heavy.			• Measure the output current. • Reduce the load.
Internal cooling fan is stopped.			• Replace the cooling fan. Refer to page *124* for details. • After replacing the cooling fan, set parameter o4-03 to 0 to reset the cooling fan maintenance.

Digital Operator Display		Fault Name	Details
oL2	oL2	Overload	The thermal sensor of the regenerative unit triggered the unit overload protection.
Cause			**Possible Solution**
Load is too heavy.			Reduce the load.
Regenerative unit capacity is too small.			Replace the regenerative unit with a larger model.
The regenerative unit does not operate.			Start regenerative unit operation first, and then start regenerative unit operation.

Digital Operator Display		Fault Name	Details
oPr	oPr	External Digital Operator Connection Fault	The external operator has been disconnected from the regenerative unit. **Note:** An oPr fault will occur when all of the following conditions are true: • Output is interrupted when the operator is disconnected (o2-06 = 1). • The Run command is assigned to the operator (b1-02 = 0 and LOCAL has been selected).
Cause			**Possible Solution**
External operator is not properly connected to the regenerative unit.			• Check the connection between the operator and the regenerative unit. • Replace the cable if damaged. • Turn off the input power and disconnect the operator. Reconnect the operator and reapply regenerative unit input power.

Digital Operator Display		Fault Name	Details
ov	ov	Overvoltage	Voltage in the DC bus has exceeded the overvoltage detection level. • 200 V Class: Approximately 410 V • 400 V Class: Approximately 820 V
Cause			**Possible Solution**
The regenerative load is too large.			Reduce the regenerative load.
Input power voltage is too high.			• Check the voltage. • Lower input power voltage within the limits listed in the specifications.
Regenerative unit fails to operate properly due to noise interference.			• Review the list of possible solutions provided for controlling noise. • Review the section on handling noise interference and check the control circuit lines, main circuit lines, and ground wiring.
The wiring of the power supply voltage detection circuits (r1/ℓ11, s1/ℓ21, t1/ℓ31) and the wiring of the main circuit terminals (R/L1, S/L2, and T/L3) is not correct.			Correct the wiring.
Digital Operator Display		**Fault Name**	**Details**
PF2	PF2	Input Power Supply Fault	Abnormal oscillation in the main circuit DC bus continued. (Applies when L8-65 is set to 1 or 2.)
Cause			**Possible Solution**
The fluctuation in the voltage of the input power supply is too large.			Investigate and correct the cause and then reset the fault. Refer to ***Diagnosing and Resetting Faults on page 113***.
A phase loss occurred in the input power supply.			
The capacity of the power supply is too small.			
The wiring is too long.			
The phase imbalance is too large.			
Digital Operator Display		**Fault Name**	**Details**
PF3	PF3	Input Phase Loss Detection	The voltage balance in the three-phase power supply has broken down. (Detected when L8-69 = 1.)
Cause			**Possible Solution**
The fluctuation in the voltage of the input power supply is too large.			Investigate and correct the cause and then reset the fault. Refer to ***Diagnosing and Resetting Faults on page 113***.
A phase loss occurred in the input power supply.			
The capacity of the power supply is too small.			
The wiring is too long.			
The phase imbalance is too large.			
Digital Operator Display		**Fault Name**	**Details**
SC	SC	Input Short-circuit/ Main Transistor Failure	Short circuit or ground fault is detected.
Cause			**Possible Solution**
IGBT fault			• Check the wiring to the drive. • Turn the power supply off and then on again to check operation. If the problem continues, contact your Magnetek representative or nearest Magnetek sales office.
IGBT short circuit detection circuit fault.			

Digital Operator Display		Fault Name	Details
SrC	SRC	Phase Order Fault	The phase order detection direction for the input power supply changed after the power supply was turned on.
Cause			**Possible Solution**
The power supply phase order changed during operation.			Investigate and correct the cause and then reset the fault. Refer to *Diagnosing and Resetting Faults on page 113*.
A momentary power loss occurred.			
An input power supply wiring terminal is loose.			
The fluctuation in the voltage of the input power supply is too large.			
Digital Operator Display		**Fault Name**	**Details**
Uv1	Uv1	Main Circuit Undervoltage	The following condition occurred in the regenerative unit when a Run Command was not being input. The main circuit DC voltage became equal to or lower than the set value of L2-05 (Undervoltage Detection Level). 200 V Class: Approximately 190 V 400 V Class: Approximately 380 V
Cause			**Possible Solution**
A phase loss occurred in the input power supply.			Check the wiring of the main circuit power supply for broken wires and wiring mistakes. Correct the wiring.
An input power supply wiring terminal is loose.			Check the terminals for looseness. Tighten the terminals to the tightening torque that is given in this manual. (See page *50*.)
Fluctuation occurred in the power supply voltage.			Check the voltage. • Correct the voltage so that it is within the range given in the power supply specifications of the regenerative unit. • If there is no problem with the main circuit power supply, check the magnetic contactor in the main circuit for faults.
A power loss occurred.			Improve the power supply.
The main circuit capacitor circuit in the regenerative unit has deteriorated.			Check the maintenance period for the capacitor in U4-05 (Capacitor Maintenance). If the value of U4-05 has exceeded 90%, replace the board or the regenerative unit. For information on board replacement, consult with your Magnetek representative or the nearest Magnetek sales office.
The operation of the relay or contactor in the inrush current protection circuit in the regenerative unit failed.			Cycle the power supply and see if the fault occurs again. • If the fault occurs repeatedly, replace the board or the regenerative unit. For information on board replacement, consult with your Magnetek representative or the nearest Magnetek sales office. Check the maintenance period for the inrush prevention relay in U4-06 (Soft Charge Bypass Relay Maintenance). • If the value of U4-06 has exceeded 90%, replace the board or the regenerative unit. For information on board replacement, consult with your Magnetek representative or the nearest Magnetek sales office.
A fault occurred in the power supply device.			Check the wiring of the power supply device. Correct the wiring.
A fault occurred in the power supply.			A fault occurred in the power supply.
A fault occurred in power supply voltage detection.			Check the wiring. Correct the wiring.
Digital Operator Display		**Fault Name**	**Details**
Uv2	Uv2	Control Power Supply Voltage Fault	Voltage is too low for the control regenerative unit input power.
Cause			**Possible Solution**
Internal circuitry is damaged.			• Cycle power to the regenerative unit. Check if the fault reoccurs. • If the problem continues, replace either the control board or the entire regenerative unit. For instructions on replacing the control board, contact Magnetek or a Magnetek representative.

Digital Operator Display		Fault Name	Details
Uv3	Uv3	Undervoltage 3 (Soft-Charge Bypass Circuit Fault)	The soft-charge bypass circuit failed.
Cause			**Possible Solution**
The relay or contactor on the soft-charge bypass circuit is damaged.			• Cycle power to the regenerative unit and see if the fault reoccurs. • If the problem continues, replace either the control board or the entire regenerative unit. For instructions on replacing the control board, contact Magnetek or a Magnetek representative. • Check monitor U4-06 for the performance life of the soft-charge bypass. • Replace either the control board or the entire regenerative unit if U4-06 exceeds 90%. For instructions on replacing the control board, contact Magnetek or a Magnetek representative.

<1> If the fault occurs when starting the regenerative unit, CPF00 or CPF20 is displayed. If it occurs during operation, CPF01 or CPF21 is displayed.

5.4 Alarm Detection

◆ Alarm Codes, Causes, and Possible Solutions

Alarms are regenerative unit protection functions that do not necessarily cause the regenerative unit to stop. After removing the cause of an alarm, the regenerative unit will return to the same status is was before the alarm occurred.

When an alarm has been triggered, the ALM light on the digital operator display blinks and the alarm code display flashes. If a multi-function output is set for an alarm (H2-□□ = 10), that output terminal will be triggered.

Note: If a multi-function output is set to close when an alarm occurs (H2-□□ = 10), it will also close when maintenance periods are reached, triggering alarms LT-1 through LT-4 (triggered only if H2-□□ = 2F).

Table 5.7 Alarm Codes, Causes, and Possible Solutions

Digital Operator Display		Minor Fault Name	Detail	Alarm Output (H2-□□ = 10)
AEr	AEr	Communication Option Station Number Setting Error (CC-Link, CANopen, MECHATROLINK)	Option card node address is outside of the acceptable setting range.	YES
Cause			**Possible Solutions**	
Station number is set outside the possible setting range.			Set the station number of the option card correctly.	
Digital Operator Display		**Minor Fault Name**	**Detail**	**Alarm Output (H2-□□ = 10)**
Aou	Aov	Power Supply Overvoltage	The input power supply voltage became equal to or higher than the Input Power Supply Overvoltage Detection Level. 200 V Class: Approximately 277 Vac 400 V Class: Approximately 554 Vac	YES
Cause			**Possible Solutions**	
The input power supply voltage is too high.			Reduce the voltage to within the range in the power supply specifications.	
Digital Operator Display		**Minor Fault Name**	**Detail**	**Alarm Output (H2-□□ = 10)**
AUu	AUv	Power Supply Undervoltage	The input power supply voltage became equal to or lower than the Input Power Supply Undervoltage Detection Level. 200 V Class: Approximately 150 Vac 400 V Class: Approximately 300 Vac	YES
Cause			**Possible Solutions**	
The power supply voltage is low.			Increase the power supply voltage.	
A phase loss occurred in the input power supply.			Check the input power supply for phase loss or an imbalance in the interphase voltages. Investigate and correct the cause and then reset the fault.	
Voltage detection failed.			Correctly wire r1/ℓ11, ⏦1/ℓ21, and t1/ℓ31.	
Digital Operator Display		**Minor Fault Name**	**Detail**	**Alarm Output (H2-□□ = 10)**
bb	bb	Baseblock	Output interrupted as indicated by an external baseblock signal.	N.A.
Cause			**Possible Solutions**	
External baseblock signal was entered via one of the multi-function input terminals (S1 to S8).			Check external sequence and baseblock signal input timing.	

Digital Operator Display		Minor Fault Name	Detail	Alarm Output (H2-☐☐ = 10)
bUS	bUS	Option Communication Error	• The connection was lost after initial communication was established. • Assign a Run command frequency reference to the option.	YES
Cause			**Possible Solutions**	
Connection is broken or master controller stopped communicating.			• Check for faulty wiring. • Correct the wiring. • Check for disconnected cables and short circuits. Repair as needed.	
Option is damaged.			If there are no problems with the wiring and the fault continues to occur, replace the option.	
The option is not properly connected to the regenerative unit.			• The connector pins on the option are not properly lined up with the connector pins on the regenerative unit. • Reinstall the option.	
A data error occurred due to noise.			• Check options available to minimize the effects of noise. • Take steps to counteract noise in the control circuit wiring, main circuit lines and ground wiring. • Try to reduce noise on the controller side. • Use surge absorbers on magnetic contactors or other equipment causing the disturbance. • Use recommended cables or some other type of shielded line. Ground the shield to the controller side or on the input power side. • Separate the wiring for communication devices from the regenerative unit input power lines. Install an EMC noise filter to the regenerative unit input power.	

Digital Operator Display		Minor Fault Name	Detail	Alarm Output (H2-☐☐ = 10)
CALL	CALL	Serial Communication Transmission Error	Communication has not yet been established.	YES
Cause			**Possible Solutions**	
Communications wiring is faulty, there is a short circuit, or something is not connected properly.			• Check for wiring errors. • Correct the wiring. • Check for disconnected cables and short circuits. Repair as needed.	
Programming error on the master side.			Check communications at start-up and correct programming errors.	
Communications circuitry is damaged.			• Perform a self-diagnostics check. • If the problem continues, replace either the control board or the entire regenerative unit. For instructions on replacing the control board, contact Magnetek or your nearest sales representative.	
Termination resistor setting is incorrect.			Install a termination resistor at both ends of a communication line. Set the internal termination resistor switch correctly on slave regenerative units. Place DIP switch S2 to the ON position.	

Digital Operator Display		Minor Fault Name	Detail	Alarm Output (H2-☐☐ = 10)
CE	CE	MEMOBUS/Modbus Communication Error	Control data was not received correctly for two seconds.	YES
Cause			**Possible Solutions**	
A data error occurred due to noise.			• Check options available to minimize the effects of noise. • Take steps to counteract noise in the control circuit wiring, main circuit lines, and ground wiring. • Reduce noise on the controller side. • Use surge absorbers for the magnetic contactors or other components that may be causing the disturbance. • Use only recommended shielded line. Ground the shield on the controller side or on the regenerative unit input power side. • Separate all wiring for communication devices from regenerative unit input power lines. Install an EMC noise filter to the regenerative unit input power supply.	
Communication protocol is incompatible.			• Check the H5 parameter settings and the protocol setting in the controller. • Ensure settings are compatible.	
The CE detection time (H5-09) is set shorter than the time required for a communication cycle to take place.			• Check the PLC. • Change the software settings in the PLC. • Set a longer CE detection time using parameter H5-09.	
Incompatible PLC software settings or there is a hardware problem.			• Check the PLC. • Remove the cause of the error on the controller side.	

Communications cable is disconnected or damaged.			• Check the connector to make sure the cable has a signal. • Replace the communications cable.	
Digital Operator Display		**Minor Fault Name**	**Detail**	**Alarm Output (H2-☐☐ = 10)**
CoF	CoF	Current Offset Fault	A fault occurred in adjustment of the automatic current offset when the power supply was turned on.	YES
Cause			**Possible Solutions**	
A fault occurred in the current detection circuit.			Cycle the power supply and check operation. If the fault occurs again, replace the board or regenerative unit. For information on board replacement, consult with your Magnetek representative or the nearest Magnetek sales office.	
Digital Operator Display		**Minor Fault Name**	**Detail**	**Alarm Output (H2-☐☐ = 10)**
CrST	CrST	Cannot Reset	A fault reset command was entered while the Run command was still present.	YES
Cause			**Possible Solutions**	
Fault reset was being executed when a Run command was entered.			• Ensure that a Run command cannot be entered from the external terminals or option during fault reset. • Turn off the Run command.	
Digital Operator Display		**Minor Fault Name**	**Detail**	**Alarm Output (H2-☐☐ = 10)**
CyC	CyC	MECHATROLINK Communications Cycle Setting Error	The MECHATROLINK option card is not set correctly.	YES
Cause			**Possible Solutions**	
The communications cycle of the MECHATROLINK option card is out of range.			Correct the setting.	
Digital Operator Display		**Minor Fault Name**	**Detail**	**Alarm Output (H2-☐☐ = 10)**
E5	E5	MECHATROLINK Watchdog Timer Error	A Watchdog Timer Error was detected.	YES
Cause			**Possible Solutions**	
There is no continuity in the watchdog timer in the data that is sent by the host controller.			Execute the DISCONNECT or ALM_CLR command, and then move to phase 3 again with the CONNECT or SYNC_SET command.	
Digital Operator Display		**Minor Fault Name**	**Detail**	**Alarm Output (H2-☐☐ = 10)**
EF0	EF0	Option Card External Fault	An external fault condition is present.	YES
Cause			**Possible Solutions**	
An external fault was received from the PLC with F6-03 set to 3, which allows the regenerative unit to continue running after an external fault occurs.			• Remove the cause of the external fault. • Remove the external fault input from the PLC.	
There is a problem with the PLC program.			Check the PLC program and correct problems.	

Digital Operator Display		Minor Fault Name	Detail	Alarm Output (H2-☐☐ = 10)
EF1	EF1	External Fault (Input Terminal S1)	External fault at multi-function input terminal S1.	YES
EF2	EF2	External fault (input terminal S2)	External fault at multi-function input terminal S2.	
EF3	EF3	External fault (input terminal S3)	External fault at multi-function input terminal S3.	
EF4	EF4	External fault (input terminal S4)	External fault at multi-function input terminal S4.	
EF5	EF5	External fault (input terminal S5)	External fault at multi-function input terminal S5.	
EF6	EF6	External fault (input terminal S6)	External fault at multi-function input terminal S6.	
EF7	EF7	External fault (input terminal S7)	External fault at multi-function input terminal S7.	
EF8	EF8	External fault (input terminal S8)	External fault at multi-function input terminal S8.	

Cause	Possible Solutions
An external device has tripped an alarm function.	Remove the cause of the external fault and reset the multi-function input value. Refer to ***Stopping the Regenerative Unit for Faults in Peripheral Devices on page 79*** for details.
Wiring is incorrect.	• Ensure the signal lines have been connected properly to the terminals assigned for external fault detection (H1-☐☐=24 to 27, 2C to 2F). • Reconnect the signal line. Refer to ***Stopping the Regenerative Unit for Faults in Peripheral Devices on page 79*** for details.
Multi-function contact inputs are set incorrectly.	• Check if the unused terminals have been set for H1-☐☐ = 24 to 27, 2C to 2F (External Fault). • Change the terminal settings. Refer to ***Stopping the Regenerative Unit for Faults in Peripheral Devices on page 79*** for details.

Digital Operator Display		Minor Fault Name	Detail	Alarm Output (H2-☐☐ = 10)
FAn	Fan	Internal Circulation Fan Fault	The internal circulation fan in the regenerative unit is faulty.	YES

Cause	Possible Solutions
An internal circulation fan is faulty.	Cycle the power supply and see if the fault occurs again. Check the operation of the internal circulation fans. Check U4-03 (Cooling Fan Operation Time) and U4-04 (Cooling Fan Maintenance Display). If the life of the internal circulation fans has expired or if a fan is faulty, perform fan replacement according to instructions in this manual.
An internal circulation fan or MC power supply is faulty.	Cycle the power supply and see if the fault occurs again. If the fault occurs repeatedly, replace the board or the regenerative unit. For information on board replacement, consult with your Magnetek representative or the nearest Magnetek sales office.

Digital Operator Display		Minor Fault Name	Detail	Alarm Output (H2-☐☐ = 10)
Fdv	Fdv	Power Supply Frequency Fault	The input power supply frequency exceeded the allowable frequency fluctuation.	YES

Cause	Possible Solutions
A momentary power loss occurred.	Investigate and correct the cause and then reset the fault. Refer to ***Diagnosing and Resetting Faults on page 113***.
An input power supply wiring terminal is loose.	
The fluctuation in the voltage of the input power supply is too large.	
The AC power supply fuse is open.	• A transistor inside the regenerative unit was destroyed. • The input wiring or drive output has ground faulted or short circuited. Contact your Magnetek representative or the nearest Magnetek sales office.
The phase rotation direction has changed in the input power supply.	Correct the wiring.

The detected power supply frequency exceeded the allowable value.			Improve the power supply.	
Digital Operator Display		**Minor Fault Name**	**Detail**	**Alarm Output (H2-☐☐ = 10)**
HCA	HCA	Current Alarm	Regenerative unit current exceeded overcurrent warning level (150% of the rated current).	YES
Cause			**Possible Solutions**	
Load is too heavy.			Reduce the load for applications with repetitive operations (i.e., stops and starts), or replace the regenerative unit.	
Digital Operator Display		**Minor Fault Name**	**Detail**	**Alarm Output (H2-☐☐ = 10)**
LT-1	LT-1	Cooling Fan Maintenance Time	The cooling fan has reached its expected maintenance period and may need to be replaced. **Note:** An alarm output (H2-☐☐ = 10) will only be triggered if both (H2-☐☐ = 2F and H2-☐☐ = 10) are set.	YES
Cause			**Possible Solutions**	
The cooling fan has reached 90% of its expected performance life.			Replace the cooling fan and set o4-03 to 0 to reset the Maintenance Monitor.	
Digital Operator Display		**Minor Fault Name**	**Detail**	**Alarm Output (H2-☐☐ = 10)**
LT-2	LT-2	Capacitor Maintenance Time	The main circuit and control circuit capacitors are nearing the end of their expected performance life. **Note:** An alarm output (H2-☐☐ = 10) will only be triggered if H2-☐☐ = 2F.	YES
Cause			**Possible Solutions**	
The main circuit and control circuit capacitors have reached 90% of their expected performance lives.			Replace either the control board or the entire regenerative unit. For instructions on replacing the control board, contact Magnetek or your nearest sales representative.	
Digital Operator Display		**Minor Fault Name**	**Detail**	**Alarm Output (H2-☐☐ = 10)**
LT-3	LT-3	Soft Charge Bypass Relay Maintenance Time	The DC bus soft charge relay is nearing the end of its expected performance life. **Note:** An alarm output (H2-☐☐ = 10) will only be triggered if H2-☐☐ = 2F.	YES
Cause			**Possible Solutions**	
The DC bus soft charge relay has reached 90% of expected performance life.			Replace either the control board or the entire regenerative unit. For instructions on replacing the control board, contact Magnetek or your nearest sales representative.	
Digital Operator Display		**Minor Fault Name**	**Detail**	**Alarm Output (H2-☐☐ = 10)**
oH	oH	Heatsink Overheat	The temperature of the heatsink exceeded the overheat pre-alarm level set to L8-02 (90-100 °C). Default value for L8-02 is determined by o2-04 (Unit Model Selection).	YES
Cause			**Possible Solutions**	
Surrounding temperature is too high			• Check the surrounding temperature. • Improve the air circulation within the enclosure panel. • Install a fan or air conditioner to cool surrounding area. • Remove anything near regenerative unit that may cause extra heat.	
Airflow around the regenerative unit is restricted.			• Provide proper installation space around the regenerative unit as indicated in the manual. Refer to ***Installation Orientation and Spacing on page 23*** for details. • Allow for the proper space and ensure that there is sufficient circulation around the control panel.	
			• Check for dust or other foreign materials clogging the cooling fan. • Clear debris caught in the fan that restricts air circulation.	
The ambient temperature is too high.			Check the ambient temperature. • Improve ventilation in the control panel. • Install a cooling device (e.g., a cooling fan or air conditioner) and lower the ambient temperature. • If there are heat-generating objects nearby, remove them.	
The load is too large.			Measure the output current. Lower the load.	

Internal cooling fan has stopped.	• Replace the cooling fan. Refer to page *124* for details. • After replacing the regenerative unit, set parameter o4-03 to 0 to reset the cooling fan operation time.

Digital Operator Display		Minor Fault Name	Detail	Alarm Output (H2-☐☐ = 10)
oL2	oL2	Overload	The thermal sensor of the regenerative unit triggered the unit overload protection.	YES

Cause	Possible Solutions
Load is too heavy.	Reduce the load.
The regenerative unit does not operate.	Start regenerative unit operation first, and then start regenerative unit operation.

Digital Operator Display		Minor Fault Name	Detail	Alarm Output (H2-☐☐ = 10)
ov	ov	DC Bus Overvoltage	The DC bus voltage exceeded the trip point. • 200 V Class: Approximately 410 V • 400 V Class: Approximately 820 V	YES

Cause	Possible Solutions
Electrical noise interference causes the regenerative unit to operate incorrectly.	• Review possible solutions for handling noise interference. • Review section on handling noise interference and check control circuit lines, main circuit lines and ground wiring. • If the magnetic contactor is identified as a source of noise, install a surge protector to the MC coil.
	Set number of fault restarts (L5-01) to a value other than 0.
There was a regenerative load while the regenerative unit is stopped.	Operate the regenerative unit.
The power supply voltage is too high.	Lower the voltage so that it is within the power supply specifications of the regenerative unit.
There is a regenerative load while the regenerative unit is stopped.	Operate the regenerative unit.
The wiring of the power supply voltage detection circuits (r1/ℓ11, ⩓1/ℓ21, t1/ℓ31) and the wiring of the main circuit terminals (R/L1, S/L2, and T/L3) is not correct.	Check the wiring. Correct the wiring.

Digital Operator Display		Minor Fault Name	Detail	Alarm Output (H2-☐☐ = 10)
PAUv	PAUv	Power Supply Undervoltage Pre-Alarm	The input power supply voltage became equal to or lower than the Input Power Supply Undervoltage Detection Level. 200 V Class: Approximately 150 Vac 400 V Class: Approximately 300 Vac The regenerative unit enters the baseblock state during pre-alarm. When the input supply voltage is restored during the pre-alarm, the regenerative unit will release the base block and continue to operate.	YES

Cause	Possible Solutions
The power supply voltage is low.	Increase the power supply voltage.
A phase loss occurred in the input power supply.	Check the input power supply for phase loss or an imbalance in the interphase voltages. Investigate and correct the cause and then reset the fault.
Voltage detection failed.	Check r1/ℓ11, ⩓1/ℓ21, t1/ℓ31 to see if they are wired correctly.

Digital Operator Display		Minor Fault Name	Detail	Alarm Output (H2-☐☐ = 10)
PF3	PF3	Input Phase Loss Detection	Abnormal oscillation continued in the input power supply voltage. (Detected when L8-69 = 1.)	YES
Cause			**Possible Solutions**	
The fluctuation in the voltage of the input power supply is too large.			Investigate the cause and implement countermeasures. Refer to ***Diagnosing and Resetting Faults on page 113*** for details.	
A phase loss occurred in the input power supply.				
The interphase voltage balance is bad.				

Digital Operator Display		Minor Fault Name	Detail	Alarm Output (H2-☐☐ = 10)
PFdv	PFDv	Power Supply Frequency Pre-Alarm	The input power supply frequency fluctuates more than ±15 Hz. The regenerative unit enters the baseblock state during pre-alarm. When the input supply frequency returns to normal conditions, the regenerative unit will release the base block and continue to operate.	YES
Cause			**Possible Solutions**	
Momentary power loss has occurred.			Activate the momentary power loss ride-thru.	
Voltage distortion is large.			Increase the power supply capacity.	
Voltage detection failure			Confirm r1/l11, s1/l21, t1/l31 are correctly wired.	
Phase loss has occurred.			Confirm the power supply and regenerative unit is correctly connected.	

Digital Operator Display		Minor Fault Name	Detail	Alarm Output (H2-☐☐ = 10)
SE	SE	MEMOBUS/Modbus Test Mode Fault	A MEMOBUS/Modbus communications test was performed during operation.	YES
Cause			**Possible Solutions**	
A fault occurred during MEMOBUS/Modbus Communications Test Mode.			Always stop the operation of the regenerative unit before you perform MEMOBUS/Modbus communications tests.	

Digital Operator Display		Minor Fault Name	Detail	Alarm Output (H2-☐☐ = 10)
SrC	SRC	Phase Order Fault	The phase order detection direction for the input power supply changed after the power supply was turned on.	YES
Cause			**Possible Solutions**	
A momentary power loss occurred.			Investigate and correct the cause and then reset the fault. Refer to ***Diagnosing and Resetting Faults on page 113*** for details.	
An input power supply wiring terminal is loose.				
The fluctuation in the voltage of the input power supply is too large.				

Digital Operator Display		Minor Fault Name	Detail	Alarm Output (H2-☐☐ = 10)
Uv	Uv	Undervoltage	One of the following conditions was true when the regenerative unit was stopped and a Run command was entered: • DC bus voltage dropped below the level specified in L2-05. • Contactor to suppress inrush current in the regenerative unit was opened. • Low voltage in the control regenerative unit input power. This alarm outputs only if L2-01 is not 0 and DC bus voltage is under L2-05.	YES
Cause			**Possible Solutions**	
Phase loss in the regenerative unit input power.			Check for wiring errors in the main circuit input power. Correct the wiring.	
Loose wiring in the regenerative unit input power terminals.			• Ensure the terminals have been properly tightened. • Apply the tightening torque to the terminals as specified. Refer to ***Wire Gauges and Tightening Torque on page 50***.	
There is a problem with the regenerative unit input power voltage.			• Check the voltage. • Lower the voltage of the regenerative unit input power so that it is within the limits listed in the specifications.	
A power loss occurred.			Improve the power supply.	

Internal circuitry is worn.	• Check the maintenance time for the capacitors (U4-05). • Replace either the control board or the entire regenerative unit if U4-05 exceeds 90%. For instructions on replacing the control board, contact Magnetek or your nearest sales representative.
The regenerative unit input power transformer is too small and voltage drops when the power is switched on.	• Check for an alarm when the magnetic contactor, line breaker, and leakage breaker are closed. • Check the capacity of the regenerative unit input power transformer.
Air inside the regenerative unit is too hot.	Check the temperature inside the regenerative unit.
The CHARGE light is broken or disconnected.	Replace either the control board or the entire regenerative unit. For instructions on replacing the control board, contact Magnetek or your nearest sales representative.

Digital Operator Display		Minor Fault Name	Detail	Alarm Output (H2-☐☐ = 10)
urE	vrE	Resonance Detection	A filter resonance fault was detected or there is a harmonic component on the power supply side.	YES
Cause			**Possible Solutions**	
There is noise on the power supply line.			Investigate the source of the noise and implement countermeasures.	

<1> If the fault occurs when starting the regenerative unit, CPF00 or CPF20 is displayed. If it occurs during operation, CPF01 or CPF21 is displayed.

5.5 Operator Programming Errors

◆ Operator Programming Error Codes, Causes, and Possible Solutions

An Operator Programming Error (oPE) occurs when a contradictory parameter is set or an individual parameter is set to an inappropriate value.

The regenerative unit will not operate until the parameter or parameters causing the problem are set correctly. An oPE, however, does not trigger an alarm or fault output. If an oPE occurs, investigate the cause and refer to ***Table 5.8*** for the appropriate action. When an oPE appears on the operator display, press the ENTER button to view U1-18 and see which parameter is causing the oPE.

Table 5.8 oPE Codes, Causes, and Possible Solutions

Digital Operator Display		Error Name	Detail
Err	Err	EEPROM Write Error	A verification mismatch occurred when writing data to the EEPROM.
Cause			**Possible Solutions**
The data was corrupted by noise when writing data to the EEPROM.			• Press ENTER. • Set the parameters again. • Cycle the power supply. Refer to ***Diagnosing and Resetting Faults on page 113*** for details.
EEPROM Hardware Failure			Replace the board or regenerative unit. For information on board replacement, consult with your Magnetek representative or the nearest Magnetek sales office.
Digital Operator Display		**Error Name**	**Detail**
oPE01	oPE01	Unit Capacity Setting Error	Unit capacity and the value set to o2-04 do not match.
Cause			**Possible Solutions**
The Unit Model Selection (o2-04) and the actual capacity of the regenerative unit are not the same.			Correct the value set to o2-04.
Digital Operator Display		**Error Name**	**Detail**
oPE02	oPE02	Parameter Range Setting Error	Use U1-18 to find parameters set outside the range.
Cause			**Possible Solutions**
Parameters were set outside the possible setting range.			Set parameters to the proper values.
Note: When multiple errors occur simultaneously, other errors are given precedence over oPE02.			
Digital Operator Display		**Error Name**	**Detail**
oPE03	oPE03	Multi-Function Input Selection Error	A contradictory setting is assigned to multi-function contact inputs H1-01 to H1-08.
Cause			**Possible Solutions**
The same function is assigned to two multi-function inputs. Excludes “Not used” and “External Fault.”			• Ensure all multi-function inputs are assigned to different functions. • Re-enter the multi-function settings to ensure this does not occur.

Digital Operator Display		Error Name	Detail
oPE04	oPE04	Terminal Board Mismatch Error	The regenerative unit or the removable terminal block with parameter backup was replaced.
Cause			**Possible Solutions**
The regenerative unit was replaced (but the removable terminal block with parameter backup was not replaced). The removable terminal block with parameter backup was replaced.			Set A1-03 to 5550 to load the parameter settings stored in the terminal board to the regenerative unit. Initialize parameters after regenerative unit replacement by setting A1-03 to 2220.
Digital Operator Display		**Error Name**	**Detail**
oPE05	oPE05	Run Command Selection Error	The settings for the Run Command or Bus Voltage Command are not correct.
Cause			**Possible Solutions**
The Run Command Selection 1 is assigned to an option card (b1-02 = 3) and an input option card is not connected to the unit.			Reconnect the input option card to the regenerative unit.
Digital Operator Display		**Error Name**	**Detail**
oPE07	oPE07	Multi-Function Analog Input Selection Error	A contradictory setting is assigned to multi-function analog inputs H3-02, H3-10, or H3-06.
Cause			**Possible Solutions**
At least two of these parameters have the same setting: H3-02, H3-10, or H3-06.			Change the settings to H3-02, H3-10, and H3-06 so that functions no longer conflict. **Note:** Both 1F (Through mode) and F (Through mode) can be set to H3-02, H3-10, or H3-06 simultaneously.
Digital Operator Display		**Error Name**	**Detail**
oPE30	oPE30	Incorrect Input Voltage Adjustment	The input voltage offset adjustment has not been performed.
Cause			**Possible Solutions**
• The setting of o2-04 (Unit Model Selection) changed. • ERPROM failed for the input voltage offset.			For information on clearing the fault, consult with your Magnetek representative or the nearest Magnetek sales office.

5.6 Copy Function Related Displays

◆ Tasks, Errors, and Troubleshooting

The table below lists the messages and errors that may appear when using the Copy function. When executing the tasks offered by the Copy function, the operator will indicate the task being performed. When an error occurs, a code appears on the operator to indicate the error. Note that errors related to the Copy function do not trigger a multifunction output terminal that has been set up to close when a fault or alarm occurs. To clear an error, simply press any key on the operator and the error display will disappear.

Table 5.9 lists the corrective action that can be taken when an error occurs.

Note: **1.** Whenever using the copy function, the regenerative unit should be fully stopped.
2. The regenerative unit will not accept a Run command while the Copy function is being executed.
3. Parameters can only be saved to a regenerative unit when the voltage class, capacity, control mode, and software version match.

Table 5.9 Copy Function Task and Error Displays

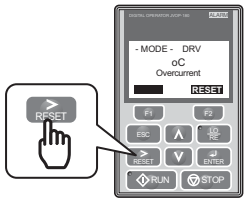
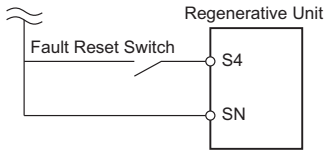
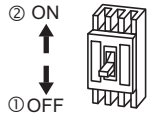
Digital Operator Display		Error Name
CoPy	CoPy	Writing Parameter Settings (flashing)
CPyE	CPyE	Error Writing Data
CSEr	CSEr	Copy Unit Error
dFPS	dFPS	Model Mismatch
End	End	Task Complete
iFEr	iFEr	Communication Error
ndAT	ndAT	Model, Voltage Class, Capacity Mismatch
rdEr	rdEr	Error Reading Data
rEAd	rEAd	Reading Parameter Settings (flashing)
vAEr	vAEr	Voltage Class, Capacity Mismatch
vFyE	vFyE	Parameter settings in the regenerative unit and those saved to the copy function are not the same
vrFy	vrFy	Comparing Parameter Settings (flashing)

5.7 Diagnosing and Resetting Faults

When a fault occurs and the regenerative unit stops, follow the instructions below to remove whatever conditions triggered the fault, then restart the regenerative unit.

◆ Fault Reset Methods

When a fault occurs, the cause of the fault must be removed and the regenerative unit must be restarted. The table below lists the different ways to restart the regenerative unit.

After the Fault Occurs	Procedure	
Fix the cause of the fault, restart the regenerative unit, and reset the fault	Press RESET on the digital operator when the error code is displayed.	
Resetting via Fault Reset Digital Input S4	Close then open the fault signal digital input via terminal S4. S4 is set for “Fault Reset” as default (H1-04 = 14).	
Turn off the main power supply if the above methods do not reset the fault. Reapply power after the digital operator display has turned off.		

Note: If the Run command is present, the regenerative unit will disregard any attempts to reset the fault. Remove the Run command before attempting to clear a fault situation.

6

Periodic Inspection & Maintenance

This chapter describes the periodic inspection and maintenance of the regenerative unit to ensure that it receives the proper care to maintain overall performance.

6.1 Section Safety

⚠ WARNING

Electrical Shock Hazard

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

Failure to comply could result in death or serious injury.

Before servicing, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. The charge indicator LED will extinguish when the DC bus voltage is below 50 Vdc. To prevent electric shock, wait for at least the time specified on the warning label; after all indicators are OFF, measure for unsafe voltages to confirm the unit is safe prior to servicing.

Do not operate equipment with covers removed.

Failure to comply could result in death or serious injury.

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

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

Failure to comply could result in death or serious injury.

Do not allow unqualified personnel to perform work on the unit.

Failure to comply could result in death or serious injury.

Installation, maintenance, inspection, and servicing must be performed only by authorized personnel familiar with installation, adjustment, and maintenance of this equipment.

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

Failure to comply could result in death or serious injury.

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

Do not touch any terminals before the capacitors have fully discharged.

Failure to comply could result in death or serious injury.

Before servicing, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. The charge indicator LED will extinguish when the DC bus voltage is below 50 Vdc. To prevent electric shock, wait for at least the time specified on the warning label; after all indicators are OFF, measure the voltage level to confirm it has reached a safe level.

Fire Hazard

Tighten all terminal screws to the specified tightening torque.

Loose electrical connections could result in death or serious injury by fire due to overheating of electrical connections.

Do not use an improper voltage source.

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

Verify that the rated voltage of the unit matches the voltage of the incoming power supply before applying power.

Do not use improper combustible materials.

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

Attach the unit to metal or other noncombustible material.

NOTICE

Observe proper electrostatic discharge procedures (ESD) when handling the unit and circuit boards.

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

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

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

Do not use unshielded cable for control wiring.

Failure to comply may cause electrical interference resulting in poor system performance. Use shielded, twisted-pair wires and ground the shield to the shield ground terminal E (G) of the unit.

Do not modify the unit circuitry.

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

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

Check all the wiring to ensure that all connections are correct after installing the unit and connecting any other devices.

Failure to comply could result in damage to the unit.

Frequently switching the unit power supply on and off can damage the unit.

To get the full performance life out of the electrolytic capacitors and circuit relays, refrain from switching the unit power supply off and on more than once every 30 minutes.

Do not operate damaged equipment.

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

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

6.2 Inspection

Power electronics have limited life and may exhibit changes in characteristics or performance deterioration after years of use under normal conditions. To help avoid such problems, it is important to perform preventive maintenance and periodic inspection on the regenerative unit.

Regenerative units contain a variety of power electronics such as power transistors, semiconductors, capacitors, resistors, fans, and relays. The electronics in the regenerative unit serve a critical role in maintaining proper motor control.

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

Note: The regenerative unit will require more frequent inspection if it is placed in harsh environments, such as:

- High ambient temperatures
- Frequent starting and stopping
- Fluctuations in the AC supply or load
- Excessive vibrations or shock loading
- Dust, metal dust, salt, sulfuric acid, chlorine atmospheres
- Poor storage conditions

Perform the first equipment inspection one to two years after installation.

◆ Recommended Daily Inspection

Table 6.1 outlines the recommended daily inspection for the Magnetek regenerative unit. Check the following items on a daily basis to avoid premature deterioration in performance or product failure. Copy this checklist and mark the "Checked" column after each inspection.

NOTICE: *Check the operation of the cooling fan only during inspections.*

Table 6.1 General Recommended Daily Inspection Checklist

Inspection Category	Inspection Points	Corrective Action	Checked
Cooling	Inspect for abnormal heat generated from the regenerative unit and visible discoloration.	Check for the following: • Excessive load. • Dirty heatsink. • Tighten all loose screws. • Ambient temperature.	
	Inspect regenerative unit cooling fan and circulation fan operation	Check for the following: • Clogged or dirty fan. • Correct Fan operation parameter setting. Refer to ***o: Operator-Related Settings on page 168*** for details.	
Environment	Verify the regenerative unit environment complies with the specifications listed in ***Installation Environment on page 23***.	Eliminate the source of contaminants or correct poor environment.	
Power Supply Voltage	Check main power supply and control voltages.	• Correct the voltage or power supply to within nameplate specifications. • Verify all main circuit phases.	

◆ Recommended Periodic Inspection

Table 6.2 outlines the recommended periodic inspections for Magnetek regenerative unit installations. Although periodic inspections should generally be performed once a year, the regenerative unit may require more frequent inspection in harsh environments or with rigorous use. Operating and environmental conditions, along with experience in each application, will determine the actual inspection frequency for each installation. Periodic inspection will help to avoid premature deterioration in performance or product failure. Copy this checklist and mark the "Checked" column after each inspection.

■ Periodic Inspection

DANGER! *Electrical Shock Hazard. Do not inspect, connect, or disconnect any wiring while the power is on. Failure to comply can result in serious personal injury. Before servicing, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. The charge indicator LED will extinguish when the DC bus voltage is below 50 Vdc. To prevent electric shock, wait for at least the time specified on the warning label; after all indicators are OFF, measure for unsafe voltages to confirm the regenerative unit is safe prior to servicing.*

NOTICE: *Check the operation of the cooling fan only during inspections.*

Table 6.2 Periodic Inspection Checklist

Inspection Area	Inspection Points	Corrective Action	Checked
Main Circuit Periodic Inspection			
General	• Inspect equipment for discoloration from overheating or deterioration. • Inspect for damaged or deformed parts.	• Replace damaged components as required. • The regenerative unit has few serviceable parts and may require complete regenerative unit replacement.	
	Inspect for dirt, foreign particles, or dust collection on components.	• Inspect enclosure door seal if used. • Use a vacuum cleaner to remove dust and dirt, but do not allow it to come into contact with product components. • Replace components if cleaning is not possible.	
Conductors and Wiring	• Inspect wiring and connections for discoloration, damage, or heat stress. • Inspect wire insulation and shielding for wear.	Repair or replace damaged wiring.	
Terminals	Inspect terminals for stripped, damaged, or loose connections.	Tighten loose screws and replace damaged screws or terminals.	
Relays and Contactors	• Inspect contactors and relays for excessive noise during operation. • Inspect coils for signs of overheating such as melted or cracked insulation.	• Check coil voltage for overvoltage or undervoltage conditions. • Replace damaged removable relays, contactors, or circuit board.	
Electrolytic Capacitor	• Inspect for leaking, discoloration, or cracks. • Check if the cap has come off, for any swelling, or if the sides have burst open.	The regenerative unit has few serviceable parts and may require complete regenerative unit replacement.	
Diode, IGBT (Power Transistor)	Inspect for dust or other foreign material collected on the surface.	Use a vacuum cleaner to remove dust and dirt, but do not allow it to come into contact with product components.	
Control Circuit Periodic Inspection			
General	• Inspect terminals for stripped, damaged, or loose connections. • Make sure all terminals have been properly tightened.	• Tighten loose screws and replace damaged screws or terminals. • If terminals are integral to a circuit board, then board or regenerative unit replacement may be required.	
Circuit Boards	Check for any odor, discoloration, and rust. Make sure connections are properly fastened and that no dust or oil mist has accumulated on the surface of the board.	• Fix any loose connections. • If an antistatic cloth or vacuum plunger cannot be used, replace the board. • Use a vacuum cleaner to remove dust and dirt, but do not allow it to come into contact with product components. • Do not use any solvents to clean the board. • The regenerative unit has few serviceable parts and may require complete regenerative unit replacement.	

6.2 Inspection

Inspection Area	Inspection Points	Corrective Action	Checked
Cooling System Periodic Inspection			
Cooling Fan, Circulation Fan, Control Board Cooling Fan	• Check for abnormal oscillation or unusual noise. • Check for damaged or missing fan blades.	• Replace as required. • *Cooling Fans on page 123* for information on cleaning or replacing the fan.	
Heatsink	Inspect for dust or other foreign material collected on the surface.	Use a vacuum cleaner to remove dust and dirt, but do not allow it to come into contact with product components.	
Display Periodic Inspection			
Digital Operator	• Make sure data appears on the display properly. • Inspect for dust or other foreign material that may have collected on surrounding components.	• Contact the nearest sales office if there is any trouble with the display or keypad. • Clean the digital operator.	

6.3 Periodic Maintenance

The regenerative unit has Maintenance Monitors that keep track of component wear. This feature provides advance maintenance warning and eliminates the need to shut down the entire system for unexpected problems. The regenerative unit allows the user to check predicted maintenance periods for the components listed below.

- Cooling Fan, Circulation Fan, Control Board Cooling Fan
- Electrolytic Capacitors
- Inrush Prevention Circuit

For replacement parts, contact the distributor where the regenerative unit was purchased or contact Magnetek directly.

◆ Replacement Parts

Table 6.3 contains the estimated performance life of components that require replacement during the life of the regenerative unit. Only use Magnetek replacement parts for the appropriate model and revision.

Table 6.3 Estimated Performance Life

Component	Estimated Performance Life
Cooling Fan, Circulation, Control Board Cooling Fan	10 years
Electrolytic Capacitors	10 years <1>
Fuse	10 years

<1> The regenerative unit has few serviceable parts and may require complete regenerative unit replacement.

NOTICE: *Estimated performance life based on specific usage conditions. These conditions are provided for the purpose of replacing parts to maintain performance. Some parts may require more frequent replacement due to poor environments or rigorous use.*
Usage conditions for estimated performance life:
Ambient temperature: Yearly average of 40°C (IP00/Open Type enclosure)
Load factor: 80% maximum
Operation time: 24 hours a day

■ Performance Life Monitors Maintenance Monitors

The regenerative unit calculates the maintenance period for components that may require replacement during the life of the regenerative unit. A percentage of the maintenance period is displayed on the digital operator by viewing the appropriate monitor parameter.

When the maintenance period reaches 100%, there is increased risk that the regenerative unit may malfunction. Magnetek recommends checking the maintenance period regularly to ensure maximum performance life.

Refer to ***Inspection on page 118*** for more details.

Table 6.4 Performance Life Monitors Used for Component Replacement

Parameter	Component	Contents
U4-03	Cooling Fan Circulation Fan Control Board Cooling Fan	Displays the accumulated operation time of the fan from 0 to 99999 hours. This value is automatically reset to 0 after it reaches 99999.
U4-04		Displays the accumulated fan operation time as a percentage of the specified maintenance period.
U4-05	DC Bus Capacitors	Displays the accumulated time the capacitors are used as a percentage of the specified maintenance period.
U4-06	Inrush (pre-charge) Relay	Displays the number of times the regenerative unit is powered up as a percentage of the performance life of the inrush circuit.

■ Alarm Outputs for Maintenance Monitors

An output can be set up to inform the user when a specific components has neared its expected performance life.

When one of multi-function relay output terminals has been assigned the maintenance monitor function (H2-☐☐ = 2F), the terminal will close when the cooling fan, DC bus capacitors, or DC bus pre-charge relay reach 90% of the expected performance life. Additionally the digital operator will display an alarm like shown in ***Table 6.5*** to indicate the specific components that may need maintenance.

Table 6.5 Maintenance Alarms (H2-01 to H2-03 = 2F)

Digital Operator Alarm Display		Function	Corrective Action
LT-1	LT-1	The cooling fans, the DC bus capacitors, or the DC bus charge circuit have reached 90% of their designated life time	Replace the cooling fan.
LT-2	LT-2		Contact a Magnetek representative or the nearest Magnetek sales office on possible regenerative unit replacement.
LT-3	LT-3		Contact a Magnetek representative or the nearest Magnetek sales office on possible regenerative unit replacement.

■ Related Parameters

NOTICE: *Use parameters o4-03, o4-05, and o4-07 to reset a Maintenance Monitor to zero after replacing a specific component. 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.*

Table 6.6 Maintenance Setting Parameters

No.	Name	Function
o4-03 <1> <2>	Cooling Fan Operation Time Setting	Sets the value of the fan operation time monitor U4-03 in units of 10 h.
o4-05 <2>	Capacitor Maintenance Setting	Sets the value of the Maintenance Monitor for the capacitors.
o4-07 <2>	DC Bus Pre-Charge Relay Maintenance Setting	Sets the value of the Maintenance Monitor for the soft charge bypass relay.

<1> Parameter o4-03 is set in increments of 10 hours. For example, setting o4-03 to 30 set the operating time for cooling fan maintenance 300 hours and the Cooling Fan Operation Time monitor (U4-03) will show 300 hours.
<2> The maintenance period depends on the operating environment of the regenerative unit.

6.4 Cooling Fans

NOTICE: *Follow cooling fan replacement instructions. The cooling fan cannot operate properly when installed incorrectly and could seriously damage the regenerative unit. To ensure maximum useful product life, replace all cooling fans when performing maintenance.*

Contact a Magnetek representative or the nearest Magnetek sales office to order replacement cooling fans as required.

For regenerative units with multiple cooling fans, replace all the fans when performing maintenance to ensure maximum product performance life.

WARNING! *Electrical Shock Hazard. Do not connect or disconnect wiring while the power is on. Failure to comply can result in serious personal injury. Before servicing the regenerative unit, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. After shutting off the power, wait for at least the amount of time specified on the regenerative unit before touching any components.*

CAUTION! *Burn Hazard. Do not touch a hot regenerative unit heatsink. Failure to comply could result in minor or moderate injury. Shut off the power to the regenerative unit when replacing the cooling fan. To prevent burns, wait at least 15 minutes and ensure the heatsink has cooled down.*

NOTICE: *Follow cooling fan replacement instructions. Improper fan replacement could cause damage to equipment. Make sure the fan is facing upwards when installing the replacement fan into the regenerative unit. Replace all fans when performing maintenance to help ensure maximum useful product life.*

◆ Number of Cooling Fans

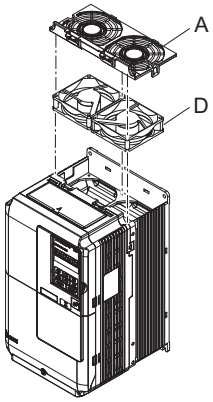
Three-Phase 200 V Class				Three-Phase 400 V Class			
Model	Cooling Fans	Circulation Fans	Page	Model	Cooling Fans	Circulation Fans	Page
2A03P5	2	–	125	4A03P5	2	–	125
2A0005	2	–		4A0005	2	–	
2A0007	2	–		4A0007	2	–	
2A0010	2	–		4A0010	2	–	
2A0014	2	–		4A0014	2	–	
2A0017	2	–		4A0017	2	–	
2A0020	2	–		4A0020	2	–	
2A0028	2	–		4A0028	2	–	
2A0035	2	–	127	4A0035	2	–	127
2A0053	2	–	129	4A0043	2	–	
2A0073	2	–		4A0053	2	–	129
2A0105	2	1		4A0073	2	–	
				4A0105	2	–	
				4A0150	2	–	
				4A0210	3	1	
				4A0300	3	1	

◆ Cooling Fan Component Names

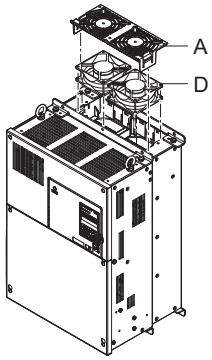
WARNING! *Electrical Shock Hazard. Do not connect or disconnect wiring while the power is on. Failure to comply can result in serious personal injury. Before servicing the regenerative unit, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. After shutting off the power, wait for at least the amount of time specified on the regenerative unit before touching any components.*

CAUTION! *Burn Hazard. Do not touch a hot regenerative unit heatsink. Failure to comply could result in minor or moderate injury. Shut off the power to the regenerative unit when replacing the cooling fan. To prevent burns, wait at least 15 minutes and ensure the heatsink has cooled down.*

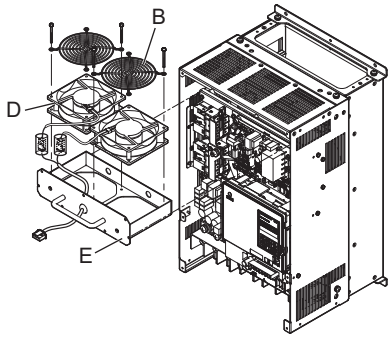
2A03P5 to 2A0028



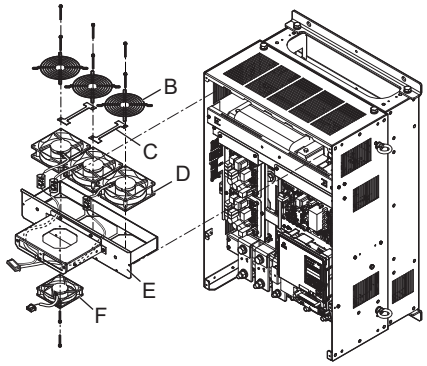
2A0035
4A0035, 4A0043



2A0053 to 2A0073
4A0053 to 4A0105



2A0105
4A0210, 4A0300



A – Fan finger guard
B – Fan guard
C – Cable cover
D – Cooling fan
E – Fan bracket
F – Circulation fan

Figure 6.1 Cooling Fan Component Names (2A03P5 to 2A0105, 4A03P5 to 4A0300)

◆ Cooling Fan Replacement

WARNING! *Electrical Shock Hazard. Do not connect or disconnect wiring while the power is on. Failure to comply can result in serious personal injury. Before servicing the regenerative unit, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. After shutting off the power, wait for at least the amount of time specified on the regenerative unit before touching any components.*

CAUTION! *Burn Hazard. Do not touch a hot regenerative unit heatsink. Failure to comply could result in minor or moderate injury. Shut off the power to the regenerative unit when replacing the cooling fan. To prevent burns, wait at least 15 minutes and ensure the heatsink has cooled down.*

NOTICE: *Follow cooling fan replacement instructions. Improper fan replacement could cause damage to equipment. Make sure the fan is facing upwards when installing the replacement fan into the regenerative unit. Replace all fans when performing maintenance to help ensure maximum useful product life.*

■ 2A03P5 to 2A0028, 4A03P5 to 4A0028

Removing the Cooling Fan Finger Guard and Cooling Fan

1. Depress the right and left sides of the fan cover tabs and pull upward. Remove the fan cover from the top of the regenerative unit. The following figure illustrates a regenerative unit with a single cooling fan.

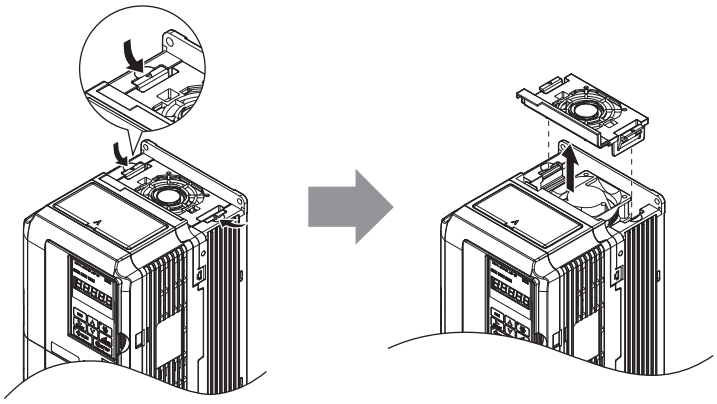


Figure 6.2 Remove the Cooling Fan Finger Guard: 2A03P5 to 2A0028, 4A03P5 to 4A0028

2. Remove the cooling fan cartridge. Disconnect the pluggable connector and remove the fan.

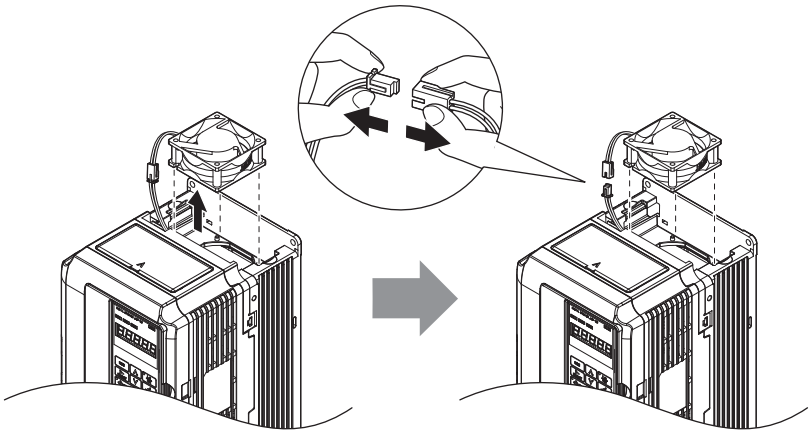
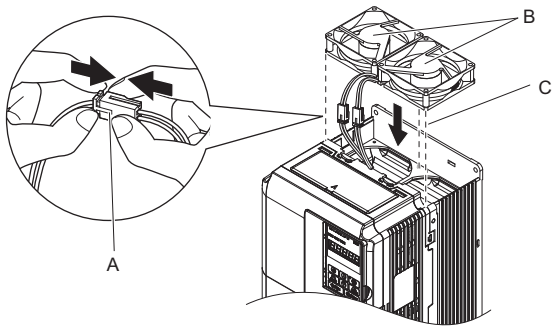


Figure 6.3 Remove the Cooling Fan: 2A03P5 to 2A0028, 4A03P5 to 4A0028

Installing the Cooling Fan

Reverse the procedure described above to reinstall the cooling fan.

1. Install the replacement cooling fan into the regenerative unit, ensuring the alignment pins line up as shown in the figure below.



A – Push the connectors together so no space remains between them
B – Label facing up
C – Make sure the alignment pins line up properly

Figure 6.4 Install the Cooling Fan: 2A03P5 to 2A0028, 4A03P5 to 4A0028

2. Properly connect the fan power lines, then place the cable back into the recess of the regenerative unit.

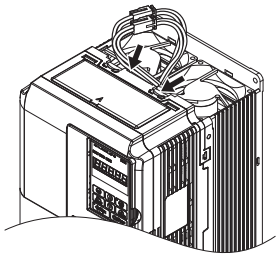


Figure 6.5 Connect the Cooling Fan Power Supply Connectors: 2A03P5 to 2A0028, 4A03P5 to 4A0028

3. While pressing in on the hooks on the front side of the fan finger guard, guide the fan finger guard until it clicks back into place.

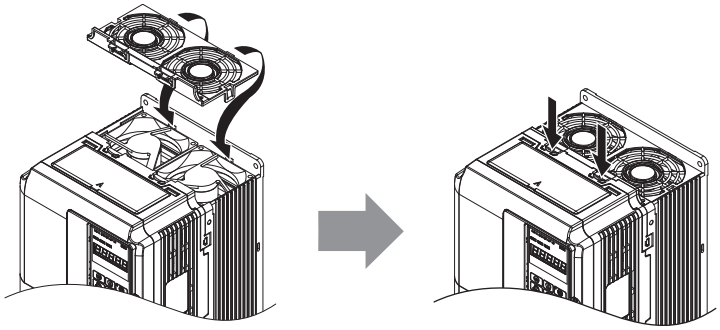


Figure 6.6 Reattach the Fan Finger Guard: 2A03P5 to 2A0028, 4A03P5 to 4A0028

4. Turn on the power supply and set o4-03 to 0 to reset the Maintenance Monitor cooling fan operation time.

■ 2A0035, 4A0035, 4A0043

Removing the Cooling Fan Finger Guard and Cooling Fan

1. While pressing in on the hooks located on the left and right sides of the fan finger guard, free the fan finger guard leading by lifting the back end first.

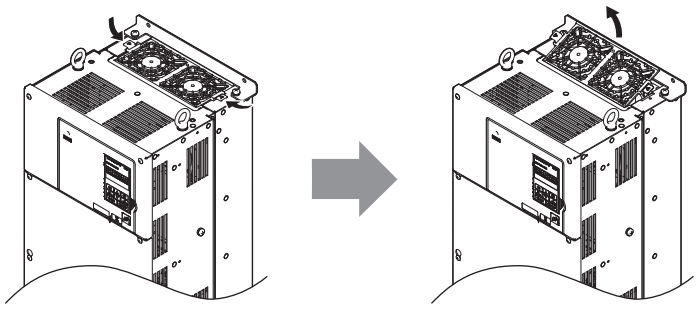


Figure 6.7 Remove the Cooling Fan Finger Guard: 2A0035, 4A0035, 4A0043

2. Lift out the back end of the fan finger guard first. Unplug the replay connector and free the fan finger guard from the regenerative unit.

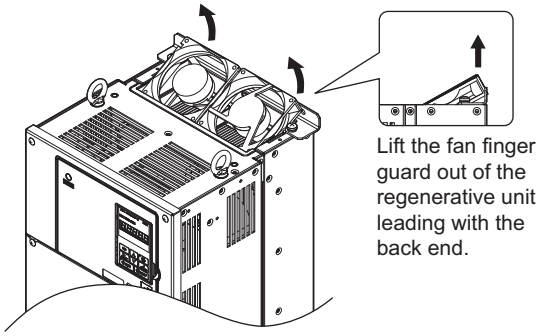
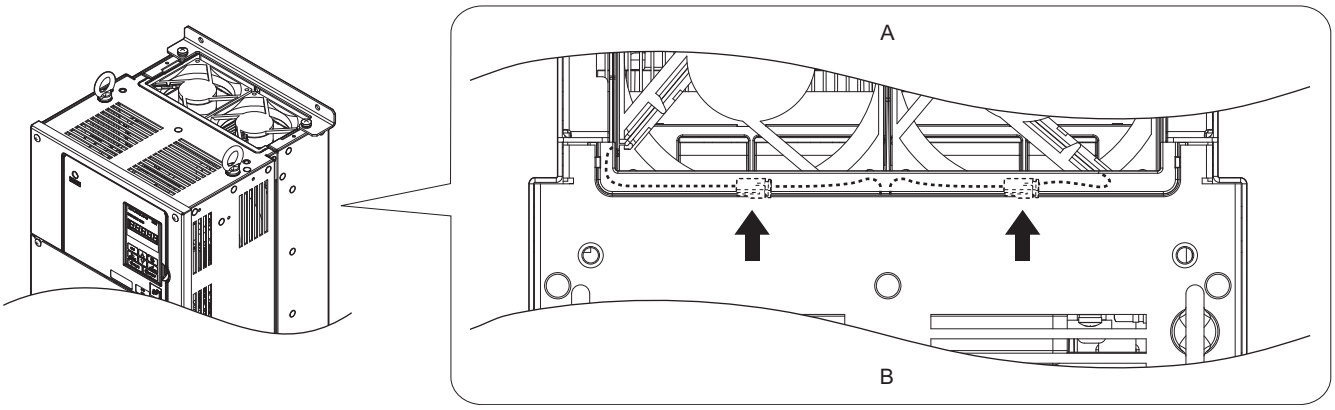


Figure 6.8 Remove the Cooling Fan: 2A0035, 4A0035, 4A0043

Installing the Cooling Fan

Reverse the procedure described above to reinstall the cooling fan.

1. Properly connect the fan power lines.
2. Place the power supply connectors and cable back into the recess of the regenerative unit.



A – Back **B – Front**

Figure 6.9 Cooling Fan Power Supply Connectors: 2A0035, 4A0035, 4A0043

3. Install the replacement fan into the regenerative unit.

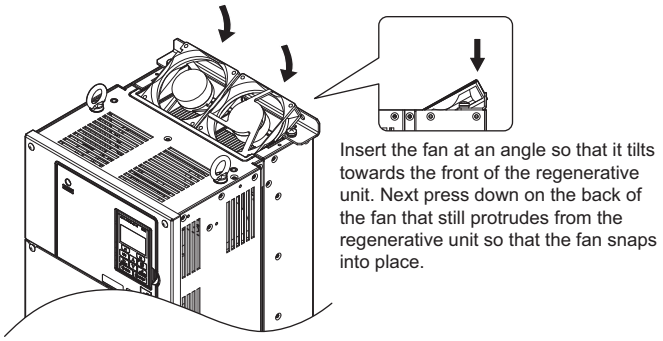


Figure 6.10 Install the Cooling Fan: 2A0035, 4A0035, 4A0043

4. Tilt up the back end of the fan finger guard and slide the fan finger guard into the opening near the front of the regenerative unit, then guide the fan finger guard into place.

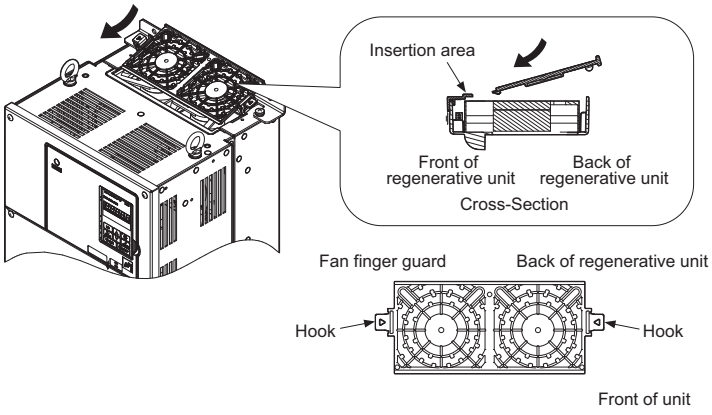


Figure 6.11 Reattach the Fan Cover: 2A0035, 4A0035, 4A0043

5. Press in on the hooks of the left and right sides of the fan cover and guide the fan finger guard until it clicks into place.

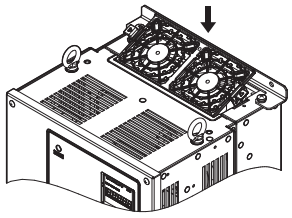


Figure 6.12 Reattach the Fan Finger Guard: 2A0035, 4A0035, 4A0043

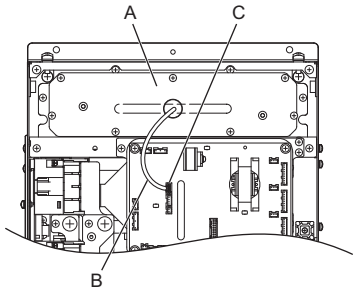
6. Turn on the power supply and set o4-03 to 0 to reset the Maintenance Monitor cooling fan operation time.

■ 2A0053 to 2A0105, 4A0053 to 4A0300

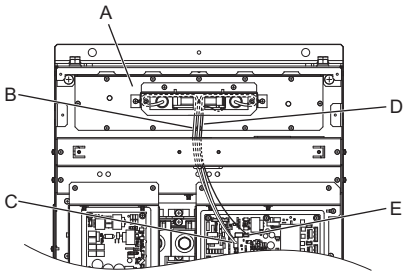
Removing and Disassembling the Cooling Fan Unit

1. Remove the terminal cover and front cover. Refer to ***Terminal Cover on page 45*** for details.
2. Remove the fan connector (CN6). Remove the fan connectors (CN6, CN7) in models 2A0105, 4A0210, and 4A0300.

2A0053, 2A0073, 4A0053 to 4A0150



2A0105, 4A0210, 4A0300



A – Fan unit
B – Fan relay cable
C – Fan connector (CN6)
D – Circulation fan relay cable
E – Fan connector (CN7)

Figure 6.13 Cooling Fan Replacement: Fan Unit and Connectors

3. Remove the screws holding the fan unit in place and slide the fan unit out of the regenerative unit.

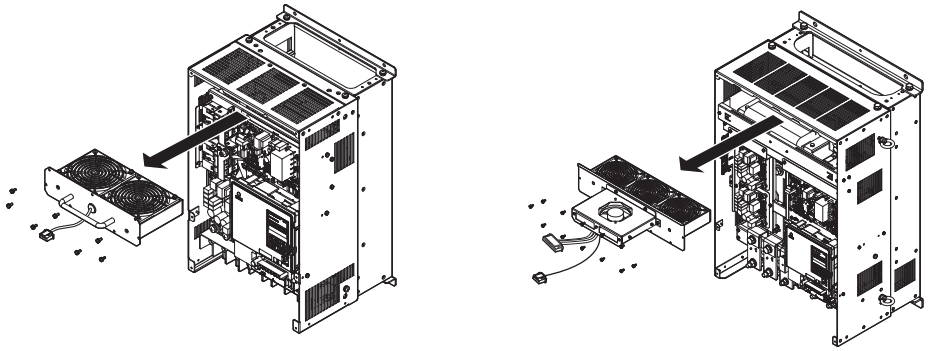
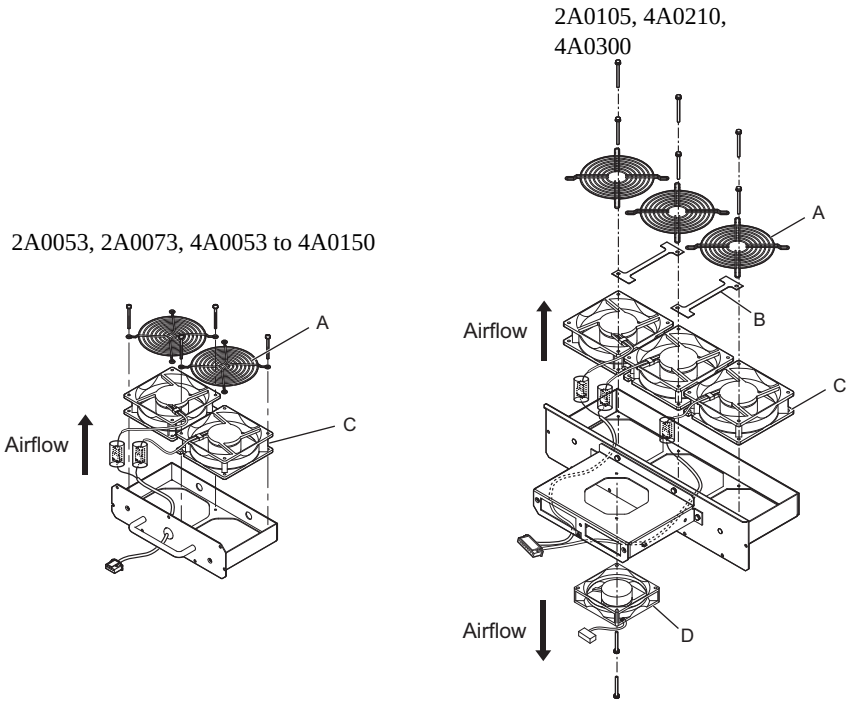


Figure 6.14 Remove the Fan Unit

4. Remove the fan guard and replace the cooling fans.

Note: **1.** Do not pinch the fan cable between parts when reassembling the fan unit.
2. Install the internal circulation fans so that they blow air upward. Install the cooling fan so that it blows air downward.

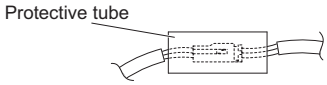


A – Fan guard **C – Cooling fan (Air flow: Upward)**
B – Cable cover **D – Circulation fan (Air flow: Downward)**

Figure 6.15 Fan Unit Disassembly

Cooling Fan Wiring: 2A0053, 4A0053, 4A0073

1. Position the protective tube so the fan connector sits in the center of the protective tube.



2. Place the fan connector covered by the tube.

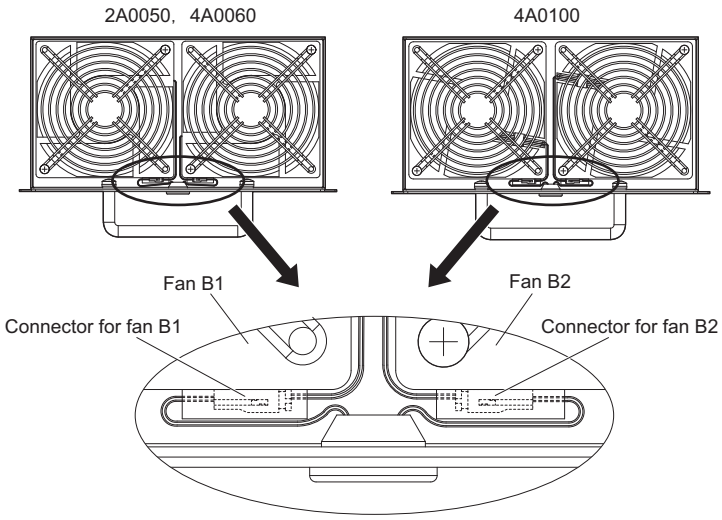
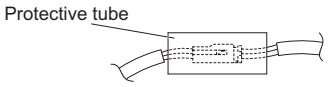


Figure 6.16 Cooling Fan Wiring: 2A0053, 4A0053, 4A0073

3. Make sure that the protective tube does not stick out beyond the fan guard.

Cooling Fan Wiring: 2A0073, 4A0105, 4A0150

1. Position the protective tube so the fan connector sits in the center of the protective tube.



2. Insert the connector for fan B2 and guide the lead wire for fan B2 so the cable hook holds it in place. Insert the connector for fan B1.

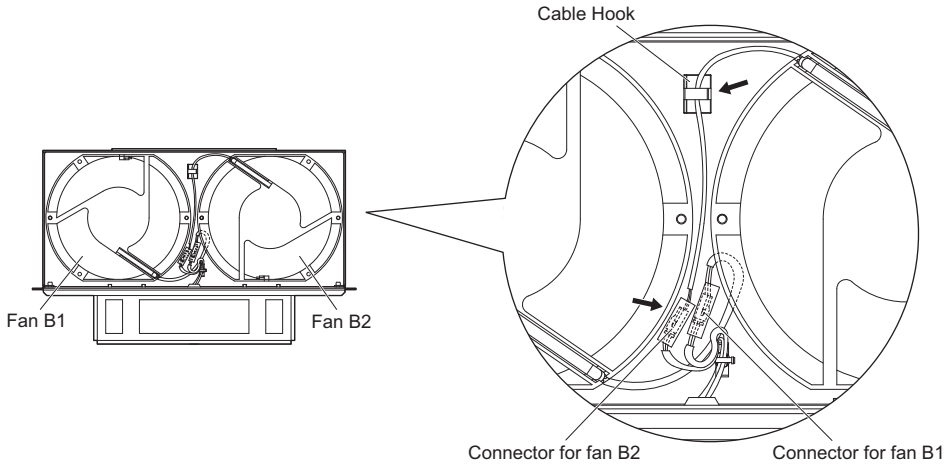
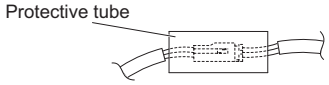


Figure 6.17 Cooling Fan Wiring: 2A0073, 4A0105, 4A0150

3. Double-check the relay connector to ensure it is properly connected.

Cooling Fan Wiring: 2A0105, 4A0210 to 4A0300

1. Position the protective tube so the fan connector sits in the center of the protective tube.



2. In the space between fans 1 and 2, place the fan connector for fan B2 in front of the fan connector for fan B1.
3. Place the connector for fan B3 between fans B2 and B3.

Note: Model 2A0105 does not have the fan B3.

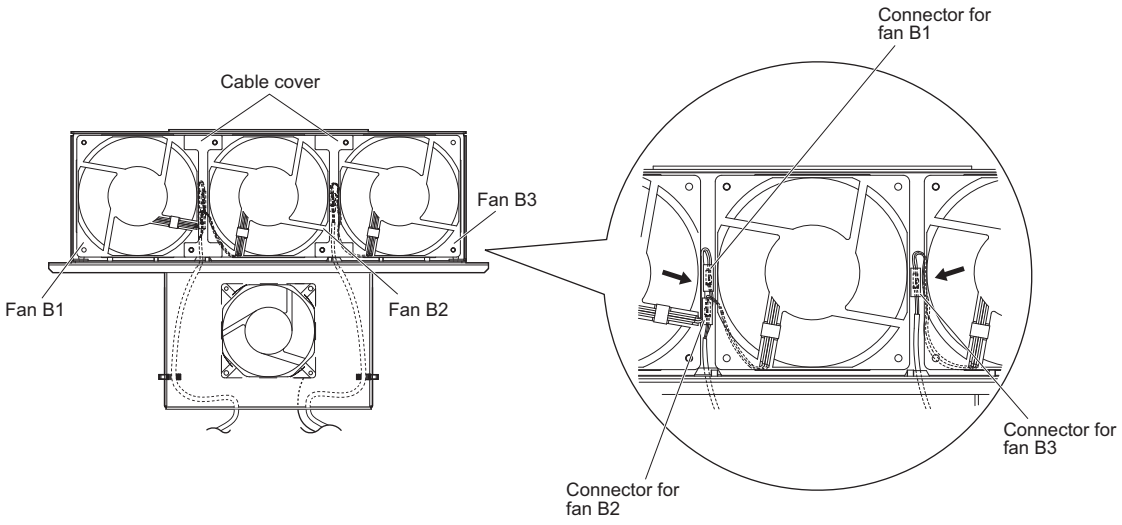


Figure 6.18 Cooling Fan Wiring: 2A0053 to 2A0105, 4A0053 to 4A0300

4. Double-check the relay connector to ensure it is properly connected.
5. Reattach the cable cover to its original position and tighten the screws so the fan guard holds the cable cover in place.

Note: Do not pinch the fan cable between parts when reassembling the fan unit.

Installing the Cooling Fan Unit

1. Reverse the procedure described above to reinstall the cooling fan unit.

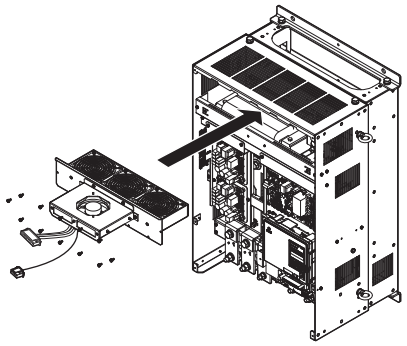


Figure 6.19 Install the Cooling Fan Unit: 2A0053 to 2A0105, 4A0053 to 4A0300

2. Reattach the covers and digital operator.
3. Turn on the power supply and set o4-03 to 0 to reset the Maintenance Monitor cooling fan operation time.

6.5 Regenerative Unit Replacement

◆ Serviceable Parts

The regenerative unit contains some serviceable parts. The following parts can be replaced over the life span of the regenerative unit:

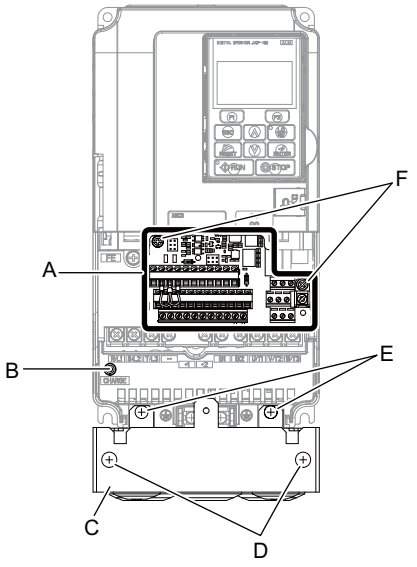
- Terminal board I/O PCBs
- Cooling fan(s)
- Front cover

Replace the regenerative unit if the main power circuitry is damaged. Contact your local Magnetek representative before replacing parts if the regenerative unit is still under warranty. Magnetek reserves the right to replace or repair the regenerative unit according to Magnetek warranty policy.

WARNING! *Electrical Shock Hazard. Do not inspect, connect, or disconnect any wiring while the power is on. Failure to comply can result in serious personal injury. Before servicing the regenerative unit, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. After shutting off the power, wait for at least the amount of time specified on the regenerative unit before touching any components.*

◆ Terminal Board

The regenerative unit has a modular I/O terminal block that facilitates quick regenerative unit replacement. The terminal board contains on-board memory that stores all regenerative unit parameter settings and allows the parameters to be saved and transferred to the replacement regenerative unit. To transfer the terminal board, disconnect the terminal board from the damaged regenerative unit and reconnect it to the replacement regenerative unit. There is no need to manually reprogram the replacement regenerative unit after transferring the terminal board.



A – Removable terminal board
B – Charge LED
C – Conduit bracket
D – Conduit bracket cover screws
E – Conduit bracket mounting screws
F – Terminal board locking screws

Figure 6.20 Terminal Board

◆ Replacing the Regenerative Unit

WARNING! *Electrical Shock Hazard. Do not connect or disconnect wiring while the power is on. Failure to comply can result in serious personal injury. Before servicing the regenerative unit, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. After shutting off the power, wait for at least the amount of time specified on the regenerative unit before touching any components.*

WARNING! *Electrical Shock Hazard. Do not allow unqualified personnel to perform work on the regenerative unit. Failure to comply could result in serious injury. Installation, maintenance, inspection and servicing must be performed only by authorized personnel familiar with installation, adjustment and maintenance of regenerative units.*

NOTICE: *Observe proper electrostatic discharge procedures (ESD) when handling the regenerative unit and circuit boards. Failure to comply may result in ESD damage to the regenerative unit circuitry.*

The following procedure explains how to replace a regenerative unit.

This section provides instructions for regenerative unit replacement only.

To install option boards or other types of options, refer to the specific manuals for those options.

■ Removing the Regenerative Unit

1. Remove the terminal cover.

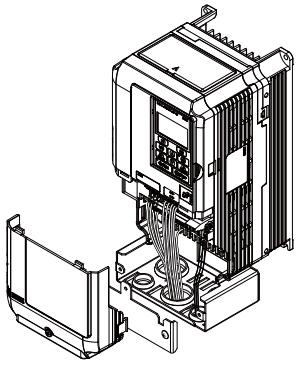


Figure 6.21 Removing the Terminal Cover

2. Loosen the screws holding the terminal board in place. Remove the screw securing the bottom cover and remove the bottom cover from the regenerative unit.

Note: IP00/Open Type enclosure regenerative units do not have a bottom cover or conduit.

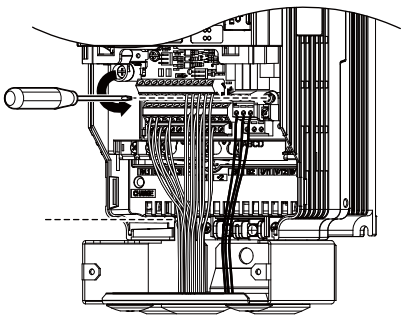


Figure 6.22 Unscrew the Terminal Board and Remove the Terminal Cover

3. Slide the terminal board as illustrated by the arrows to remove it from the regenerative unit along with the bottom cover.

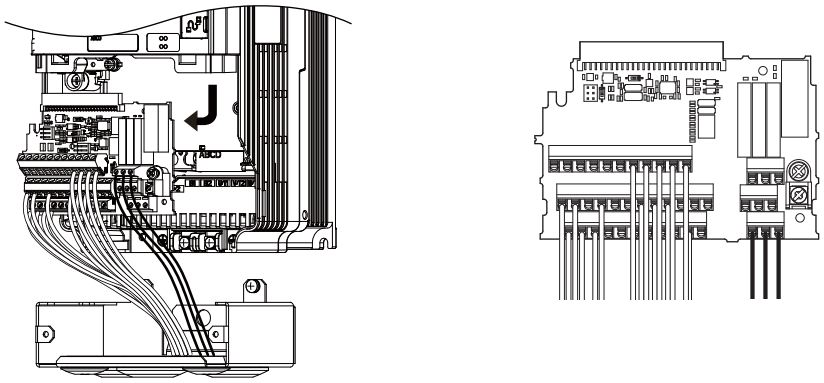


Figure 6.23 Remove the Terminal Board and Disconnected Removable Terminal Board

4. Disconnect all option cards and options. Make sure they are intact before reusing them.
5. Replace the regenerative unit and wire the main circuit.

Installing the Regenerative Unit

1. After wiring the main circuit, connect the terminal block to the regenerative unit as shown in ***Figure 6.24***. Use the installation screw to fasten the terminal block into place.

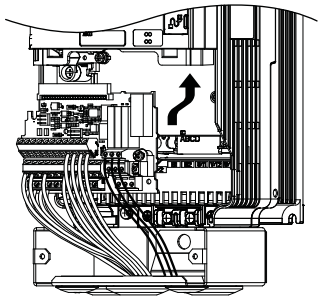


Figure 6.24 Installing the Terminal Board

2. Replace the terminal cover.
3. Put the terminal cover back into its original place.
4. When the power to the regenerative unit is first switched on, all parameter settings are transferred from the terminal board into the regenerative unit memory. Should an oPE04 error occur, load the parameter settings that have been saved on the terminal board onto the new regenerative unit by setting parameter A1-03 to 5550. Reset timers used for the Maintenance Monitor function by setting parameters o4-01 through o4-12 back to 0, and parameter o4-13 to 1.

7

Standard Configuration Devices, Peripheral Devices, and Options

This chapter explains the installation of peripheral devices and options available for the regenerative unit.

7.1 Section Safety

⚠ WARNING

Electrical Shock Hazard

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

Failure to comply could result in death or serious injury.

Before servicing, disconnect all power to the equipment. The internal capacitor remains charged even after the power supply is turned off. The charge indicator LED will extinguish when the DC bus voltage is below 50 Vdc. To prevent electric shock, wait for at least the time specified on the warning label; after all indicators are OFF, measure for unsafe voltages to confirm the unit is safe prior to servicing.

Do not operate equipment with covers removed.

Failure to comply could result in death or serious injury.

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

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

Failure to comply could result in death or serious injury.

If a fuse is open or ground fault circuit interrupter GFCI is tripped, check the wiring and the selection of the peripheral devices.

Contact your supplier if the cause cannot be identified. Failure to comply may result in electrical shock by indirect or direct contact. The regenerative unit can cause a residual current with a DC component in the protective earthing conductor.

Do not allow unqualified personnel to perform work on the unit.

Failure to comply could result in death or serious injury.

Installation, maintenance, inspection, and servicing must be performed only by authorized personnel familiar with installation, adjustment, and maintenance of this equipment.

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

Failure to comply could result in death or serious injury.

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

Do not use damaged wires, place excessive stress on wiring, or damage the wire insulation.

Failure to comply could result in death or serious injury.

Fire Hazard

Tighten all terminal screws to the specified tightening torque.

Loose electrical connections could result in death or serious injury by fire due to overheating of electrical connections.

⚠ CAUTION

Carry all standard configuration and peripheral devices in a method suitable for the weight of the device.

Incorrectly handling devices could cause them to fall and result in injury or damage to the device.

NOTICE

Observe proper electrostatic discharge procedures (ESD) when handling the unit and circuit boards.

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

Do not use unshielded cable for control wiring.

Failure to comply may cause electrical interference resulting in poor system performance. Use shielded, twisted-pair wires and ground the shield to the shield ground terminal E (G) of the unit.

Check all the wiring to ensure that all connections are correct after installing the unit and connecting any other devices.

Failure to comply could result in damage to the unit.

Do not operate damaged equipment.

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

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

7.2 Regenerative Unit Options and Peripheral Devices

Table 7.1 lists the names of the various peripheral devices, accessories, and options available for Magnetek regenerative units. Contact Magnetek or your Magnetek agent to order these peripheral devices.

- Peripheral Device Selection: Refer to the Magnetek catalog for selection and part numbers.
- Peripheral Device Installation: Refer to the corresponding option manual for installation instructions.

Table 7.1 Available Peripheral Devices

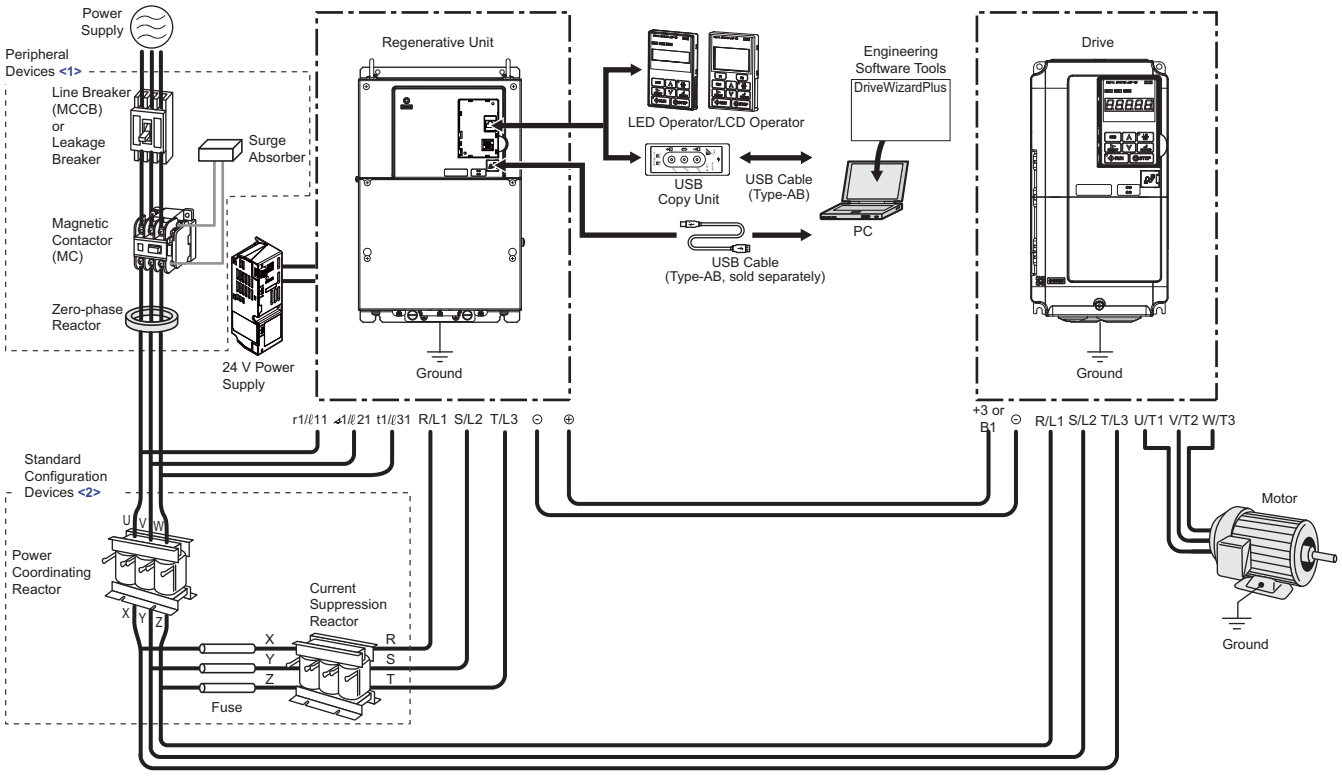
Option	Model Number	Description
Power Options		
24 V Power Supply	PS-A10LB (200 V class) PS-A10HB (400 V class)	Provides power supply for the control circuit and option boards. **Note:** Parameter settings cannot be changed when the drive is operating solely from this power supply.
Interface Options		
USB Copy Unit (RJ-45/ USB compatible plug)	JVOP-181	• Can copy parameter settings easily and quickly to be later transferred to another regenerative unit. • Adapter for connecting regenerative unit to the USB port of a PC.
PC Cable	Commercially available USB2.0 A/B cable.	Connect regenerative unit and PC when using DriveWizard Industrial. The cable length must be 3 m or less.
LED Operator	JVOP-182	5-digit LED operator; maximum cable length for remote usage: 3 m
LCD Operator Extension Cable	WV001: 1 m WV003: 3 m	Cable for connecting the LCD operator.
Mechanical Options		
Attachment for External Heatsink	–	Attachment for External Heatsink
Communications Option Cards		
MECHATROLINK-II Interface	SI-T3	Used for running or stopping the regenerative unit, setting or referencing parameters, and monitoring input current, output voltage, or similar items through MECHATROLINK-II communication with the host controller.
CC-Link Interface	SI-C3 Available soon.	Used for running or stopping the regenerative unit, setting or referencing parameters, and monitoring input current, output voltage, or similar items through CC-Link communication with the host controller.
DeviceNet Interface	SI-N3 Available soon.	Used for running or stopping the regenerative unit, setting or referencing parameters, and monitoring input current, output voltage, or similar items through DeviceNet communication with the host controller.
PROFIBUS-DP Interface	SI-P3 Available soon.	Used for running or stopping the regenerative unit, setting or referencing parameters, and monitoring input current, output voltage, or similar items through PROFIBUS-DP communication with the host controller.
CANopen Interface	SI-S3 Available soon.	Used for running or stopping the regenerative unit, setting or referencing parameters, and monitoring input current, output voltage, or similar items through CANopen communication with the host controller.
Monitor Option Cards		
Analog Monitor	AO-A3	Outputs analog signal for monitoring the output state (input frequency, output voltage etc.) of the regenerative unit. Output resolution: 11 bit signed (1/2048) Output voltage: 0 to 10 Vdc (non-isolated) Terminals: 2 analog outputs
Digital Output	DO-A3	Outputs isolated type digital signal for monitoring the run state of the regenerative unit (alarm signal, during run, etc.) Terminals: 6 photocoupler outputs (48 V, 50 mA or less) 2 relay contact outputs (250 Vac, 1 A or less 30 Vdc, 1 A or less)

7.3 Connecting Standard Configuration Devices and Peripheral Devices

Figure 7.1 illustrates how to configure the regenerative unit with standard configuration devices, peripheral devices, and options.

Refer to the specific manual for the devices shown below for more detailed installation instructions.

Note: Refer to *Standard Connection Diagram on page 38* for details on connecting standard configuration devices.



<1> Select these peripheral devices for the drive. Refer to the drive manual for more detailed instructions regarding these devices.
<2> A corresponding power coordinating reactor and current suppression reactor that consider the saturation current and thermal factors are required for each model of regenerative unit. Always install the specified devices.

Figure 7.1 Connecting Standard Configuration Devices and Peripheral Devices

Note: If the regenerative unit is set to trigger a fault output when the fault restart function is activated (L5-02 = 1), then a sequence to interrupt power when a fault occurs will turn off the power to the regenerative unit while the regenerative unit attempts to restart. The default setting for L5-02 is 0 (fault output active during restart).

7.4 Standard Configuration Devices Wiring

Install the standard configuration devices listed below when installing the regenerative unit.
Refer to the product catalog for selection of standard configuration devices.

- Power Coordinating Reactor
- Current Suppression Reactor
- Fuse
- Fuse Holder

◆ Wire Gauges and Tightening Torque

Use the ***Table 7.2*** to select the appropriate wires and crimp terminals for power coordinating reactor, current suppression reactor, and fuse holder.

Note: Wire gauge recommendations based on continuous current ratings using 75°C 600 Vac vinyl-sheathed wire assuming ambient temperature within 40°C.

Consider the amount of voltage drop when selecting wire gauges. Increase the wire gauge when the voltage drop is greater than 2% of motor rated voltage. Ensure the wire gauge is suitable for the terminal block. Use the following formula to calculate the amount of voltage drop:

Line drop voltage (V) = $\sqrt{3}$ × wire resistance (Ω/km) × wire length (m) × current (A) × 10^{-3}

Table 7.2 Wire Gauge and Torque Specifications

Model	Terminals	For Asia <1>		For U.S.A. <2>		For Europe and China <3>		Screw Size	Tightening Torque N·m (lb·in.)
		Recomm. Gauge mm²	Applicable Gauge mm²	Recomm. Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Recomm. Gauge mm²	Applicable Gauge mm²		
200 V Class									
2A03P5	U, V, W	3.5	3.5 to 14	12	12 to 6	4	4 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
	X, Y, Z								
	R, S, T								
2A0005	U, V, W	3.5	3.5 to 14	12	12 to 6	4	4 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
	X, Y, Z								
	R, S, T								
2A0007	U, V, W	3.5	3.5 to 14	12	12 to 6	4	4 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
	X, Y, Z								
	R, S, T								
2A0010	U, V, W	5.5	5.5 to 14	10	10 to 6	4	4 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
	X, Y, Z								
	R, S, T								
2A0014	U, V, W	8	8 to 14	8	8 to 6	6	6 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
	X, Y, Z								
	R, S, T								
2A0017	U, V, W	14	14 to 38	8	8 to 1	10	10 to 25	M6	3.6 to 4.0 (31.9 to 35.4)
	X, Y, Z								
	R, S, T								
2A0020	U, V, W	14	14 to 38	6	6 to 1	10	10 to 25	M6	3.6 to 4.0 (31.9 to 35.4)
	X, Y, Z								
	R, S, T								
2A0028	U, V, W	22	22 to 38	4	4 to 1	16	16 to 35	M6	3.6 to 4.0 (31.9 to 35.4)
	X, Y, Z								
	R, S, T								

Model	Terminals	For Asia <1>		For U.S.A. <2>		For Europe and China <3>		Screw Size	Tightening Torque N·m (lb·in.)
		Recomm. Gauge mm²	Applicable Gauge mm²	Recomm. Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Recomm. Gauge mm²	Applicable Gauge mm²		
2A0035	U, V, W X, Y, Z R, S, T	38	38 to 70	2	2 to 2/0	25	25 to 70	M8	5.4 to 6.0 (47.8 to 53.1)
2A0053	U, V, W X, Y, Z R, S, T	50	50 to 150	2/0	2/0 to 250	50	50 to 95	M8	13.5 to 15.0 (119,5 to 132,8)
2A0073	U, V, W X, Y, Z R, S, T	80	80 to 150	1/0 × 2P	1/0 to 300	70	70 to 150	M12	32.0 to 40.0 (283 to 354)
2A0105	U, V, W X, Y, Z R, S, T	80 × 2P	80 to 325	3/0 × 2P	3/0 to 600	95 × 2P	95 to 240	M12	32.0 to 40.0 (283 to 354)
400 V Class									
4A03P5	U, V, W X, Y, Z R, S, T	3.5	3.5 to 14	10	10 to 6	4	4 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
4A0005	U, V, W X, Y, Z R, S, T	3.5	3.5 to 14	10	10 to 6	4	4 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
4A0007	U, V, W X, Y, Z R, S, T	3.5	3.5 to 14	12	12 to 6	4	4 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
4A0010	U, V, W X, Y, Z R, S, T	3.5	3.5 to 14	12	12 to 6	4	4 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
4A0014	U, V, W X, Y, Z R, S, T	3.5	3.5 to 14	10	10 to 6	4	4 to 16	M4	2.1 to 2.3 (18.6 to 20.4)
4A0017	U, V, W X, Y, Z R, S, T	8	8 to 38	10	10 to 1	10	10 to 25	M6	3.6 to 4.0 (31.9 to 35.4)
4A0020	U, V, W X, Y, Z R, S, T	8	8 to 38	8	8 to 1	10	10 to 25	M6	3.6 to 4.0 (31.9 to 35.4)
4A0028	U, V, W X, Y, Z R, S, T	8	8 to 38	8	8 to 1	10	10 to 25	M6	3.6 to 4.0 (31.9 to 35.4)
4A0035	U, V, W X, Y, Z R, S, T	14	14 to 70	6	6 to 2/0	10	10 to 70	M8	5.4 to 6.0 (47.8 to 53.1)
4A0043	U, V, W X, Y, Z R, S, T	14	14 to 70	4	4 to 2/0	10	10 to 70	M8	5.4 to 6.0 (47.8 to 53.1)
4A0053	U, V, W X, Y, Z R, S, T	22	22 to 70	4	4 to 2/0	16	16 to 70	M8	5.4 to 6.0 (47.8 to 53.1)

Model	Terminals	For Asia <1>		For U.S.A. <2>		For Europe and China <3>		Screw Size	Tightening Torque N·m (lb·in.)
		Recomm. Gauge mm²	Applicable Gauge mm²	Recomm. Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Recomm. Gauge mm²	Applicable Gauge mm²		
4A0073	U, V, W	30	30 to 70	2	2 to 2/0	25	25 to 70	M8	5.4 to 6.0 (47.8 to 53.1)
	X, Y, Z								
	R, S, T								
4A0105	U, V, W	50	50 to 150	2/0	2/0 to 300	50	50 to 150	M10	18.0 to 23.0 (159 to 204)
	X, Y, Z								
	R, S, T								
4A0150	U, V, W	100	100 to 150	250	250 to 300	95	95 to 240	M12	32.0 to 40.0 (283 to 354)
	X, Y, Z								
	R, S, T								
4A0210	U, V, W	80 × 2P	80 to 325	3/0 × 2P	3/0 to 600	95 × 2P	95 to 240	M12	32.0 to 40.0 (283 to 354)
	X, Y, Z								
	R, S, T								
4A0300	U, V, W	100 × 2P	100 to 325	250 × 2P	250 to 600	95 × 2P	95 to 240	M12	32.0 to 40.0 (283 to 354)
	X, Y, Z								
	R, S, T								

<1> Gauges listed here are for use in Japan.
<2> Gauges listed here are for use in the United States.
<3> Gauges listed here are for use in Europe and China.

◆ Terminal Functions

■ Power Coordinating Reactor

Table 7.3 Terminal Function (Power Coordinating Reactor)

Terminal		Function
U	Power Coordinating Reactor Inputs	These terminals are connected to the power supply.
V		
W		
X	Power Coordinating Reactor Outputs	These terminals are connected to the connected drive device input terminals and input fuses.
Y		
Z		

■ Current Suppression Reactor

Table 7.4 Terminal Function (Current Suppression Reactor)

Terminal		Function
X	Current Suppression Reactor Inputs	These terminals are connected to the input fuses.
Y		
Z		
R	Current Suppression Reactor Outputs	These terminals are connected to the regenerative unit.
S		
T		

◆ Specification

Table 7.5 Rating (200 V Class)

Voltage Class		200 V Class											
Model		2A03P5	2A0005	2A0007	2A0010	2A0014	2A0017	2A0020	2A0028	2A0035	2A0053	2A0073	2A0105
Power Coordinating Reactor	Rated Current [A]	20	30	40	60	80	90	120	160	200	280	360	500
	Inductance [mH]	0.53	0.35	0.265	0.18	0.13	0.12	0.09	0.07	0.05	0.038	0.026	0.02
	Heat Loss (W)	30	45	40	65	75	90	90	100	100	94	120	170
Current Suppression Reactor	Rated Current [A]	15	15	20	40	40	50	60	80	100	153	209	306
	Inductance [mH]	0.31	0.31	0.15	0.1	0.1	0.06	0.05	0.04	0.03	0.02	0.015	0.01
	Heat Loss (W)	22	22	21	32	32	31	35	48	46	21	19	23
Fuse	Rated Current [A]	20	25	32	50	63	80	100	125	160	200	350	500
	Heat Loss (W)	1.0	1.5	2.3	3.5	5.7	6.4	5.8	8.9	11.2	14.4	35.9	44.3

Table 7.6 Rating (400 V Class)

Voltage Class		400 V Class							
Model		4A03P5	4A0005	4A0007	4A0010	4A0014	4A0017	4A0020	4A0028
Power Coordinating Reactor	Rated Current [A]	10	15	20	30	40	50	60	80
	Inductance [mH]	2.2	1.42	1.06	0.7	0.53	0.42	0.36	0.26
	Heat Loss (W)	40	50	40	65	60	90	90	95
Current Suppression Reactor	Rated Current [A]	7.5	7.5	10	15	25	25	30	40
	Inductance [mH]	1.2	1.2	0.6	0.4	0.3	0.3	0.2	0.15
	Heat Loss (W)	21	21	19	23	36	50	30	85
Fuse	Rated Current [A]	16	16	16	25	40	40	50	63
	Heat Loss (W)	0.8	1.2	1.7	3.1	4.5	5.9	7.0	10.3

Voltage Class		400 V Class							
Model		4A0035	4A0043	4A0053	4A0073	4A0105	4A0150	4A0210	4A0300
Power Coordinating Reactor	Rated Current [A]	90	120	150	200	250	330	490	660
	Inductance [mH]	0.24	0.18	0.15	0.11	0.09	0.06	0.04	0.03
	Heat Loss (W)	100	130	112	138	154	169	210	300
Current Suppression Reactor	Rated Current [A]	50	60	75	100	161	237	326	466
	Inductance [mH]	0.12	0.1	0.08	0.06	0.04	0.03	0.02	0.013
	Heat Loss (W)	46	56	81	72	95	105	120	160
Fuse	Rated Current [A]	80	100	125	160	250	350	500	630
	Heat Loss (W)	14.3	18.0	19.9	30.3	29.8	47.8	51.1	77.9

Note: Kits that include the power reactor, current suppression reactor, and fuses can be found in ***Table 1.2*** on page ***20***, and the part lists can be found in ***Replacement Parts on page 202***.

7.5 Installing Peripheral Devices

This section describes the proper steps and precautions to take when installing or connecting various peripheral devices to the regenerative unit.

NOTICE: *Use a class 2 power supply when connecting to the control terminals. Improper application of peripheral devices could result in regenerative unit performance degradation due to improper power supply. Refer to NEC Article 725 Class 1, Class 2, and Class 3 Remote-Control, Signaling, and Power Limited Circuits for requirements concerning class 2 power supplies.*

◆ Installing a Molded Case Circuit Breaker (MCCB) or Ground Fault Circuit Interrupter (GFCI)

Install an MCCB or GFCI for line protection between the drive power supply and the main circuit power supply input terminals R/L1, S/L2, and T/L3. This protects the main circuit and devices wired to the main circuit while also providing overload protection.

Consider the following when selecting and installing an MCCB or a GFCI:

- The capacity of the MCCB or GFCI should be 1.5 to 2 times the rated output current of the drive. Use an MCCB or GFCI to keep the drive from faulting out instead of using overheat protection (150% for one minute at the rated output current).
- If several drives are connected to one MCCB or GFCI that is shared with other equipment, use a sequence that shuts the power OFF when errors are output by using magnetic contactor (MC) as shown in ***Figure 7.2***.

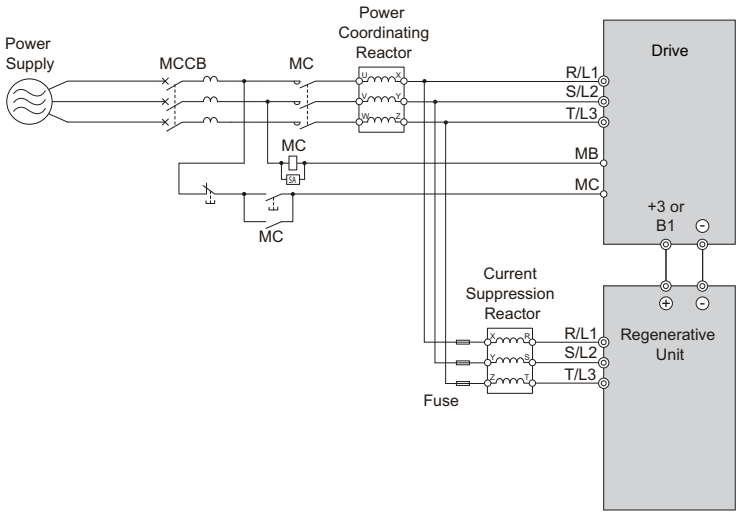


Figure 7.2 Power Supply Interrupt Wiring (Example)

WARNING! *Electrical Shock Hazard. Disconnect the MCCB (or GFCI) and MC before wiring terminals. Failure to comply may result in serious injury or death.*

■ Application Precautions when Installing a GFCI

Drive outputs generate high-frequency leakage current as a result of high-speed switching. Install a GFCI on the input side of the drive to switch off potentially harmful leakage current.

Use a GFCI with harmonic countermeasures and with a rated operating current of 30 mA minimum for each connected drive at the power supply side to eliminate harmonic leakage current and suppress any potentially harmful frequencies.

Leakage current can cause unprotected components to operate incorrectly. If this is a problem, lower the carrier frequency, replace the components in question with parts protected against harmonic current, or increase the sensitivity amperage of the circuit interrupter to at least 200 mA per drive.

Factors in determining leakage current:

- Size of the drive
- EMI/RFI filter
- Carrier frequency
- Motor cable type and length

Select an interrupter that senses all types of current (AC and DC) and high frequency currents to safely protect the system.

◆ Installing a Magnetic Contactor at the Power Supply Side

■ Disconnecting the Power Supply

Instead of an MCCB, you can also use an MC in the sequence to turn off the power supply for the main circuits when protection functions in the drive are activated or for emergency stop operations. However, if an MC at the input (primary side) to the drive is used to force the drive to stop, it will stop without performing regenerative operation. Create the sequence carefully.

NOTICE: *Do not connect electromagnetic switches or MCs to the output motor circuits without proper sequencing. Improper sequencing of output motor circuits could result in damage to the drive.*

NOTICE: *Install an MC on the input side of the drive when the drive should not automatically restart after power loss. To get the full performance life out of the electrolytic capacitors and circuit relays, refrain from switching the drive power supply off and on more than once every 30 minutes. Frequent use can damage the drive. Use the drive to stop and start the motor.*

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

Note: Set up a delay that prevents the MC from opening prematurely to continue operating the drive through a momentary power loss.

◆ Connecting a Surge Absorber

A surge absorber suppresses surge voltage generated from switching an inductive load near the drive. Inductive loads include magnetic contactors, relays, valves, solenoids, and brakes. Always use a surge absorber or diode when operating with an inductive load.

WARNING! *Fire Hazard. Do not connect surge absorbers to the drive output power terminals. Failure to comply may result in serious injury or death by fire or flying debris.*

◆ Attachment for External Heatsink Mounting

An external attachment can be used to project the heatsink outside of an enclosure to ensure that there is sufficient air circulation around the heatsink.

Contact a Magnetek sales representative or Magnetek directly for more information on this attachment.

Appendix: A

Specifications

This chapter provides the specifications of the regenerative unit and describes the derating methods.

A.1 Power Ratings

Table A.1 Power Ratings (Three-Phase 200 V Class)

Item		Specification											
Model		2A03P5	2A0005	2A0007	2A0010	2A0014	2A0017	2A0020	2A0028	2A0035	2A0053	2A0073	2A0105
Maximum Applicable Motor Capacity [HP]		5	7	10	15	20	25	30	40	50	74	101	148
Rating	Rated Output Capacity [HP] <1>	5	7	9	13	19	23	27	38	47	71	98	141
Rating	Rated Output Current (DC) [A]	14	20	27	41	55	68	81	112	138	207	282	413
	Rated Input Current (AC) [A]	10	15	20	30	41	50	60	83	102	153	209	306

<1> Rated output capacity is calculated with a rated input voltage of 200 V.

Table A.2 Power Ratings (Three-Phase 400 V Class)

Item		Specification							
Model		4A03P5	4A0005	4A0007	4A0010	4A0014	4A0017	4A0020	4A0028
Maximum Applicable Motor Capacity [HP]		5	7	10	15	20	25	30	40
Rating	Rated Output Capacity [HP] <1>	5	7	9	13	19	23	27	38
Rating	Rated Output Current (DC) [A]	7	11	15	22	30	36	43	58
	Rated Input Current (AC) [A]	5	8	11	16	22	27	32	43

<1> Rated output capacity is calculated with a rated input voltage of 400 V.

Item		Specification							
Model		4A0035	4A0043	4A0053	4A0073	4A0105	4A0150	4A0210	4A0300
Maximum Applicable Motor Capacity [HP]		50	60	74	101	148	215	295	422
Rating	Rated Output Capacity [HP] <1>	47	58	71	98	141	201	282	402
Rating	Rated Output Current (DC) [A]	73	89	109	149	217	320	440	629
	Rated Input Current (AC) [A]	54	66	81	110	161	237	326	466

<1> Rated output capacity is calculated with a rated input voltage of 400 V.

A.2 Regenerative Unit Specifications

Item		Specification
Input	Rated Voltage Rated Frequency	200 V Class: 200 to 240 Vac 50/60 Hz 400 V Class: 380 to 480 Vac 50/60 Hz
	Allowable Voltage Fluctuation	-15 to +10%
	Allowable Frequency Fluctuation	±2%
Control Characteristics	Control Method	120° excitation method
	Input Power Factor	0.9 minimum (for rated load)
	Regenerative Torque	150% 30 s, 100% 25% ED 60 s, 80% continuous
	Voltage Reference Range	200 V Class: 300 to 360 Vdc 400 V Class: 600 to 730 Vdc
	Main Control Functions	Cooling fan on/off switch, MEMOBUS/Modbus Communication (RS-422/RS-485 maximum, 115.2 kbps)
Protection Functions	Momentary Overcurrent Protection	Operation stops when unit current is approximately 250% of the rated power supply current.
	Open Fuse	Operation stops if the fuse opens.
	Overload	Operation stops when unit current is 150% of the rated power supply current for 30 s.
	Overvoltage Protection (Output)	200 V class: Stops when DC bus voltage exceeds approximately 410 Vdc 400 V class: Stops when DC bus voltage exceeds approximately 820 Vdc
	Overvoltage Protection (Input)	200 V class: Stops when input voltage exceeds approximately 227 Vac 400 V class: Stops when input voltage exceeds approximately 554 Vac
	Undervoltage Protection (Output)	200 V class: Stops when DC bus voltage is below approximately 190 Vdc 400 V class: Stops when DC bus voltage is below approximately 380 Vdc
	Undervoltage Protection (Input)	200 V class: Stops when input voltage is below approximately 150 Vac 400 V class: Stops when input voltage is below approximately 300 Vac
	Momentary Power Loss Ride-Thru	Immediate stop after Momentary Power Loss is detected.
	Power Supply Frequency Fault	Operation stops if the input frequency deviates by ±6 Hz of rated frequency.
	Heatsink Overheat Protection	Thermistor protection
	Ground Protection	Electronic circuit protection <1>
	DC Bus Charge LED	Remains lit until DC bus voltage is below 50 V
Environment	Area of Use	Indoors
	Ambient Temperature	IP00/Open Type enclosure: -10°C to +50°C (14°F to 122°F) IP20/NEMA Type 1 enclosure: -10°C to +40°C (14°F to 104°F)
	Humidity	95 RH% or less (no condensation)
	Vibration/Shock	2A03P5 to 2A0053, 4A03P5 to 4A0073 10 to 20 Hz at 9.8 m/s^2 20 to 55 Hz at 5.9 m/s^2 2A0073 to 2A0105, 4A0105 to 4A0300 10 to 20 Hz at 9.8 m/s^2 20 to 55 Hz at 2.0 m/s^2
	Storage Temperature	-20°C to +60°C (-4°F to +140°F)
	Altitude	1000 m (3281 ft) or lower, up to 3000 m (9843 ft) with derating.
Protection Design		IP00/Open Type enclosure, IP20/NEMA Type 1 enclosure
Standard		• UL508C • IEC/EN 61800-5-1 • IEC/EN 61800-3

<1> Ground protection cannot be provided when the impedance of the ground fault path is too low, or when the regenerative unit is powered up while a ground fault is present at the output.

A.3 Heat Loss Data

Table A.3 Heat Loss

Model	Heatsink Loss (W) <1>	Interior Unit Loss (W) <1>	Total Loss (W) <1>
200 V Class			
2A03P5	31	22	53
2A0005	51	27	78
2A0007	76	33	109
2A0010	99	39	138
2A0014	149	49	198
2A0017	155	53	208
2A0020	201	67	268
2A0028	270	98	368
2A0035	295	127	422
2A0053	494	164	658
2A0073	609	236	845
2A0105	910	365	1275
400 V Class			
4A03P5	16	21	37
4A0005	27	24	51
4A0007	41	28	69
4A0010	53	31	84
4A0014	80	38	118
4A0017	91	44	135
4A0020	114	50	164
4A0028	174	66	240
4A0035	169	74	243
4A0043	221	91	312
4A0053	266	109	375
4A0073	397	164	561
4A0105	572	255	827
4A0150	869	336	1205
4A0210	1193	532	1725
4A0300	1534	630	2164

<1> Values are the regenerative torque at 80% continuous rating.

A.4 Derating Data

The regenerative unit can be operated above the rated temperature, altitude, and default carrier frequency by derating the unit capacity.

◆ Temperature Derating

To ensure the maximum performance life, the regenerative unit output current must be derated as shown in ***Figure A.1*** when the regenerative unit is installed in areas with high ambient temperature or if regenerative units are mounted side-by-side in a cabinet. In order to ensure reliable overload protection, set parameters L8-35 according to the installation conditions.

■ Parameter Settings

If the ambient temperature is higher than the rating or if regenerative units are installed side by side in the control panel, you must set the L8-12 and L8-35 parameters according to the installation conditions. Derate the output current according to ***Figure A.1***

No.	Name	Description	Setting Value	Default Setting
L8-12	Ambient Temperature Setting	Adjust the Overload (oL2) protection level when the regenerative unit is installed in an environment that exceeds its ambient temperature rating.	-10 to +50	+40°C
L8-35	Installation Method Selection	0: IP00 Open Type Enclosure 1: Side-by-Side Mounting 2: IP20/NEMA Type 1 Enclosure 3: External Heatsink Installation	0 to 3	Default setting is determined by o2-04 (Unit Model Selection).

Setting 0: IP00 Open Type Enclosure

Regenerative unit operation between -10°C and +50°C allows 100% continuous current without derating.

Setting 1: Side-by-Side Mounting

Regenerative unit operation between -10°C and +30°C allows 100% continuous current without derating. Operation between +30°C and +50°C requires output current derating.

Setting 2: IP20/NEMA Type 1 Enclosure

Regenerative unit operation between -10°C and +40°C allows 100% continuous current without derating. Operation between +40°C and +50°C requires output current derating.

Setting 3: External Heatsink Installation

Regenerative unit operation between -10°C and +40°C allows 100% continuous current without derating. Operation between +40°C and +50°C requires output current derating.

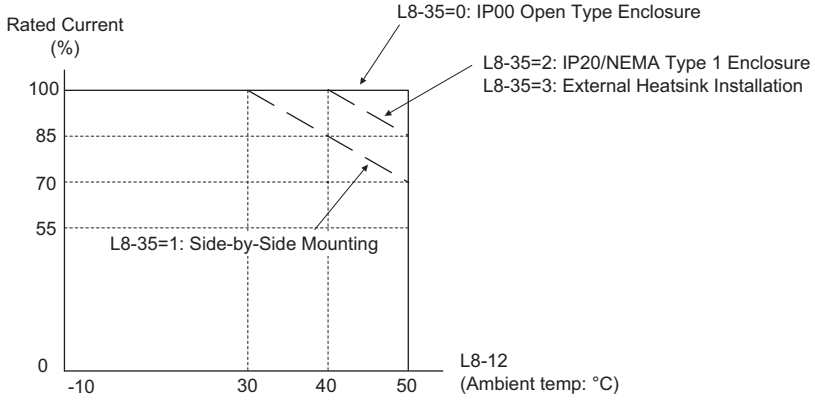


Figure A.1 Ambient Temperature and Installation Method Derating

◆ Altitude Derating

Standard ratings are valid for installation altitudes up to 1000 m. For installations from 1000 m to 3000 m, the regenerative unit rated voltage and the rated output current must be derated by 1% per 100 m.

Appendix: B

Parameter List

This appendix contains a full listing of all parameters and settings available in the regenerative unit.

B.1 Parameter Groups

Parameter Group	Name	Page
A1	Initialization Parameters	*157*
A2	User Parameters	*157*
b1	Operation Mode Selection	*158*
b4	Timer Function	*158*
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F4	Analog Monitor Card (AO-A3)	*159*
F5	Digital Monitor Card (DO-A3)	*160*
F6	Communication Option Card	*160*
H1	Multi-Function Digital Inputs	*161*
H2	Multi-Function Relay Outputs	*162*
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L2	Momentary Power Loss Ride-Thru	*166*

Parameter Group	Name	Page
L5	Fault Restart	*167*
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o1	Digital Operator Display Selection	*168*
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B.2 Parameter Tables

◆ A: Initialization Parameters

The A parameter group creates the operating environment for the regenerative unit. This includes the parameter Access Level, Control Method, Password, User Parameters and more.

RUN : Indicates that the parameter setting can be changed while the regenerative unit is operating.

No. (Address Hex)	Name	LCD Display	Description	Values
A1: Initialization				
A1-00 (100H) RUN <1>	Language Selection	Select Language 0: English 1: ニホンゴ (Japanese) 7: Chinese	0: English 1: Japanese 7: Chinese	Default: 0 Min.: 0 Max.: 7
A1-01 (101H) RUN	Access Level Selection	Access Level 0: Operation Only 1: User Parameters 2: Advanced Level	0: View and set A1-01 and A1-04. U□-□□ parameters can also be viewed. 1: User Parameters (access to a set of parameters selected by the user, A2-01 to A2-32) 2: Advanced Access (access to view and set all parameters)	Default: 2 Min.: 0 Max.: 9999
A1-03 (103H)	Initialize Parameters	Init Parameters 0: No Initialize 1110: User Initialize 2220: 2-Wire Initial 3330: 3-Wire Initial 5550: oPE04 error reset	0: No initialization 1110: User Initialize (parameter values must be stored using parameter o2-03) 2220: 2-Wire initialization 3330: 3-Wire initialization 5550: oPE04 error reset	Default: 0 Min.: 0 Max.: 5550
A1-04 (104H)	Password	Enter Password	When the value set into A1-04 does not match the value set into A1-05, parameters A1-01 through A1-03, A1-06, and A2-01 through A2-33 cannot be changed.	Default: 0000 Min.: 0000 Max.: 9999
A1-05 (105H)	Password Setting	Select Password		
A2: User Parameters				
A2-01 (106H)	User Parameters 1	User Param 1	Recently edited parameters are listed here. The user can also select parameters to appear here for quicker access.	Default: b1-02 Range: A1-00 to o4-19
A2-02 (107H)	User Parameters 2	User Param 2		Default: b1-21 Range: A1-00 to o4-19
A2-03 (108H)	User Parameters 3	User Param 3		Default: – Range: A1-00 to o4-19
A2-04 to A2-32 (109H to 125H)	User Parameters 4 to 32	User Param 4 - 32		Default: – Range: A1-00 to o4-19
A2-33 (126H)	User Parameter Automatic Selection	User Parms Sel 0: Disabled 1: Enabled	Determines whether recently edited parameters are saved to the second half of the User Parameters (A2-17 to A2-32) for quicker access. 0: Parameters A2-01 to A2-32 are reserved for the user to create a list of User Parameters. 1: Save history of recently viewed parameters. Recently edited parameters will be saved to A2-17 through A2-32 for quicker access.	Default: 0 Range: 0 to 1

<1> Parameter setting value is not reset to the default value when the regenerative unit is initialized.

◆ b: Application

Application parameters configure the source of the operation mode selection.

No. (Address Hex)	Name	LCD Display	Description	Values
b1: Operation Mode Selection				
b1-02 (181H)	Run Command Selection 1	Run Source 1 0: Digital operator 1: Digital Inputs 2: Communication 3: Option PCB	0: Digital operator 1: Digital input terminals 2: MEMOBUS/Modbus communications 3: Option PCB	Default: 1 Range: 0 to 3
b1-06 (185H)	Digital Input Reading	Cntl Input Scans 1: Scan 2: Scans	Defines how the digital inputs are read. The inputs are acted upon every 1 ms or 2 ms depending upon the setting. 0: Input status is read once and processed immediately (for quicker response) 1: Input is read twice and processed only if the status is the same in both readings (robust against noisy signals)	Default: 1 Range: 0, 1
b1-08 (187H)	Run Command Selection in Programming Mode	RUN dur PRG Mode 0: Run Disabled@PRG 1: ModeRun Enabled@PRG 2: Prg only @ Stop	Allow the regenerative unit to run while in Programming Mode. 0: Run command is not accepted while in Programming Mode. 1: Run command is accepted while in Programming Mode. 2: Prohibit entering Programming Mode during run.	Default: 0 Range: 0 to 2
b1-17 (1C6H)	Run Command at Power Up	Run Cmd @ Pwr On 0: Cycle Ext Run 1: Accept Ext Run	Determines whether an external Run command that is active during power up will start the regenerative unit. 0: Disregarded. A new Run Command must be issued. 1: Allowed. Regenerative unit will start immediately if Run Command is present at power up.	Default: 0 Range: 0, 1
b1-21 (766H)	Operator Operation Mode	Run Mode Sel 0: Manual Run 1: Auto run	Sets the operation mode when b1-02 (Run Command Selection) is set to 0 (LED operator or LCD operator). 0: Forced operation 1: Automatic operation	Default: 1 Range: 0, 1
b4: Timer Function				
b4-01 (1A3H)	Timer Function On-Delay Time	Delay-ON Timer	Sets the on-delay times for a digital timer output (H2-□□=12). The output is triggered by a digital input programmed to H1-□□=18.	Default: 0.0 s Min.: 0.0 Max.: 3000.0
b4-02 (1A4H)	Timer Function Off-Delay Time	Delay-OFF Timer	Sets the off-delay times for a digital timer output (H2-□□=12). The output is triggered by a digital input programmed to H1-□□=18.	Default: 0.0 s Min.: 0.0 Max.: 3000.0

◆ C: Tuning

Tuning parameters set the voltage increase time, voltage decrease time, carrier frequency, and DC bus voltage control.

No. (Address Hex)	Name	LCD Display	Description	Values
C7: DC Bus Voltage Control				
C7-14 (759H)	Bias Voltage at Operation Start	Vd Bias@Start	Normally, it is not necessary to change the setting of this parameter. Adjusts the level to start regenerative operation for automatic operation. Operation starts when the Voltage Deviation (U1-73) exceeds the sum of C7-14 and C7-15. Operation stops when Voltage Deviation goes below the set value of C7-14.	200 V Class Default: 2.0 Min.: 00.0 Max.: 50.0 400 V Class Default: 4.0 Min.: 0.0 Max.: 100.0
C7-15 (75AH)	Voltage Hysteresis Width at Operation Start/Stop	Vd Hysteresis	Normally, it is not necessary to change the setting of this parameter. Adjusts the level to start regenerative operation for automatic operation. Operation starts when the Voltage Deviation (U1-73) exceeds the sum of C7-14 and C7-15. Operation stops when Voltage Deviation goes below the set value of C7-14.	200 V Class Default: 3.0 Min.: 00.0 Max.: 50.0 400 V Class Default: 6.0 Min.: 0.0 Max.: 100.0
C7-16 (75BH)	Minimum Operation Time	Minimum On Time	Sets the minimum operation time from the start of operation to when operation stops in automatic operation.	Default: 1.00 s Min.: 0.00 Max.: 600.00
C7-43 (112AH)	Input Voltage Offset Adjustment	Vac Bias Adj Sel	There is normally no need to change this parameter from the default value. This parameter is for factory setting. If the setting is not correct, the regenerative unit may be damaged. 0: Standard 1: Start offset adjustment. (The parameter returns to 0 after it is set.) 2: Offset adjustment not required. (The parameter returns to 0 after it is set.)	Default: 0 Range: 0 to 2
C7-50 (113BH)	Operation Ready ON Delay Time	Conv READY delay	Sets the delay time to turn on the Operation Ready signal (H2-□□=6).	Default: 0 ms Min.: 0 Max.: 500
C7-53 (111FH)	Automatic Operation Stop Power	Autorun Power	Sets the power to stop the automatic operation. When in automatic operation, Regenerative unit stops automatic operation when the power becomes lower than regenerative load.	Default: 50% Min.: 0% Max.: 100%

◆ F: Options

F parameters program the regenerative unit for communication options and to function with option cards.

No. (Address Hex)	Name	LCD Display	Description	Values
F4: Analog Monitor Card (AO-A3)				
F4-01 (391H)	Terminal V1 Monitor Selection	AO Ch1 Select	Sets the monitor signal for output from terminal V1. Set this parameter to the last three digits of the desired U□-□□ monitor. Some U parameters are available only in certain control modes.	Default: 0 Min.: 000 Max.: 408

No. (Address Hex)	Name	LCD Display	Description	Values
F4-02 (392H) RUN	Terminal V1 Monitor Gain	AO Ch1 Gain	Sets the gain for voltage output via terminal V1.	Default: 100.0% Min.: -999.9% Max.: 999.9%
F4-03 (393H)	Terminal V2 Monitor Selection	AO Ch2 Select	Sets the monitor signal for output from terminal V2. Set this parameter to the last three digits of the desired U□-□□ monitor. Some U parameters are available only in certain control modes.	Default: 0 Min.: 000 Max.: 408
F4-04 (394H) RUN	Terminal V2 Monitor Gain	AO Ch2 Gain	Sets the gain for voltage output via terminal V2.	Default: 50.0% Min.: -999.9% Max.: 999.9%
F4-05 (395H) RUN	Terminal V1 Monitor Bias	AO Ch1 Bias	Sets the amount of bias added to the voltage output via terminal V1.	Default: 0.0% Min.: -999.9% Max.: 999.9%
F4-06 (396H) RUN	Terminal V2 Monitor Bias	AO Ch2 Bias	Sets the amount of bias added to the voltage output via terminal V2.	Default: 0.0% Min.: -999.9% Max.: 999.9%
F4-07 (397H)	Terminal V1 Signal Level	AO Opt Level Ch1 0: 0-10 VDC 1: -10 +10 VDC	0: 0 to 10 V 1: -10 to 10 V	Default: 0 Min.: 0 Max.: 1
F4-08 (398H)	Terminal V2 Signal Level	AO Opt Level Ch2 0: 0-10 VDC 1: -10 +10 VDC	0: 0 to 10 V 1: -10 to 10 V	Default: 0 Min.: 0 Max.: 1
F5: Digital Output Card (DO-A3)				
F5-01 (399H)	Terminal P1-PC Output Selection	DO Ch1 Select	Sets the function for contact output terminals M1-M2, M3-M4, and photocoupler output terminals P1 through P6.	Default: F Min.: 0 Max.: 160
F5-02 (39AH)	Terminal P2-PC Output Selection	DO Ch2 Select		Default: F Min.: 0 Max.: 160
F5-03 (39BH)	Terminal P3-PC Output Selection	DO Ch3 Select		Default: F Min.: 0 Max.: 160
F5-04 (39CH)	Terminal P4-PC Output Selection	DO Ch4 Select		Default: F Min.: 0 Max.: 160
F5-05 (39DH)	Terminal P5-PC Output Selection	DO Ch5 Select		Default: F Min.: 0 Max.: 160
F5-06 (39EH)	Terminal P6-PC Output Selection	DO Ch6 Select		Default: F Min.: 0 Max.: 160
F5-07 (39FH)	Terminal M1-M2 Output Selection	DO Ch7 Select		Default: F Min.: 0 Max.: 160
F5-08 (3A0H)	Terminal M3-M4 Output Selection	DO Ch8 Select		Default: F Min.: 0 Max.: 160
F6: Communication Option Card For details on a specific option card, refer to the instruction manual for the option card.				

◆ H: Multi-Function Terminals

H parameters assign functions to the multi-function input and output terminals.

No. (Address Hex)	Name	LCD Display	Description	Values
H1: Multi-Function Digital Inputs				
H1-01 (438H)	Multi-Function Digital Input Terminal S1 Function Selection	Term S1 Func Sel	Assigns a function to the multi-function digital inputs S1 to S8. **Note:** Set unused terminals to F.	Default: 3C Min.: 1 Max.: 67
H1-02 (439H)	Multi-Function Digital Input Terminal S2 Function Selection	Term S2 Func Sel		Default: 3D Min.: 1 Max.: 67
H1-03 (400H)	Multi-Function Digital Input Terminal S3 Function Selection	Term S3 Func Sel		Default: 24 Min.: 0 Max.: 67
H1-04 (401H)	Multi-Function Digital Input Terminal S4 Function Selection	Term S4 Func Sel		Default: 14 Min.: 0 Max.: 67
H1-05 (402H)	Multi-Function Digital Input Terminal S5 Function Selection	Term S5 Func Sel		Default: F Min.: 0 Max.: 67
H1-06 (403H)	Multi-Function Digital Input Terminal S6 Function Selection	Term S6 Func Sel		Default: F Min.: 0 Max.: 67
H1-07 (404H)	Multi-Function Digital Input Terminal S7 Function Selection	Term S7 Func Sel		Default: F Min.: 0 Max.: 67
H1-08 (405H)	Multi-Function Digital Input Terminal S8 Function Selection	Term S8 Func Sel		Default: 8 Min.: 0 Max.: 67

H1 Multi-Function Digital Input Selections			
H1-☐☐ Setting	Function	LCD Display	Description
1	LOCAL/REMOTE selection	Local/Remote Sel	Open: REMOTE (parameter settings determine the source of the frequency Reference 1 or 2 (b1-01, b1-02 or b1-15, b1-16) Closed: LOCAL, Frequency reference and Run command are input from the digital operator
8	Baseblock command (N.O.)	Ext BaseBlk N.O.	Closed: No output
9	Baseblock command (N.C.)	Ext BaseBlk N.C.	Open: No output
C	Analog terminal input selection	Term A2 Enable	Open: Function assigned by H3-14 is disabled. Closed: Function assigned by H3-14 is enabled.
F	Through mode	Term Not Used	Select this setting when using the terminal in a pass-through mode.
14	Fault reset	Fault Reset	Closed: Resets faults if the cause is closed and the Run command is removed.
18	Timer function input	Timer function	Triggers the timer set up by parameters b4-01 and b4-02. Must be set in conjunction with the timer function output (H2-☐☐ = 12).

H1 Multi-Function Digital Input Selections			
H1-☐☐ Setting	**Function**	**LCD Display**	**Description**
1B	Program lockout	Program Lockout	Open: Parameters cannot be edited (except for U1-01 if the reference source is assigned to the digital operator). Closed: Parameters can be edited and saved.
24 to 27 2C to 2F	External fault	External fault 24: NO/ Always Det, Coast to Stop 25: NC/Always Det, Coast to Stop 26: NO/During RUN, Coast to Stop 27: NC/During RUN, Coast to Stop 2C: NO/Always Det, Alarm Only 2D: NC/Always Det, Alarm Only 2E: NO/ During RUN, Alarm Only 2F: NC/During RUN, Alarm Only	24: N.O., Always detected, coast to stop 25: N.C., Always detected, coast to stop 26: N.O., During run, coast to stop 27: N.C., During run, coast to stop 2C: N.O., Always detected, alarm only (continue running) 2D: N.C., Always detected, alarm only (continue running) 2E: N.O., During run, alarm only (continue running) 2F: N.C., During run, alarm only (continue running)
3C	Forced Operation Command	Manual Run	Closed: Starts the operation of the regenerative unit.
3D	Automatic Operation Command	Auto Run	Closed: The regenerative unit starts to operate when the voltage of the bus increases (i.e., when a regenerative state is reached).
47	Node Setup	Node SetUp	Closed: Node setup for SI-S3 enabled.
67	Communications test mode	Comm Test Mode	Tests the MEMOBUS/Modbus RS-422/RS-485 interface. Displays “PASS” if the test completes successfully.

No. (Address Hex)	Name	LCD Display	Description	Values
H2: Multi-Function Relay Outputs				
H2-01 (40BH)	Terminal M1-M2 function selection (Relay)	M1-M2 Func Sel	Refer to ***H2 Multi-Function Relay Output Settings on page 162*** for a description of setting values. **Note:** Set unused terminals to F.	Default: 26 Min.: 0 Max.: 160
H2-02 (40CH)	Terminal M3-M4 Function Selection (Relay)	P1/PC Func Sel		Default: 6 Min.: 0 Max.: 160
H2-03 (40DH)	Terminal M5-M6 Function Selection (Relay)	P2/PC Func Sel		Default: 25 Min.: 0 Max.: 160
H2-06 (437H)	kWh Monitor Pulse Output Unit Selection	Pwr Mon Unit Sel 1: 1 kWh units 2: 10 kWh units 3: 100 kWh units 4: 1000 kWh units	Select the output unit of the multi-function contact when H2-01 to H2-03 is set to 3A. 1: 1 kWh 2: 10 kWh 3: 100 kWh 4: 1000 kWh	Default: 1 Min.: 1 Max.: 4

H2 Multi-Function Relay Output Settings			
H2-☐☐ Setting	**Function**	**LCD Display**	**Description**
0	During run	During RUN 1	Closed: A Run command is active or voltage is output.
6	Operation Ready	Drive Ready	Closed: Power up is complete and the regenerative unit is ready to accept a Run command.
7	DC bus undervoltage	DC Bus Undervolt	Closed: DC bus voltage is below the Uv trip level set in L2-05.

H2 Multi-Function Relay Output Settings			
H2-☐☐ Setting	**Function**	**LCD Display**	**Description**
8	During baseblock (N.O.)	BaseBlk 1	Closed: Regenerative unit has entered the baseblock state (no regeneration).
E	Fault	Fault	Closed: Fault occurred.
F	Through mode	Not Used	Set this value when using the terminal in the pass-through mode.
10	Minor fault	Minor Fault	Closed: An alarm has been triggered.
11	Fault reset command active	Reset Cmd Active	Closed: A command has been entered to clear a fault via the input terminals or from the serial network.
12	Timer output	Timer Output	Closed: Timer output.
1B	During baseblock (N.C.)	BaseBlk 2	Open: Regenerative unit has entered the baseblock state (no regeneration).
1D	During Regeneration	Regenerating	Closed: Motor is regenerating energy into the regenerative unit.
1E	Restart enabled	Dur Flt Restart	Closed: An automatic restart is performed
20	Heatsink Overheat (oH) pre-alarm	OH Prealarm	Closed: Heatsink temperature exceeds the parameter L8-02 value.
24	Fuse Blowout Detection	FUA/FUD Detect	Closed: Fuse burnout detected.
25	During Run 1	During RUN 1	Closed: The drive is ready to operate.
26	During MC ON	MC On	Closed: The magnetic contactor is closed.
27	Overload (oL2) Warning	OL2 Pre-alarm	Closed: There is an overload warning.
2F	Maintenance Period	Maintenance	Closed: It is time to perform maintenance on the cooling fan, electrolytic capacitor, and inrush prevention relay.
3A	kWh Monitor Pulse Output	Power (Produced)	Set the unit in H2-06. Multi-function output is ON for 200 ms depending on the unit selected in H2-06.
3B	Alarm 2	Minor Fault 2	Closed: Alarm occurred (excluding Uv, AUv, Fdv, SrC, and PAUv). **Note:** This setting is available in regenerative unit software versions PRG:2003 or later.
3C	LOCAL/REMOTE status	Local	Open: REMOTE Closed: LOCAL
4D	oH Pre-alarm time limit	OH Pre-Alarm	Closed: oH pre-alarm time limit has passed.
60	Internal cooling fan alarm	Fan Alrm Det	Closed: Internal cooling fan alarm
100 to 160	Function 0 to 60 with inverse output	–	Inverts the output switching of the multi-function output functions. Set the last two digits of 1☐☐ to reverse the output signal of that specific function.

No. (Address Hex)	Name	LCD Display	Description	Values
H3: Multi-Function Analog Inputs				
H3-01 (410H)	Terminal A1 Signal Level Selection	Term A1 Level 0: 0-10V, (LowLim=0) 1: 0-10V, (BipolRef)	0: 0 to 10 V 1: -10 to 10 V	Default: 0 Min.: 0 Max.: 1
H3-02 (434H)	Terminal A1 Function Selection	Term A1 FuncSel	Sets the function of terminal A1.	Default: F Min.: F Max.: F
H3-03 (411H) RUN	Terminal A1 Gain Setting	Terminal A1 Gain	Sets the level of the input value selected in H3-02 when 10 V is input at terminal A1.	Default: 100.0% Min.: -999.9% Max.: 999.9%
H3-04 (412H) RUN	Terminal A1 Bias Setting	Terminal A1 Bias	Sets the level of the input value selected in H3-02 when 0 V is input at terminal A1.	Default: 0.0% Min.: -999.9% Max.: 999.9%

No. (Address Hex)	Name	LCD Display	Description	Values
H3-05 (413H)	Terminal A3 Signal Level Selection	Term A3 Signal 0: 0-10V (LowLim=0) 1: 0-10V (BipolRef)	0: 0 to 10 V 1: -10 to 10 V	Default: 0 Min.: 0 Max.: 1
H3-06 (414H)	Terminal A3 Function Selection	Terminal A3 Sel	Sets the function of terminal A3.	Default: F Min.: F Max.: F
H3-07 (415H) RUN	Terminal A3 Gain Setting	Terminal A3 Gain	Sets the level of the input value selected in H3-06 when 10 V is input at terminal A3.	Default: 100.0% Min.: -999.9% Max.: 999.9%
H3-08 (416H) RUN	Terminal A3 Bias Setting	Terminal A3 Bias	Sets the level of the input value selected in H3-06 when 0 V is input at terminal A3.	Default: 0.0% Min.: -999.9% Max.: 999.9%
H3-09 (417H)	Terminal A2 Signal Level Selection	Term A2 Level 0: 0-10V, (LowLim=0) 1: 0-10V, (BipolRef) 2: 4-20 mA 3: 0-20 mA	0: 0 to 10 V 1: -10 to 10 V 2: 4 to 20 mA 3: 0 to 20 mA **Note:** Use DIP switch S1 to set input terminal A2 for a current or a voltage input signal.	Default: 2 Min.: 0 Max.: 3
H3-10 (418H)	Terminal A2 Function Selection	Term A2 FuncSel	Sets the function of terminal A2.	Default: F Min.: F Max.: F
H3-11 (419H) RUN	Terminal A2 Gain Setting	Terminal A2 Gain	Sets the level of the input value selected in H3-10 when 10 V (20 mA) is input at terminal A2.	Default: 100.0% Min.: -999.9% Max.: 999.9%
H3-12 (41AH) RUN	Terminal A2 Bias Setting	Terminal A2 Bias	Sets the level of the input value selected in H3-10 when 0 V (0 or 4 mA) is input at terminal A2.	Default: 0.0% Min.: -999.9% Max.: 999.9%
H3-13 (41BH)	Analog Input Filter Time Constant	A1/A2 Filter T	Sets a primary delay filter time constant for terminals A1, A2, and A3. Used for electrical noise filtering.	Default: 0.03 s Min.: 0.00 s Max.: 2.00 s
H3-14 (41CH)	Analog Input Terminal Enable Selection	A1/A2 Sel 1: A1 Available 2: A2 Available 3: A1/A2 Available 4: A3 Available 5: A1/A3 Available 6: A2/A3 Available 7: All Available	Determines which analog input terminals will be enabled when a digital input programmed for “Analog input enable” (H1-□□ = C) is activated. 1: Terminal A1 only 2: Terminal A2 only 3: Terminals A1 and A2 only 4: Terminal A3 only 5: Terminals A1 and A3 6: Terminals A2 and A3 7: All terminals enabled	Default: 7 Min.: 1 Max.: 7

H3 Analog Output Settings			
H3-□□ Setting	Function	LCD Display	Description
F	Through mode	Through mode	Set this value when using the terminal in the pass-through mode.

No. (Address Hex)	Name	LCD Display	Description	Values
H4: Analog Outputs				
H4-01 (41DH)	Terminal FM Monitor Selection	Term FM FuncSel	Selects the data to be output through terminal FM. Set the desired monitor parameter to the digits available in U☐-☐☐. For example, enter “154” for U1-54.	Default: 157 Min.: 000 Max.: 408
H4-02 (41EH) RUN	Terminal FM Monitor Gain	Terminal FM Gain	Sets the signal level at terminal FM that is equal to 100% of the selected monitor value.	Default: 100.0% Min.: -999.9% Max.: 999.9%
H4-03 (41FH) RUN	Terminal FM Monitor Bias	Terminal FM Bias	Sets the signal level at terminal FM that is equal to 0% of the selected monitor value.	Default: 0.0% Min.: -999.9% Max.: 999.9%
H4-04 (420H)	Terminal AM Monitor Selection	Terminal AM Sel	Selects the data to be output through terminal AM. Set the desired monitor parameter to the digits available in U☐-☐☐. For example, enter “154” for U1-54.	Default: 155 Min.: 000 Max.: 408
H4-05 (421H) RUN	Terminal AM Monitor Gain	Terminal AM Gain	Sets the signal level at terminal AM that is equal to 100% of the selected monitor value.	Default: 50.0% Min.: -999.9% Max.: 999.9%
H4-06 (422H) RUN	Terminal AM Monitor Bias	Terminal AM Bias	Sets the signal level at terminal AM that is equal to 0% of the selected monitor value.	Default: 0.0% Min.: -999.9% Max.: 999.9%
H4-07 (423H)	Terminal FM Signal Level Selection	Level Select1 0: 0-10 VDC 1: -10 +10 VDC 2: 4-20 mA	Sets the signal level at terminal FM. 0: 0 to 10 V 1: -10 to 10 V 2: 4 to 20 mA	Default: 0 Min.: 0 Max.: 1
H4-08 (424H)	Terminal AM Signal Level Selection	AO Level Select2 0: 0-10 VDC 1: -10 +10 VDC 2: 4-20 mA	Sets the signal level at terminal AM. 0: 0 to 10 V 1: -10 to 10 V 2: 4 to 20 mA	Default: 0 Min.: 0 Max.: 1
H5: MEMOBUS/Modbus Serial Communication **Note:** Restart the drive to enable MEMOBUS/Modbus communication settings.				
H5-01 (0425)	Drive Slave Address	Serial Comm Adr	Selects drive station node number (address) for MEMOBUS/ Modbus terminals R+, R-, S+, S-. Cycle power for the setting to take effect.	Default: 1F (Hex) Min.: 0 Max.: FF
H5-02 (0426)	Communication Speed Selection	Serial Baud Rate 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	0: 1200 bps 1: 2400 bps 2: 4800 bps 3: 9600 bps 4: 19200 bps 5: 38400 bps 6: 57600 bps 7: 76800 bps 8: 115200 bps Cycle power for the setting to take effect.	Default: 3 Range: 0 to 8
H5-03 (0427)	Communication Parity Selection	Serial Com Sel 0: No Parity 1: Even Parity 2: Odd Parity	0: No parity 1: Even parity 2: Odd parity Cycle power for the setting to take effect.	Default: 0 Range: 0 to 2
H5-04 (0428)	Stopping Method after Communication Error	Serial Fault Sel 0: Ramp to Stop 1: Coast to Stop 3: Alarm Only	0: Ramp to stop 1: Coast to stop 3: Alarm only	Default: 3 Range: 1, 3

No. (Address Hex)	Name	LCD Display	Description	Values
H5-05 (0429)	Communication Fault Detection Selection	Serial Flt Dtct 0: Disabled 1: Enabled	0: Disabled 1: Enabled. If communication is lost for more than two seconds, a CE fault will occur.	Default: 1 Range: 0, 1
H5-06 (042A)	Drive Transmit Wait Time	Transmit WaitTIM	Set the wait time between receiving and sending data.	Default: 5 ms Min.: 5 Max.: 65
H5-07 (042B)	RTS Control Selection	RTS Control Sel 0: Disabled 1: Enabled	0: Disabled. RTS is always on. 1: Enabled. RTS turns on only when sending.	Default: 1 Range: 0, 1
H5-09 (0435)	Communications Fault Detection Time	CE Detect Time	Sets the time required to detect a communications error. Adjustment may be needed when networking several drives.	Default: 2.0 s Min.: 0.0 Max.: 10.0
H5-11 (043C)	Communications ENTER Function Selection	Enter CommandSel 0: Enter Required 1: No EnterRequired	0: Drive requires an Enter command before accepting any changes to parameter settings. 1: Parameter changes are activated immediately without the Enter command (same as V7).	Default: 1 Range: 0, 1

◆ L: Protection Function

Protection function parameters set momentary power loss processing, fault retries, and hardware protection.

No. (Address Hex)	Name	LCD Display	Description	Values
L2: Momentary Power Loss Ride-Thru				
L2-01 (485H)	Momentary Power Loss Operation Selection	PwrL Selection 0: Disabled 1: Enbl with Timer 2: Enbl whl CPU act	0: Disabled. Regenerative unit trips on Uv1 fault when power is lost. 1: Recover within the time set in L2-02. Uv1 will be detected if power loss is longer than L2-02. 2: Recover as long as CPU has power. Uv1 is not detected. **Note:** Even if L2-01 is set to 1 or 2, the R1000 may detect a fault if momentary power loss occurs during regeneration.	Default: 0 Min.: 0 Max.: 2
L2-02 (486H)	Momentary Power Loss Ride-Thru Time	PwrL Ridethru t	Sets the Power Loss Ride-Thru time. Enabled only when L2-01 = 1 or 3.	Default: <2> Min.: 0.0 s Max.: 25.5 s
L2-05 (489H)	Undervoltage Detection Level (Uv)	PUV Det Level	There is normally no need to change this parameter from the default value.	200 V Class Default: 190 V Min.: 150 V Max.: 210 V 400 V Class Default: 380 V Min.: 300 V Max.: 420 V
L2-21 (4D5H)	AUv Detection Level	AC UV Level	Sets the undervoltage detection level for power supply voltage (AC) in volts.	200 V Class Default: 150 V Min.: 100 V Max.: 200 V 400 V Class Default: 300 V Min.: 200 V Max.: 400 V
L2-38 (11E3H)	Power Supply Frequency Excessive Deviation Pre-alarm	pFDV DetectCount	Sets the number of times the regenerative unit detecting PFDv (Power Supply Frequency Excessive Deviation Pre-alarm). Disabled when set to 0.	Default: 4 Min.: 0 Max.: 30

No. (Address Hex)	Name	LCD Display	Description	Values
L5: Fault Restart				
L5-01 (49EH)	Number of Auto Restart Attempts	Num of Restarts	Sets the number of times the regenerative unit may attempt to restart after the following faults occur: GF, oC, oL2, ov, Uv1.	Default: 0 time Min.: 0 time Max.: 10 times
L5-02 (49FH)	Auto Restart Fault Output Operation Selection	Restart Sel 0: Flt Outp Disabld 1: Flt Outp Enabled	0: Fault output not active. 1: Fault output active during restart attempt.	Default: 0 Min.: 0 Max.: 1
L5-04 (4A0H)	Fault Reset Interval Time	Flt Reset Wait T	Sets the amount of time to wait between performing fault restarts.	Default: 10.0 s Min.: 0.5 s Max.: 600.0 s
L5-05 (46CH)	Fault Reset Operation Selection	Fault Reset Sel 0: Continuous 1: Use L5-04 Time	0: Continuously attempt to restart while incrementing restart counter only at a successful restart. 1: Attempt to restart with the interval time set in L5-04 and increment the restart counter with each attempt.	Default: 0 Min.: 0 Max.: 1
L8: Drive Protection				
L8-02 (4AEH)	Overheat Alarm Level	OH Pre-Alarm Lvl	An overheat alarm occurs when heatsink temperature exceeds the L8-02 level.	Default: <2> Min.: 50°C Max.: 150°C
L8-03 (4AFH)	Overheat Pre-Alarm Operation Selection	OH Pre-Alarm Sel 0: Ramp to stop 3: Alarm only	0: Ramp to stop. A fault is triggered. 3: Continue operation. An alarm is triggered.	Default: 3 Min.: 1 Max.: 3
L8-07 (4B3H)	Input Phase Loss (PF3) Protection Selection	Phase Loss Det	0: Disabled 1: Enabled	Default: 1 Min.: 0 Max.: 1
L8-10 (4B6H)	Heatsink Cooling Fan Operation Selection	Fan On/Off Sel 0: Dur Run (OffDly) 1: Always On	0: During run only. Fan operates only during run for L8-11 seconds after stop. 1: Fan always on. Cooling fan operates whenever the regenerative unit is powered up.	Default: 0 Min.: 0 Max.: 1
L8-11 (4B7H)	Heatsink Cooling Fan Off Delay Time	Fan Delay Time	Sets a delay time to shut off the cooling fan after the Run command is removed when L8-10 = 0.	Default: 60 s Min.: 0 s Max.: 300 s
L8-12 (4B8H)	Ambient Temperature Setting	Ambient Temp	Enter the ambient temperature. This value adjusts the oL2 detection level.	Default: 40°C Min.: -10°C Max.: 50°C
L8-35 (4ECH)	Installation Method Selection	Installation Sel 0: IP00/OpenChassis 1: Side-by-Side 2: IP20/NEMA Type 1 3: ExternalHeatsink	0: IP00 Open Type Enclosure 1: Side-by-Side Mounting 2: IP20/NEMA Type 1 3: External Heatsink Installation	Default: <2> Min.: 0 Max.: 3
L8-41 (4F2H)	High Current Alarm Selection	High Cur Alm Sel 0: Disabled 1: Enabled	0: Disabled 1: Enabled. An alarm is triggered at output currents above 150% of regenerative unit rated current.	Default: 0 Min.: 0 Max.: 1
L8-65 (66FH)	Power Supply Fault Detection Selection	Vpn Ripple Sel 0: Disabled 1: Coast to Stop 2: Alarm Only	There is normally no need to change this parameter from the default value. Monitors the ripple of DC BUS voltage and detects Input Power Supply Fault(PF2) when the ripple is too bad. 0: No detection 1: Stop operation (fault) 2: Continue operation (minor fault)	Default: 0 Min.: 0 Max.: 2

No. (Address Hex)	Name	LCD Display	Description	Values
L8-66 (670H)	Power Supply Fault Detection Voltage Level	Vpn Ripple Lvl	There is normally no need to change this parameter from the default value. The main circuit DC voltage ripple is monitored in a cycle of 200 ms. If the difference between the maximum and minimum values of the ripple exceeds the value that is set in L8-66 for the number of times that is set in L8-67, a power supply fault is detected.	200 V Class Default: <2> Min.: 1 Max.: 200 400 V Class Default: <2> Min.: 1 Max.: 200
L8-67 (671H)	Number of Times of Power Supply Fault for Detection	Vpn Ripple Cnt		Default: 5 Min.: 1 Max.: 10
L8-69 (673H)	Input Phase Loss Protection Selection 3	AC Phase Imb Det 0: Disabled 1: Enabled	Sets whether to enable or disable the protective function for the regenerative unit when there is an input phase loss. 0: Disabled 1: Enabled (Detect input phase loss and power supply imbalance.)	Default: 1 Min.: 0 Max.: 1

<2> Default setting is dependent on parameter o2-04, Unit Model Selection.

◆ o: Operator-Related Settings

The o parameters set up the digital operator displays.

No. (Address Hex)	Name	LCD Display	Description	Values
o1: Digital Operator Display Selection				
o1-01 (500H) RUN	Drive Mode Monitor Selection	User Monitor Sel	When the power supply is turned on, the operator will display the following in order: DC Bus Voltage Feedback Reference, Input Voltage, Power Supply Current, Power Supply Power, Power Supply Frequency, and U1-□□. The o1-01 parameter sets the item to display instead of the output voltage. The o1-02 parameter sets the item to display at power up.	Default: 158 (Monitor U1-58) Min.: 110 Max.: 914
o1-02 (501H) RUN	User Monitor Selection after Power Up	Power-On Monitor 1: Frequency Ref 2: FWD/REV 3: Output Freq 4: Output Current 5: User Monitor	Selects the information displayed on the digital operator when the power is turned on. 1: Output Voltage Feedback 2: Input Voltage 3: Power Supply Current 4: Power Supply Power 5: User monitor item set in o1-01	Default: 1 Min.: 1 Max.: 5
o1-05 (504H) RUN <7>	LCD Contrast Control	LCD Contrast	Sets the brightness of the LCD operator.	Default: 3 Min.: 0 Max.: 5
o2: Digital Operator Keypad Functions				
o2-01 (505H)	LO/RE Key Function Selection	LO/RE Key	0: Disabled 1: Enabled. LO/RE key switches between LOCAL and REMOTE operation.	Default: 1 Min.: 0 Max.: 1
o2-02 (506H)	STOP Key Function Selection	Oper STOP Key 0: Disabled 1: Enabled	0: Disabled. STOP key is disabled in REMOTE operation. 1: Enabled. STOP key is always enabled.	Default: 1 Min.: 0 Max.: 1

No. (Address Hex)	Name	LCD Display	Description	Values
o2-03 (507H)	User Parameter Default Value	User Default Sel 0: No Change 1: Save User Init 2: Clear User Init	0: No change. 1: Set defaults. Saves parameter settings as default values for a User Initialization. 2: Clear all. Clears the default settings that have been saved for a User Initialization.	Default: 0 Min.: 0 Max.: 2
o2-04 (508H)	Unit Model Selection	Inverter Model #	Enter the regenerative unit model. Setting required only if installing a new control board.	Default: Determined by unit capacity. Min.: – Max.: –
o2-06 (50AH)	Operation Selection when Digital Operator is Disconnected	Oper Discon Det 0: Disabled 1: Enabled	Determines the operation when the digital operator is disconnected. 0: The regenerative unit continues operating if the digital operator is disconnected. 1: A fault is triggered (oPr) and the motor coasts to stop.	Default: 1 Min.: 0 Max.: 1
o2-09 (50DH)	Reserved	–	–	–
o2-21 (81AH)	Unit Check	US signal check 0: Nomal 1: Start	Sets the operation for Unit Capacity Setting Error (oPE01). Set this parameter to 1 to reset an oPE01 fault without cycling the power supply. 0: Standard 1: Recheck regenerative unit (The parameter returns to 0 after it is set.)	Default: 0 Min.: 0 Max.: 1
o3: Copy Function				
o3-01 (515H)	Copy Function Selection	COPY SELECT 0: COPY SELECT 1: INV→OP READ 2: OP→INV WRITE 3: OP←→INV VERIFY	0: No action 1: Read parameters from the regenerative unit, saving them onto the digital operator. 2: Copy parameters from the digital operator, writing them to the regenerative unit. 3: Verify parameter settings on the regenerative unit to check if they match the data saved on the operator.	Default: 0 Min.: 0 Max.: 3
o3-02 (516H)	Copy Allowed Selection	Read Allowable 0: Disabled 1: Enabled	0: Read operation prohibited 1: Read operation allowed	Default: 0 Min.: 0 Max.: 1
o4: Maintenance Monitor Settings				
o4-01 (50BH)	Cumulative Operation Time Setting	DrvElapsTimeCnt	Sets the value for the cumulative operation time of the regenerative unit in units of 10 h.	Default: 0 Min.: 0 Max.: 9999
o4-02 (50CH)	Cumulative Operation Time Selection	ElapsTimeCntSet 0: Power-On Time 1: Running Time	0: Logs power-on time 1: Logs operation time when the regenerative unit output is active (output operation time).	Default: 0 Min.: 0 Max.: 1
o4-03 (50EH)	Cooling Fan Operation Time Setting	FanElapsTimeCn	Sets the value of the fan operation time monitor U4-03 in units of 10 h.	Default: 0 Min.: 0 Max.: 9999
o4-05 (51DH)	Capacitor Maintenance Setting	BusCap Maint Set	Sets the value of the Maintenance Monitor for the capacitors. See U4-05 to check when the capacitors may need to be replaced.	Default: 0% Min.: 0% Max.: 150%
o4-07 (523H)	DC Bus Pre-Charge Relay Maintenance Setting DC Bus Pre-Charge Relay Maintenance Setting	ChrgCircMaintSet	Sets the value of the Maintenance Monitor for the soft charge bypass relay. See U4-06 to check when the bypass relay may need to be replaced.	Default: 0% Min.: 0% Max.: 150%
o4-11 (510H)	U2, U3 Initialization	Fault Data Init 0: No Reset 1: Reset	0: U2-□□ and U3-□□ monitor data is not reset when the regenerative unit is initialized (A1-03). 1: U2-□□ and U3-□□ monitor data is reset when the regenerative unit is initialized (A1-03).	Default: 0 Min.: 0 Max.: 1

No. (Address Hex)	Name	LCD Display	Description	Values
o4-12 (512H)	kWh Monitor Initialization	kWh Monitor Init 0: No Reset 1: Reset	0: U4-10 and U4-11 monitor data is not reset when the regenerative unit is initialized (A1-03). 1: U4-10 and U4-11 monitor data is reset when the regenerative unit is initialized (A1-03).	Default: 0 Min.: 0 Max.: 1
o4-13 (528H)	Number of Run Commands Counter Initialization	Run Counter Init 0: No Reset 1: Reset	0: Number of Run commands counter is not reset when the regenerative unit is initialized (A1-03). 1: Number of Run commands counter is reset when the regenerative unit is initialized (A1-03).	Default: 0 Min.: 0 Max.: 1
o4-19 (113AH)	Power Unit Price	Cost per 1 kWh	This parameter is used to calculate the power rate that is displayed for User Monitors U9-07 through U9-14. Set the price per 1 kWh.	Default: 000.00 Min.: 000.00 Max.: 650.00

<3> Default setting is dependent on parameter o2-09.
<7> Parameter is available in software versions PRG: 2003 and later.

◆ U: Monitors

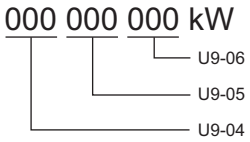
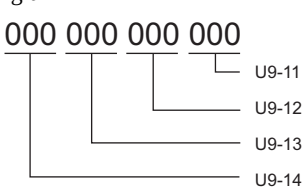
Monitor parameters allow the user to view regenerative unit status, fault information, and other data concerning regenerative unit operation.

No. (Address Hex)	Name	LCD Display	Description	Analog Output Level	Unit
U1: Operation Status Monitors					
U1-10 (49H)	Input Terminal Status	Input Term Sts	Displays the input terminal status. U1-10=00000000 1: ON 0: OFF Digital input 1 (terminal S1 enabled) Digital input 2 (terminal S2 enabled) Digital input 3 (terminal S3 enabled) Digital input 4 (terminal S4 enabled) Digital input 5 (terminal S5 enabled) Digital input 6 (terminal S6 enabled) Digital input 7 (terminal S7 enabled) Digital input 8 (terminal S8 enabled)	No signal output available	–
U1-11 (4AH)	Output Terminal Status	Output Term Sts	Displays the output terminal status. U1-11=00000000 1: ON 0: OFF Multi-Function Relay Output (terminal M1-M2) Multi-Function Relay Output (terminal M3-M4) Multi-Function Relay Output (terminal M5-M6) Reserved Fault Relay (terminal MA/MB-MC closed MA/MB-MC open)	No signal output available	–

No. (Address Hex)	Name	LCD Display	Description	Analog Output Level	Unit
U1-12 (4BH)	Drive Status	Int Ctl Sts 1	Verifies the regenerative unit operation status. U1-12=00000000 Bit 0: During RUN Bit 1: Reserved Bit 2: Reserved Bit 3: Fault reset signal input Bit 4: Power supply established (0: Not completed, 1: Completed) Bit 5: Operation ready Bit 6: Minor fault detected Bit 7: Fault detected	No signal output available	–
U1-13 (4EH)	Terminal A1 Input Level	Term A1 Level	Displays the signal level to analog input terminal A1.	10 V: 100%	0.1%
U1-14 (4FH)	Terminal A2 Input Level	Term A2 Level	Displays the signal level to analog input terminal A2.	10 V: 100%	0.1%
U1-15 (50H)	Terminal A3 Input Level	Term A3 Level	Displays the signal level to analog input terminal A3.	10 V: 100%	0.1%
U1-18 (61H)	oPE Fault Parameter	OPE Error Code	Displays the parameter number that caused the oPE02 or oPE08 operation error.	No signal output available	–
U1-19 (66H)	MEMOBUS/ Modbus Error Code	Transmit Err	Displays the contents of a MEMOBUS/Modbus error. U1-19=00000000 1 CRC Error 1 Data Length Error 0 Not Used 1 Parity Error 1 Overrun Error 1 Framing Error 1 Timed Out 0 Not Used	No signal output available	–
U1-25 (4DH)	Software Number (Flash)	CPU 1 SW Number	FLASH ID	No signal output available	–
U1-26 (5BH)	Software No. (ROM)	CPU 2 SW Number	ROM ID	No signal output available	–
U1-27 (7A8H)	Message ID (OPR)	MessageID (OPR)	Shows the message ID number for OPE.	No signal output available	–
U1-28 (7A9H)	Message ID (INV)	MessageID (INV)	Shows the message ID number for INV.	No signal output available	–
U1-52 (1081H)	DC Bus Voltage Feedback	DC V Feedback	Shows the DC bus voltage feedback value.	200 V Class 10 V: 400 V 400 V Class 10 V: 800 V	1 V
U1-54 (1083H)	Power Supply Voltage	AC Voltage	Shows the power supply voltage.	200 V Class 10 V: 400 V 400 V Class 10 V: F800 V	1 V
U1-55 (1084H)	Power Supply Current	AC Current	Shows the current on the power supply side.	10 V: Rated Input Current	1 A

No. (Address Hex)	Name	LCD Display	Description	Analog Output Level	Unit
U1-57 (1086H)	Power Supply Side Power	AC Power	Shows the power on the power supply side.	10 V: Rated power (input side)	1 kW
U1-58 (1087H)	Power Supply Frequency	AC Frequency	Shows the frequency on the power supply side.	10 V: Rated Frequency	0.1 Hz
U1-72 (1095H)	Input Power Supply Information	AC Supply Status	Shows information on the input power supply. U1-72=00000000 Bit 0: AUv reset. (0: Not completed, 1: Reset) Bit 1: PF3 reset (0: Not completed, 1: Reset) Bit 2: Rated frequency detection (0: Not completed, 1: Completed) Bit 3: Phase order detection (0: Not completed, 1: Completed) Bit 4: Power supply established (0: Not completed, 1: Completed) Bit 5: Fdv detection (0: Not detected, 1: Detected) Bit 6: PF3 detection (0: Not detected, 1: Detected) Bit 7: Reserved.	No signal output available	–
U1-73 (1096H)	Voltage Deviation	V deviation	Shows the deviation between the DC bus voltage and the power supply voltage. Deviation = Bus voltage (U1-52) $\sqrt{2}$ – Power supply voltage (U1-54) If automatic operation is enabled, operation starts when the voltage increases to this value	No signal output available	1
U2: Fault Trace					
U2-01 (80H)	Current Fault	Current Fault	Displays the current fault.	No signal output available	–
U2-02 (81H)	Previous Fault	Last Fault	Displays the previous fault.	No signal output available	–
U2-11 (8AH)	Input Terminal Status at Previous Fault	Input Term Sts	Displays the input terminal status at the previous fault. Displayed as in U1-10.	No signal output available	–
U2-12 (8BH)	Output Terminal Status at Previous Fault	Output Term Sts	Displays the output status at the previous fault. Displays the same status displayed in U1-11.	No signal output available	–
U2-13 (8CH)	Drive Operation Status at Previous Fault	Inverter Status	Displays the operation status of the regenerative unit at the previous fault. Displays the same status displayed in U1-12.	No signal output available	–
U2-14 (8DH)	Cumulative Operation Time at Previous Fault	Elapsed time	Displays the cumulative operation time at the previous fault.	No signal output available	1 h
U2-20 (8EH)	Heatsink Temperature at Previous Fault	Actual Fin Temp	Displays the temperature of the heatsink when the most recent fault occurred.	No signal output available	1°C
U2-52 (841H)	DC Bus Voltage Feedback at Previous Fault	DC V Feedback	Shows the DC bus voltage feedback value.	No signal output available	1 V
U2-54 (843H)	Power Supply Voltage at Previous Fault	AC Voltage	Shows the power supply voltage.	No signal output available	1 V
U2-57 (846H)	Power Supply Side Power at Previous Fault	AC Power	Shows the power on the power supply side.	No signal output available	1 kW

No. (Address Hex)	Name	LCD Display	Description	Analog Output Level	Unit
U2-58 (847H)	Power Supply Frequency at Previous Fault	AC Frequency	Shows the frequency on the power supply side.	No signal output available	0.1 Hz
U2-59 (848H)	Power Supply Side Current Reference at Previous Fault	AC Current Ref	Shows the current reference on the power supply side when the most recent fault occurred.	No signal output available	1 A
U2-60 (849H)	Power Factor at Previous Fault	Power Factor	Shows the power factor when the most recent fault occurred.	No signal output available	1%
U2-61 (84AH)	Active Current Reference at Previous Fault	Active Current	Shows the active current when the most recent fault occurred.	No signal output available	0.1%
U2-62 (84BH)	Reactive Current Reference at Previous Fault	Reactive Current	Shows the reactive current when the most recent fault occurred.	No signal output available	0.1%
U2-63 (84CH)	DC Bus Voltage Reference at Previous Fault (After SFS)	DC V SFS Level	Shows the DC bus voltage reference after the soft starter.	No signal output available	1 V
U2-64 (84DH)	Avr Input (Voltage Deviation) at Previous Fault	AVR Input	Shows the Avr input.	No signal output available	1 V
U2-65 (84EH)	Control Voltage Reference (Vq) at Previous Fault	Voltage Ref (Vq)	Shows the control voltage reference (Vq) when the most recent fault occurred.	No signal output available	1 V
U2-66 (84FH)	Control Voltage Reference (Vd) at Previous Fault	Voltage Ref (Vd)	Shows the control voltage reference (Vd) when the most recent fault occurred.	No signal output available	1 V
U3: Fault History					
U3-01 to U3-04 (90H to 93H)	First to 4th Most Recent Fault	Fault Message ☐	Displays the first to the fourth most recent faults.	No signal output available	–
U3-05 to U3-10 (804H to 809H)	5th to 10th Most Recent Fault	Fault Message ☐	Displays the fifth to the tenth most recent faults. After ten faults, data for the oldest fault is deleted. The most recent fault appears in U3-01, with the next most recent fault appearing in U3-02. The data is moved to the next monitor parameter each time a fault occurs.	No signal output available	–
U3-11 to U3-14 (94H to 97H)	Cumulative Operation Time at 1st to 4th Most Recent Fault	Elapsed Time ☐	Displays the cumulative operation time when the first to the fourth most recent faults occurred.	No signal output available	1 h
U3-15 to U3-20 (80EH to 813H)	Cumulative Operation Time at 5th to 10th Most Recent Fault	Elapsed Time ☐	Displays the cumulative operation time when the fifth to the tenth most recent faults occurred.	No signal output available	1 h
U4: Maintenance Monitors					
U4-01 (4CH) <4>	Cumulative Operation Time	Drv Elapsed Time	Displays the cumulative operation time of the regenerative unit. The value for the cumulative operation time counter can be reset in parameter o4-01. Use parameter o4-02 to determine if the operation time should start as soon as the power is switched on or only while the Run command is present. The maximum number displayed is 99999, after which the value is reset to 0.	No signal output available	1 h

No. (Address Hex)	Name	LCD Display	Description	Analog Output Level	Unit
U4-02 (75H)	Number of Run Commands	RUN Cmd Counter	Displays the number of times the Run command is entered. Reset the number of Run commands using parameter o4-13. This value will reset to 0 and start counting again after reaching 65535.	No signal output available	1 time
U4-03 (67H) <5>	Cooling Fan Operation Time	Fan Elapsed TIme	Displays the cumulative operation time of the cooling fan. The default value for the fan operation time is reset in parameter o4-03. This value will reset to 0 and start counting again after reaching 99999.	No signal output available	1 h
U4-04 (7EH)	Cooling Fan Maintenance	Fan Life Mon	Displays main cooling fan usage time as a percentage of its expected performance life. Parameter o4-03 can be used to reset this monitor. Replace the fan when this monitor reaches 90%.	No signal output available	1%
U4-05 (7CH)	Capacitor Maintenance	Cap Life Mon	Displays main circuit capacitor usage time as a percentage of their expected performance life. Parameter o4-05 can be used to reset this monitor. Replace the capacitor when this monitor reaches 90%.	No signal output available	1%
U4-06 (7D6H)	Soft Charge Bypass Relay Maintenance	ChgCirc Life Mon	Displays the soft charge bypass relay maintenance time as a percentage of its estimated performance life. Parameter o4-07 can be used to reset this monitor. Replace the soft charge bypass relay when this monitor reaches 90%.	No signal output available	1%
U4-08 (68H)	Heatsink Temperature	Heatsink Temp	Displays the heatsink temperature.	10 V: 100°C	1°C
U4-09 (5EH)	LED Check	LED Oper Check	Lights all segments of the LED to verify that the display is working properly.	No signal output available	–
U4-13 (7CFH)	Peak Hold Current	Current PeakHold	Displays the highest current value that occurred during run.	No signal output available	1 A
U6: Operation Status Monitors					
U6-80 to U6-99 (7B0H to 7F9H)	Option Monitors 1 to 20	–	Shows the monitor information for Option Monitor 1 (876 hex) to 20 (8FF hex). This information is displayed when option cards are connected. 200 V Class: 100% = 400 Vdc 400 V Class: 100% = 800 Vdc	No signal output available	–
U9: Operation Status Monitors					
U9-04 (823H)	Regenerative Power (GWh)	GWh Produced	Shows the total amount of regenerated power. 	0 to 999	1GWh
U9-05 (824H)	Regenerative Power (MWh)	MWh Produced		0 to 999	1MWh
U9-06 (825H)	Regenerative Power (kWh)	kWh Produced		0 to 999	1kWh
U9-11 to U9-14 (82AH to 82DH)	Regenerative Power Rates 1 to 4	Produced ☐ ($)	These parameters show the regenerative power rate in Power Unit Price (o4-19) that is calculated from the total electrical power consumptions in U9-04 to U9-06. U9-14: Digit 1 to digit 3 U9-13: Digit 4 to digit 6 U9-12: Digit 7 to digit 9 U9-11: Digit 10 to digit 12  The unit price is set in o4-19, and U9-11 to U9-14 are U9-04 to U9-06 times o4-19.	0 to 999	–

<4> The MEMOBUS/Modbus communications data is in 10 h units. If data in 1 h units are also required, refer to register number 0099H.
<5> The MEMOBUS/Modbus communications data is in 10 h units. If data in 1 h units are also required, refer to register number 009BH.

B.3 Defaults by Unit Model

The following tables show parameters and default settings that change with o2-04 (Unit Model Selection).

Table B.1 200 V Class Model Default Settings by Regenerative Unit Model Selection

No.	Name	Unit	Default Settings											
	Model	–	2A03P5	2A0005	2A0007	2A0010	2A0014	2A0017	2A0020	2A0028	2A0035	2A0053	2A0073	2A0105
o2-04	Unit Model Selection	Hex	68	6A	6B	6D	6E	6F	70	72	73	75	76	78
C7-14	Bias Voltage at Operation Start	V	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
C7-15	Voltage Hysteresis Width at Operation Start/Stop	V	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
L2-02	Momentary Power Loss Ride-Thru Time	s	1.0	1.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
L2-05	Undervoltage Detection Level (Uv)	V	190	190	190	190	190	190	190	190	190	190	190	190
L2-21	AUv Detection Level	V	150	150	150	150	150	150	150	150	150	150	150	150
L8-02	Overheat Alarm Level	°C	85	105	110	115	115	120	120	120	110	115	110	120
L8-66	Power Supply Fault Detection Voltage Level	%	50	50	50	50	50	50	50	50	50	50	50	50
L8-35	Installation Method Selection	–	2	2	2	2	2	2	2	2	2	2	0	0

Table B.2 400 V Class Model Default Settings by Regenerative Unit Model Selection

No.	Name	Unit	Default Settings							
	Model	–	4A03P5	4A0005	4A0007	4A0010	4A0014	4A0017	4A0020	4A0028
o2-04	Unit Model Selection	Hex	97	99	9A	9C	9D	9E	9F	A1
C7-14	Bias Voltage at Operation Start	V	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
C7-15	Voltage Hysteresis Width at Operation Start/Stop	V	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
L2-02	Momentary Power Loss Ride-Thru Time	s	1.0	1.0	1.0	2.0	2.0	2.0	2.0	2.0
L2-05	Undervoltage Detection Level (Uv)	V	380	380	380	380	380	380	380	380
L2-21	AUv Detection Level	V	300	300	300	300	300	300	300	300
L8-02	Overheat Alarm Level	°C	80	85	100	95	110	105	115	110
L8-66	Power Supply Fault Detection Voltage Level	%	50	50	50	50	50	50	50	50
L8-35	Installation Method Selection	–	2	2	2	2	2	2	2	2

B.3 Defaults by Unit Model

No.	Name	Unit	Default Settings							
	Model	–	4A0035	4A0043	4A0053	4A0073	4A0105	4A0150	4A0210	4A0300
o2-04	Unit Model Selection	Hex	A2	A3	A4	A5	A7	A9	AC	AE
C7-14	Bias Voltage at Operation Start	V	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
C7-15	Voltage Hysteresis Width at Operation Start/Stop	V	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
L2-02	Momentary Power Loss Ride-Thru Time	s	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
L2-05	Undervoltage Detection Level (Uv)	V	380	380	380	380	380	380	380	380
L2-21	AUv Detection Level	V	300	300	300	300	300	300	300	300
L8-02	Overheat Alarm Level	°C	110	115	115	110	110	110	140	140
L8-66	Power Supply Fault Detection Voltage Level	%	50	50	50	50	50	50	50	50
L8-35	Installation Method Selection	–	0	0	0	2	0	0	0	0

Appendix: C

Standards Compliance

This appendix explains the guidelines and criteria for maintaining CE and UL standards.

C.1 Section Safety

⚠ WARNING

Electrical Shock Hazard

Do not operate equipment with covers removed.

Failure to comply could result in death or serious injury.

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

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

Failure to comply will result in death or serious injury.

Always ground the motor-side grounding terminal.

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

Do not touch any terminals before the capacitors have fully discharged.

Failure to comply could result in death or serious injury.

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

Do not allow unqualified personnel to perform work on the regenerative unit.

Failure to comply could result in death or serious injury.

Installation, maintenance, inspection, and servicing must be performed only by authorized personnel familiar with installation, adjustment, and maintenance of regenerative units.

Do not perform work on the regenerative unit while wearing loose clothing, jewelry, or lack of eye protection.

Failure to comply could result in death or serious injury.

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

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

Failure to comply could result in death or serious injury.

Fire Hazard

Tighten all terminal screws to the specified tightening torque.

Loose electrical connections could result in death or serious injury by fire due to overheating of electrical connections.

Do not use an improper voltage source.

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

Verify that the rated voltage of the regenerative unit matches the voltage of the incoming power supply before applying power.

Do not use improper combustible materials.

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

Attach the regenerative unit to metal or other noncombustible material.

NOTICE

Observe proper electrostatic discharge procedures (ESD) when handling the regenerative unit and circuit boards.

Failure to comply may result in ESD damage to the regenerative unit circuitry.

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

Improper equipment sequencing could result in damage to the regenerative unit.

Do not use unshielded cable for control wiring.

Failure to comply may cause electrical interference resulting in poor system performance. Use shielded twisted-pair wires and ground the shield to the ground terminal of the regenerative unit.

Do not allow unqualified personnel to use the product.

Failure to comply could result in damage to the regenerative unit.

Do not modify the regenerative unit circuitry.

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

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

Check all the wiring to ensure that all connections are correct after installing the regenerative unit and connecting any other devices.

Failure to comply could result in damage to the regenerative unit.

If a fuse is open or a Ground Fault Circuit Interrupter (GFCI) is tripped, check the wiring and the selection of the peripheral devices.

Contact your supplier if the cause cannot be identified after checking the above.

Do not restart the regenerative unit immediately operate the peripheral devices if a fuse is open or a GFCI is tripped.

Check the wiring and the selection of peripheral devices to identify the cause. Contact your supplier before restarting the regenerative unit or the peripheral devices if the cause cannot be identified.

C.2 European Standards

Figure C.1 CE Mark

The CE mark indicates compliance with European safety and environmental regulations. It is required for engaging in business and commerce in Europe.
European standards include the Machinery Directive for machine manufacturers, the Low Voltage Directive for electronics manufacturers, and the EMC guidelines for controlling electrical noise.

This regenerative unit displays the CE mark based on the EMC guidelines and the Low Voltage Directive.

- Low Voltage Directive: 2006/95/EC
- EMC Guidelines: 2004/108/EC

Devices used in combination with this regenerative unit must also be CE certified and display the CE mark. When using regenerative unit displaying the CE mark in combination with other devices, it is ultimately the responsibility of the user to ensure compliance with CE standards. After setting up the device, verify that conditions meet European standards.

◆ CE Low Voltage Directive Compliance

This regenerative unit has been tested according to European standard IEC 61800-5-1, and it fully complies with the Low Voltage Directive.

To comply with the Low Voltage Directive, be sure to meet the following conditions when combining this regenerative unit with other devices:

■ Area of Use

Do not use regenerative unit in areas with pollution higher than severity 2 and overvoltage category 3 in accordance with IEC 664.

■ Recommended Branch Circuit Protection

Install appropriate input fuses to the input side to protect regenerative unit wiring and prevent other secondary damage.

Refer to ***Power Ratings on page 150*** for details on the regenerative unit Input Current and Rated Output Current.

NOTICE: *If a fuse is open or a Ground Fault Circuit Interrupter (GFCI) is tripped, check the wiring and the selection of peripheral devices to identify the cause. Contact Magnetek before restarting the regenerative unit or the peripheral devices if the cause cannot be identified.*

■ Grounding

The regenerative unit is designed to be used in T-N (grounded neutral point) networks. If installing the regenerative unit in other types of grounded systems, contact your Magnetek representative for instructions.

■ Guarding Against Harmful Materials

When installing IP00/Open Type enclosure regenerative units, use an enclosure that prevents foreign material from entering the regenerative unit from above or below.

◆ EMC Guidelines Compliance

This regenerative unit is tested according to European standards IEC/EN 61800-3: 2004, and complies with the European standards IEC/EN 12015 (requires an optional AC reactor) and IEC/EN 12016.

■ EMC Filter Installation

The EMC filter must be installed using this installation method to ensure compliance with EMC guidelines. Refer to the Quick Start Guide or Technical Manual of the drive which the regenerative unit is connected. Refer to ***Figure C.2*** for the wiring details.

Connection Diagram

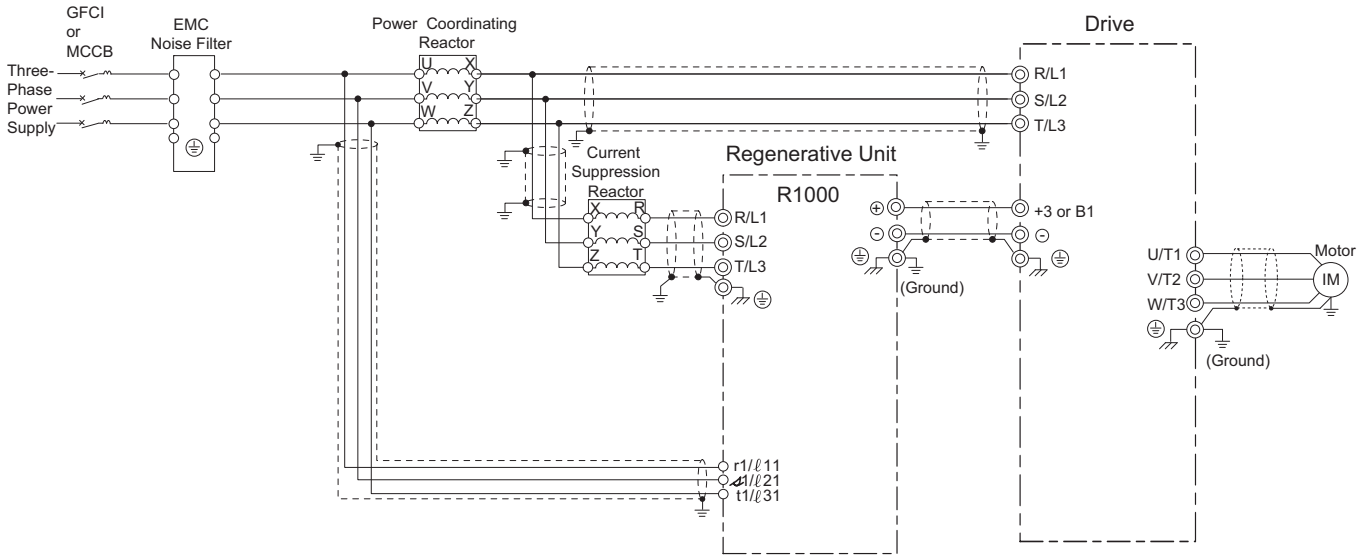


Figure C.2 Wiring Diagram for EMC (Models 2A03P5 to 2A0105, 4A03P5 to 4A0300)

C.3 UL Standards

◆ UL Standards

The RU mark applies to products in the United States and Canada and it means that UL has performed product testing and evaluation and determined that their stringent standards for product safety have been met. For a product to receive UL certification, all components inside that product must also receive UL certification.

Figure C.3 RU Mark

◆ UL Standards Compliance

This regenerative unit is tested in accordance with UL standard UL508C and complies with UL requirements. To ensure continued compliance when using this regenerative unit in combination with other equipment, meet the following conditions:

■ Installation Area

Do not install the regenerative unit to an area greater than pollution degree 2 (UL standard).

■ Ambient Temperature

IP00/Open Type enclosure: -10°C to +50°C (14°F to 122°F)

IP20/NEMA Type 1 enclosure: -10°C to +40°C (14°F to 104°F)

■ Main Circuit Terminal Wiring

Magnetek recommends using closed-loop crimp terminals on all regenerative unit models. To maintain UL/cUL approval, UL Listed closed-loop crimp terminals are specifically required when wiring the regenerative unit main circuit terminals on models 2A0035 to 2A0105, 4A0035 to 4A0300. Use only the tools recommended by the terminal manufacturer for crimping. Refer to ***Closed-Loop Crimp Terminal Recommendations on page 187*** for closed-loop crimp terminal recommendations. The wire gauges listed in the following tables are Magnetek recommendations. Refer to local codes for proper wire gauge selections.

Note: The mark ⏚ indicates the terminals for protective ground connection as defined in IEC/EN 60417-5019.
Grounding impedance:
200 V: 100 Ω or less
400 V: 10 Ω or less

Wire Gauges and Tightening Torques

Table C.1 Wire Gauge and Torque Specifications (Three-Phase 200 V Class)

Model	Terminal	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Screw Size	Tightening Torque N·m (lb·in.)
2A03P5	R/L1, S/L2, T/L3	12	12 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	⊖, ⊕	12	12 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	r1/ℓ11, ꜱ1/ℓ21, t1/ℓ31	14	14	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	12	12 to 8	M5	2.0 to 2.5 (17.7 to 22.1)

Model	Terminal	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Screw Size	Tightening Torque N·m (lb·in.)
2A0005	R/L1, S/L2, T/L3	12	12 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	⊖, ⊕	10	10 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	r1/ℓ11, 𝓈1/ℓ21, t1/ℓ31	14	14	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	12	12 to 8	M5	2.0 to 2.5 (17.7 to 22.1)
2A0007	R/L1, S/L2, T/L3	12	12 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	⊖, ⊕	10	10 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	r1/ℓ11, 𝓈1/ℓ21, t1/ℓ31	14	14	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	10	10 to 8	M5	2.0 to 2.5 (17.7 to 22.1)
2A0010	R/L1, S/L2, T/L3	10	10 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	⊖, ⊕	6	6	M4	2.1 to 2.3 (18.6 to 20.4)
	r1/ℓ11, 𝓈1/ℓ21, t1/ℓ31	14	14	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	8	8 to 6	M6	2.0 to 2.5 (17.7 to 22.1)
2A0014	R/L1, S/L2, T/L3	8	8 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	⊖, ⊕	6	6	M4	2.1 to 2.3 (18.6 to 20.4)
	r1/ℓ11, 𝓈1/ℓ21, t1/ℓ31	14	14	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	8	8 to 6	M6	2.0 to 2.5 (17.7 to 22.1)
2A0017	R/L1, S/L2, T/L3	8	8 to 1	M6	3.6 to 4.0 (31.9 to 35.4)
	⊖, ⊕	4	4 to 1	M6	3.6 to 4.0 (31.9 to 35.4)
	r1/ℓ11, 𝓈1/ℓ21, t1/ℓ31	14	14	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	8	8 to 4	M6	5.4 to 6.0 (47.8 to 53.1)
2A0020	R/L1, S/L2, T/L3	6	6 to 1	M6	3.6 to 4.0 (31.9 to 35.4)
	⊖, ⊕	4	4 to 1	M6	3.6 to 4.0 (31.9 to 35.4)
	r1/ℓ11, 𝓈1/ℓ21, t1/ℓ31	14	14	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	6	6 to 4	M6	5.4 to 6.0 (47.8 to 53.1)

Model	Terminal	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Screw Size	Tightening Torque N·m (lb·in.)
2A0028	R/L1, S/L2, T/L3	4	4 to 1	M6	3.6 to 4.0 (31.9 to 35.4)
	⊖, ⊕	2	2 to 1	M6	3.6 to 4.0 (31.9 to 35.4)
	r1/ℓ11, ꜝ1/ℓ21, t1/ℓ31	14	14	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	6	6 to 4	M6	5.4 to 6.0 (47.8 to 53.1)
2A0035	R/L1, S/L2, T/L3	2	2 to 2/0	M8	5.4 to 6.0 (47.8 to 53.1)
	⊖, ⊕	1/0	1/0 to 2/0	M8	5.4 to 6.0 (47.8 to 53.1)
	r1/ℓ11, ꜝ1/ℓ21, t1/ℓ31	14	14 to 10	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	4	4	M8	9.0 to 11.0 (79.7 to 97.4)
2A0053	R/L1, S/L2, T/L3	2/0	2/0 to 250	M8	13.5 to 15.0 (119.5 to132.8)
	⊖, ⊕	4/0	4/0 to 250	M8	13.5 to 15.0 (119.5 to132.8)
	r1/ℓ11, ꜝ1/ℓ21, t1/ℓ31	14	14 to 10	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	3	3 to 2	M10	18.0 to 23.0 (159 to 204)
2A0073	R/L1, S/L2, T/L3	1/0 × 2P	1/0 to 300	M12	32.0 to 40.0 (283 to 354)
	⊖, ⊕	3/0 × 2P	3/0 to 300	M12	32.0 to 40.0 (283 to 354)
	r1/ℓ11, ꜝ1/ℓ21, t1/ℓ31	14	14 to 10	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	1/0	1/0 to 300	M12	32.0 to 40.0 (283 to 354)
2A0105	R/L1, S/L2, T/L3	3/0 × 2P	3/0 to 600	M12	32.0 to 40.0 (283 to 354)
	⊖, ⊕	300 × 2P	300 to 600	M12	32.0 to 40.0 (283 to 354)
	r1/ℓ11, ꜝ1/ℓ21, t1/ℓ31	14	14 to 10	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	1/0	1/0 to 300	M12	32.0 to 40.0 (283 to 354)

Table C.2 Wire Gauge and Torque Specifications (Three-Phase 400 V Class)

Model	Terminal	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Screw Size	Tightening Torque N·m (lb·in.)
4A03P5	R/L1, S/L2, T/L3	10	10 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	⊖, ⊕	12	12 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	r1/ℓ11, ꜝ1/ℓ21, t1/ℓ31	14	14	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	12	12 to 10	M5	2.0 to 2.5 (17.7 to 22.1)

Model	Terminal	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Screw Size	Tightening Torque N·m (lb·in.)
4A0005	R/L1, S/L2, T/L3	10	10 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	⊖, ⊕	12	12 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	r1/ℓ11, 𝓈1/ℓ21, t1/ℓ31	14	14	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	12	12 to 10	M5	2.0 to 2.5 (17.7 to 22.1)
4A0007	R/L1, S/L2, T/L3	12	12 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	⊖, ⊕	12	12 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	r1/ℓ11, 𝓈1/ℓ21, t1/ℓ31	14	14	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	10	10	M5	2.0 to 2.5 (17.7 to 22.1)
4A0010	R/L1, S/L2, T/L3	12	12 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	⊖, ⊕	10	10 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	r1/ℓ11, 𝓈1/ℓ21, t1/ℓ31	14	14	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	10	10 to 6	M6	2.0 to 2.5 (17.7 to 22.1)
4A0014	R/L1, S/L2, T/L3	10	10 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	⊖, ⊕	10	10 to 6	M4	2.1 to 2.3 (18.6 to 20.4)
	r1/ℓ11, 𝓈1/ℓ21, t1/ℓ31	14	14	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	10	10 to 6	M6	2.0 to 2.5 (17.7 to 22.1)
4A0017	R/L1, S/L2, T/L3	10	10 to 1	M6	3.6 to 4.0 (31.9 to 35.4)
	⊖, ⊕	6	6 to 1	M6	3.6 to 4.0 (31.9 to 35.4)
	r1/ℓ11, 𝓈1/ℓ21, t1/ℓ31	14	14	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	8	8 to 6	M6	5.4 to 6.0 (47.8 to 53.1)
4A0020	R/L1, S/L2, T/L3	8	8 to 1	M6	3.6 to 4.0 (31.9 to 35.4)
	⊖, ⊕	6	6 to 1	M6	3.6 to 4.0 (31.9 to 35.4)
	r1/ℓ11, 𝓈1/ℓ21, t1/ℓ31	14	14	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	8	8 to 6	M6	5.4 to 6.0 (47.8 to 53.1)

C.3 UL Standards

Model	Terminal	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Screw Size	Tightening Torque N·m (lb·in.)
4A0028	R/L1, S/L2, T/L3	8	8 to 1	M6	3.6 to 4.0 (31.9 to 35.4)
	⊖, ⊕	6	6 to 1	M6	3.6 to 4.0 (31.9 to 35.4)
	r1/ℓ11, 𝓈1/ℓ21, t1/ℓ31	14	14	M3.5	0.8 to 1.0 (7.1 to 8.9)
	⏚	8	8 to 6	M6	5.4 to 6.0 (47.8 to 53.1)
4A0035	R/L1, S/L2, T/L3	6	6 to 2/0	M8	5.4 to 6.0 (47.8 to 53.1)
	⊖, ⊕	3	3 to 2/0	M8	5.4 to 6.0 (47.8 to 53.1)
	r1/ℓ11, 𝓈1/ℓ21, t1/ℓ31	14	14 to 10	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	6	6	M8	9.0 to 11.0 (79.7 to 97.4)
4A0043	R/L1, S/L2, T/L3	4	4 to 2/0	M8	5.4 to 6.0 (47.8 to 53.1)
	⊖, ⊕	2	2 to 2/0	M8	5.4 to 6.0 (47.8 to 53.1)
	r1/ℓ11, 𝓈1/ℓ21, t1/ℓ31	14	14 to 10	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	6	6	M8	9.0 to 11.0 (79.7 to 97.4)
4A0053	R/L1, S/L2, T/L3	4	4 to 2/0	M8	5.4 to 6.0 (47.8 to 53.1)
	⊖, ⊕	2	2 to 2/0	M8	5.4 to 6.0 (47.8 to 53.1)
	r1/ℓ11, 𝓈1/ℓ21, t1/ℓ31	14	14 to 10	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	6	6 to 4	M10	18.0 to 23.0 (159 to 204)
4A0073	R/L1, S/L2, T/L3	2	2 to 2/0	M8	5.4 to 6.0 (47.8 to 53.1)
	⊖, ⊕	1/0	1/0 to 2/0	M8	5.4 to 6.0 (47.8 to 53.1)
	r1/ℓ11, 𝓈1/ℓ21, t1/ℓ31	14	14 to 10	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	4	4	M10	18.0 to 23.0 (159 to 204)
4A0105	R/L1, S/L2, T/L3	2/0	2/0 to 300	M10	18.0 to 23.0 (159 to 204)
	⊖, ⊕	4/0	4/0 to 300	M10	18.0 to 23.0 (159 to 204)
	r1/ℓ11, 𝓈1/ℓ21, t1/ℓ31	14	14 to 10	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	1	1 to 300	M10	18.0 to 23.0 (159 to 204)

Model	Terminal	Recommended Gauge AWG, kcmil	Applicable Gauge AWG, kcmil	Screw Size	Tightening Torque N·m (lb·in.)
4A0150	R/L1, S/L2, T/L3	250	250 to 300	M12	32.0 to 40.0 (283 to 354)
	⊖, ⊕	3/0 × 2P	3/0 to 600	M12	32.0 to 40.0 (283 to 354)
	r1/ℓ11, s1/ℓ21, t1/ℓ31	14	14 to 10	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	1/0	1/0 to 300	M12	32.0 to 40.0 (283 to 354)
4A0210	R/L1, S/L2, T/L3	3/0 × 2P	3/0 to 600	M10	18.0 to 23.0 (159 to 204)
	⊖, ⊕	4/0 × 2P	4/0 to 600	M10	18.0 to 23.0 (159 to 204)
	r1/ℓ11, s1/ℓ21, t1/ℓ31	14	14 to 10	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	2/0	2/0 to 350	M10	18.0 to 23.0 (159 to 204)
4A0300	R/L1, S/L2, T/L3	250 × 2P	250 to 600	M12	32.0 to 40.0 (283 to 354)
	⊖, ⊕	400 × 2P	400 to 600	M12	32.0 to 40.0 (283 to 354)
	r1/ℓ11, s1/ℓ21, t1/ℓ31	14	14 to 10	M4	1.1 to 1.2 (9.7 to 10.6)
	⏚	4/0	4/0 to 350	M12	32.0 to 40.0 (283 to 354)

Closed-Loop Crimp Terminal Recommendations

Magnetek recommends UL Listed crimp terminals made by JST and Tokyo DIP (or equivalent) for the insulation cap. ***Table C.3*** matches the wire gauges and terminal screw sizes with Magnetek-recommended crimp terminals, tools, and insulation caps. Refer to the appropriate Wire Gauge and Torque Specifications table for the wire gauge and screw size for your regenerative unit model. Place orders with a Magnetek representative or the Magnetek sales department. The closed-loop crimp terminal sizes and values listed in ***Table C.3*** are Magnetek recommendations. Wire gauge values shown in ***Table C.3*** are the recommended values. Refer to local codes for proper selections.

Table C.3 Closed-Loop Crimp Terminal Size

Model	Wire Gauge (AWG, kcmil)		Screw Size	Crimp Terminal Model Number	Tool		Insulation Cap Model No.	Code <1>
	R/L1,S/L2,T/L3	⊖, ⊕			Machine No.	Die Jaw		
200 V Class								
2A03P5	12		M4	R5.5-4	YA-4	AD-900	TP-005	100-054-029
	10			R5.5-4	YA-4	AD-900	TP-005	100-054-029
	8			8-4	YA-4	AD-901	TP-008	100-054-031
	6			14-NK4	YA-4	AD-902	TP-014	100-054-033
2A0005	12	–	M4	R5.5-4	YA-4	AD-900	TP-005	100-054-029
	10			R5.5-4	YA-4	AD-900	TP-005	100-054-029
	8			8-4	YA-4	AD-901	TP-008	100-054-031
	6			14-NK4	YA-4	AD-902	TP-014	100-054-033
2A0007	12	–	M4	R5.5-4	YA-4	AD-900	TP-005	100-054-029
	10			R5.5-4	YA-4	AD-900	TP-005	100-054-029
	8			8-4	YA-4	AD-901	TP-008	100-054-031
	6			14-NK4	YA-4	AD-902	TP-014	100-054-033
2A0010	10	–	M4	R5.5-4	YA-4	AD-900	TP-005	100-054-029
	8	–		8-4	YA-4	AD-901	TP-008	100-054-031
	6			14-NK4	YA-4	AD-902	TP-014	100-054-033

C.3 UL Standards

Model	Wire Gauge (AWG, kcmil)		Screw Size	Crimp Terminal Model Number	Tool		Insulation Cap Model No.	Code <1>
	R/L1,S/L2,T/L3	⊖, ⊕			Machine No.	Die Jaw		
2A0014	8	–	M4	8-4	YA-4	AD-901	TP-008	100-054-031
	6	6		14-NK4	YA-4	AD-902	TP-014	100-054-033
2A0017	8	–	M6	R8-6	YA-4	AD-901	TP-008	100-092-620
	6	–		R14-6	YA-4	AD-902	TP-014	100-051-261
	4			R22-6	YA-5	AD-953	TP-022	100-051-262
	3			38-6	YA-5	AD-954	TP-038	100-092-577
	2			38-6	YA-5	AD-954	TP-038	100-092-577
	1			60-6	YA-5	AD-955	TP-060	100-092-578
2A0020	6	–	M6	R14-6	YA-4	AD-902	TP-014	100-051-261
	4			R22-6	YA-5	AD-953	TP-022	100-051-262
	3			38-6	YA-5	AD-954	TP-038	100-092-577
	2			38-6	YA-5	AD-954	TP-038	100-092-577
	1			60-6	YA-5	AD-955	TP-060	100-092-578
2A0028	4	–	M6	R22-6	YA-5	AD-953	TP-022	100-051-262
	3	–		38-6	YA-5	AD-954	TP-038	100-092-577
	2			38-6	YA-5	AD-954	TP-038	100-092-577
	1			60-6	YA-5	AD-955	TP-060	100-092-578
2A0035	2	–	M8	R38-8	YA-5	AD-954	TP-038	100-051-264
	1	–		R60-8	YA-5	AD-955	TP-060	100-051-265
	1/0			R60-8	YA-5	AD-955	TP-060	100-051-265
	2/0			80-8	YF-1 YET-300-1	TD-323 TD-312	TP-080	100-092-579
2A0053	2/0	–	M8	80-8	YF-1 YET-300-1	TD-323 TD-312	TP-080	100-092-579
	3/0	–		80-8	YF-1 YET-300-1	TD-323 TD-312	TP-080	100-092-579
	4/0			100-8	YF-1 YET-300-1	TD-324 TD-312	TP-100	100-068-032
	250			150-8	YF-1 YET-300-1	TD-325 TD-313	TP-150	100-113-129
2A0073	1/0 × 2P	–	M12	R60-12	YA-5	AD-955	TP-060	100-066-160
	2/0 × 2P	–		80-L12	YF-1 YET-300-1	TD-323 TD-312	TP-080	100-051-558
	3/0 × 2P			80-L12	YF-1 YET-300-1	TD-323 TD-312	TP-080	100-051-558
	4/0	4/0 × 2P		R100-12	YF-1 YET-300-1	TD-324 TD-312	TP-100	100-051-560
	250	250 × 2P		150-L12	YF-1 YET-300-1	TD-325 TD-313	TP-150	100-051-562
	300			150-L12	YF-1 YET-300-1	TD-325 TD-313	TP-150	100-051-562

Model	Wire Gauge (AWG, kcmil)		Screw Size	Crimp Terminal Model Number	Tool		Insulation Cap Model No.	Code <1>
	R/L1,S/L2,T/L3	⊖, ⊕			Machine No.	Die Jaw		
2A0105	3/0 × 2P	–	M12	80-L12	YF-1 YET-300-1	TD-323 TD-312	TP-080	100-051-558
	4/0 × 2P			100-L12	YF-1 YET-300-1	TD-324 TD-312	TP-100	100-051-560
	250 × 2P			150-L12	YF-1 YET-300-1	TD-325 TD-313	TP-150	100-051-562
	300 × 2P			150-L12	YF-1 YET-300-1	TD-325 TD-313	TP-150	100-051-562
	350	350 × 2P		200-L12	YF-1 YET-300-1	TD-327 TD-314	TP-200	100-051-564
	400	400 × 2P		200-L12	YF-1 YET-300-1	TD-327 TD-314	TP-200	100-051-564
	500	500 × 2P		325-12	YF-1 YET-300-1	TD-328 TD-315	TP-325	100-051-277
	600			325-12	YF-1 YET-300-1	TD-328 TD-315	TP-325	100-051-277
400 V Class								
4A03P5	–	12	M4	R5.5-4	YA-4	AD-900	TP-005	100-054-029
	10			R5.5-4	YA-4	AD-900	TP-005	100-054-029
	8			8-4	YA-4	AD-901	TP-008	100-054-031
	6			14-NK4	YA-4	AD-902	TP-014	100-054-033
4A0005	–	12	M4	R5.5-4	YA-4	AD-900	TP-005	100-054-029
	10			R5.5-4	YA-4	AD-900	TP-005	100-054-029
	8			8-4	YA-4	AD-901	TP-008	100-054-031
	6			14-NK4	YA-4	AD-902	TP-014	100-054-033
4A0007	12		M4	R5.5-4	YA-4	AD-900	TP-005	100-054-029
	10			R5.5-4	YA-4	AD-900	TP-005	100-054-029
	8			8-4	YA-4	AD-901	TP-008	100-054-031
	6			14-NK4	YA-4	AD-902	TP-014	100-054-033
4A0010	12	–	M4	R5.5-4	YA-4	AD-900	TP-005	100-054-029
	10			R5.5-4	YA-4	AD-900	TP-005	100-054-029
	8			8-4	YA-4	AD-901	TP-008	100-054-031
	6			14-NK4	YA-4	AD-902	TP-014	100-054-033
4A0014	10		M4	R5.5-4	YA-4	AD-900	TP-005	100-054-029
	8			8-4	YA-4	AD-901	TP-008	100-054-031
	6			14-NK4	YA-4	AD-902	TP-014	100-054-033
4A0017	10	–	M6	R5.5-6	YA-4	AD-900	TP-005	100-068-029
	8	–		R8-6	YA-4	AD-901	TP-008	100-092-620
	6			R14-6	YA-4	AD-902	TP-014	100-051-261
	4			R22-6	YA-5	AD-953	TP-022	100-051-262
	3			38-6	YA-5	AD-954	TP-038	100-092-577
	2			38-6	YA-5	AD-954	TP-038	100-092-577
	1			60-6	YA-5	AD-955	TP-060	100-092-578
4A0020	8	–	M6	R8-6	YA-4	AD-901	TP-008	100-092-620
	6			R14-6	YA-4	AD-902	TP-014	100-051-261
	4			R22-6	YA-5	AD-953	TP-022	100-051-262
	3			38-6	YA-5	AD-954	TP-038	100-092-577
	2			38-6	YA-5	AD-954	TP-038	100-092-577
	1			60-6	YA-5	AD-955	TP-060	100-092-578

C.3 UL Standards

Model	Wire Gauge (AWG, kcmil)		Screw Size	Crimp Terminal Model Number	Tool		Insulation Cap Model No.	Code <1>
	R/L1,S/L2,T/L3	⊖, ⊕			Machine No.	Die Jaw		
4A0028	8	–	M6	R8-6	YA-4	AD-901	TP-008	100-092-620
	6			R14-6	YA-4	AD-902	TP-014	100-051-261
	4			R22-6	YA-5	AD-953	TP-022	100-051-262
	3			38-6	YA-5	AD-954	TP-038	100-092-577
	2			38-6	YA-5	AD-954	TP-038	100-092-577
	1			60-6	YA-5	AD-955	TP-060	100-092-578
4A0035	6	–	M8	R14-8	YA-4	AD-902	TP-014	100-051-035
	4			R22-8	YA-5	AD-953	TP-022	100-051-263
	3			R38-8	YA-5	AD-954	TP-038	100-051-264
	2			R38-8	YA-5	AD-954	TP-038	100-051-264
	1			R60-8	YA-5	AD-955	TP-060	100-051-265
	1/0			R60-8	YA-5	AD-955	TP-060	100-051-265
	2/0			80-8	YF-1 YET-300-1	TD-323 TD-312	TP-080	100-092-579
4A0043	4	–	M8	R22-8	YA-5	AD-953	TP-022	100-051-263
	3	–		R38-8	YA-5	AD-954	TP-038	100-051-264
	2			R38-8	YA-5	AD-954	TP-038	100-051-264
	1			R60-8	YA-5	AD-955	TP-060	100-051-265
	1/0			R60-8	YA-5	AD-955	TP-060	100-051-265
	2/0			80-8	YF-1 YET-300-1	TD-323 TD-312	TP-080	100-092-579
4A0053	4	–	M8	R22-8	YA-5	AD-953	TP-022	100-051-263
	3	–		R38-8	YA-5	AD-954	TP-038	100-051-264
	2			R38-8	YA-5	AD-954	TP-038	100-051-264
	1			R60-8	YA-5	AD-955	TP-060	100-051-265
	1/0			R60-8	YA-5	AD-955	TP-060	100-051-265
	2/0			80-8	YF-1 YET-300-1	TD-323 TD-312	TP-080	100-092-579
4A0073	2	–	M8	R38-8	YA-5	AD-954	TP-038	100-051-264
	1	–		R60-8	YA-5	AD-955	TP-060	100-051-265
	1/0			R60-8	YA-5	AD-955	TP-060	100-051-265
	2/0			80-8	YF-1 YET-300-1	TD-323 TD-312	TP-080	100-092-579
4A0105	2/0	–	M10	80-L10	YF-1 YET-300-1	TD-323 TD-312	TP-080	100-051-557
	3/0	–		80-L10	YF-1 YET-300-1	TD-323 TD-312	TP-080	100-051-557
	4/0			R100-10	YF-1 YET-300-1	TD-324 TD-312	TP-100	100-051-559
	250			R150-10	YF-1 YET-300-1	TD-325 TD-313	TP-150	100-051-272
	300			R150-10	YF-1 YET-300-1	TD-325 TD-313	TP-150	100-051-272

Model	Wire Gauge (AWG, kcmil)		Screw Size	Crimp Terminal Model Number	Tool		Insulation Cap Model No.	Code <1>
	R/L1,S/L2,T/L3	⊖, ⊕			Machine No.	Die Jaw		
4A0150	–	3/0 × 2P	M12	80-L12	YF-1 YET-300-1	TD-323 TD-312	TP-080	100-051-558
	–	4/0 × 2P		100-L12	YF-1 YET-300-1	TD-324 TD-312	TP-100	100-051-560
	250	250 × 2P		150-L12	YF-1 YET-300-1	TD-325 TD-313	TP-150	100-051-562
	300	300 × 2P		150-L12	YF-1 YET-300-1	TD-325 TD-313	TP-150	100-051-562
	–	350 × 2P		200-L12	YF-1 YET-300-1	TD-327 TD-314	TP-200	100-051-564
	–	400		200-L12	YF-1 YET-300-1	TD-327 TD-314	TP-200	100-051-564
	–	500		325-12	YF-1 YET-300-1	TD-328 TD-315	TP-325	100-051-277
	–	600		325-12	YF-1 YET-300-1	TD-328 TD-315	TP-325	100-051-277
4A0210	3/0 × 2P	–	M12	80-L12	YF-1 YET-300-1	TD-323 TD-312	TP-080	100-051-558
	4/0 × 2P			100-L12	YF-1 YET-300-1	TD-324 TD-312	TP-100	100-051-560
	250 × 2P			150-L12	YF-1 YET-300-1	TD-325 TD-313	TP-150	100-051-562
	300 × 2P			150-L12	YF-1 YET-300-1	TD-325 TD-313	TP-150	100-051-562
	350 × 2P			200-L12	YF-1 YET-300-1	TD-327 TD-314	TP-200	100-051-564
	400	400 × 2P		200-L12	YF-1 YET-300-1	TD-327 TD-314	TP-200	100-051-564
	500	500 × 2P		325-12	YF-1 YET-300-1	TD-328 TD-315	TP-325	100-051-277
	600	600 × 2P		325-12	YF-1 YET-300-1	TD-328 TD-315	TP-325	100-051-277
4A0300	250 × 2P	–	M12	150-L12	YF-1 YET-300-1	TD-325 TD-313	TP-150	100-051-562
	300 × 2P	–		150-L12	YF-1 YET-300-1	TD-325 TD-313	TP-150	100-051-562
	350 × 2P	–		200-L12	YF-1 YET-300-1	TD-327 TD-314	TP-200	100-051-564
	400 × 2P			200-L12	YF-1 YET-300-1	TD-327 TD-314	TP-200	100-051-564
	500 × 2P			325-12	YF-1 YET-300-1	TD-328 TD-315	TP-325	100-051-277
	600 × 2P			325-12	YF-1 YET-300-1	TD-328 TD-315	TP-325	100-051-277

<1> Codes refer to a set of three crimp terminals and three insulation caps. Prepare input and output wiring using two sets for each connection.
Example 1: Model 4A0105 with 300 kcmil for both input and output require one set for input terminals and one set for output terminals, so the user should order two sets of [100-051-272].
Example 2: Model 4A0210 with 300 kcmil × 2P for both input and output require two sets for input terminals and two sets for output terminals, so the user should order four sets of [100-051-562].

Note: Use crimp insulated terminals or insulated shrink tubing for wiring connections. Wires should have a continuous maximum allowable temperature of 75°C 600 Vac UL-approved vinyl-sheathed insulation.

Model	Wire Gauge (AWG, kcmil)	Screw Size	Crimp Terminal Model Number	Tool		Insulation Cap Model No.	Code
	r1/ℓ11, ⏦1/ℓ21, t1/ℓ31			Machine No.	Die Jaw		
2A03P5 to 2A0028, 4A03P5 to 4A0028	14	M3.5	R2-3.5	YA-4	AD-900	TP-003	100-106-516
2A0035 to 2A0105, 4A0035 to 4A0300	14	M4	R2-4	YA-4	AD-900	TP-003	100-106-517

◆ Installing Input Fuses

NOTICE: *If a fuse is open or a Ground Fault Circuit Interrupter (GFCI) is tripped, check the wiring and the selection of the peripheral devices. Check the wiring and the selection of peripheral devices to identify the cause. Contact Magnetek before restarting the regenerative unit or the peripheral devices if the cause cannot be identified.*

■ Recommended Branch Circuit Protection

Magnetek recommends installing input fuses and fuse holders to the input side of the current suppression reactor to maintain compliance with UL508C.

■ Low Voltage Wiring for Control Circuit Terminals

Wire low voltage wires with NEC Class 1 circuit conductors. Refer to national state or local codes for wiring. The external power supply shall be a UL listed Class 2 power supply source or equivalent only.

Table C.4 Control Circuit Terminal Power Supply

Input / Output	Terminal Signal	Power Supply Specifications
Multi-function digital inputs	S1, S2, S3, S4, S5, S6, S7, S8, SC	Use the internal LVLC power supply of the regenerative unit. Use class 2 for external power supply.
Multi function analog inputs	+V, -V, A1, A2, A3, AC	

■ Regenerative Unit Short-Circuit Rating

This regenerative unit is suitable for use on a circuit capable of delivering not more than 100,000 RMS symmetrical amperes, 240 Vac for 200 V class regenerative units and 480 Vac for 400 V class regenerative units, when protected by fuses.

Connect the regenerative unit to an AC drive which has built-in semiconductor short-circuit protection and conforms to UL short-circuit test.

◆ Precautionary Notes on External Heatsink (IP00/Open Type enclosure)

When using an external heatsink, UL compliance requires that exposed capacitors in the main circuit are covered to prevent injury to surrounding personnel.

The portion of the external heatsink that projects out can either be protected with the enclosure, or with the appropriate capacitor cover after regenerative unit installation is complete. Use the table below to match regenerative unit models and capacitor cover. Capacitor covers can be ordered from a Magnetek representative or directly from the Magnetek sales department. The table below lists available capacitor covers.

Table C.5 Capacitor Cover

Model	Code Number	Figure
2A0035	100-061-274	*Figure C.4*
2A0053	100-061-275	
2A0073	100-061-277	
2A0105	100-061-278	
4A0035	100-061-274	
4A0043	100-061-274	
4A0053	100-061-275	
4A0073	100-061-275	
4A0105	100-061-277	
4A0150	100-061-277	
4A0210	100-061-278	
4A0300	100-061-278	

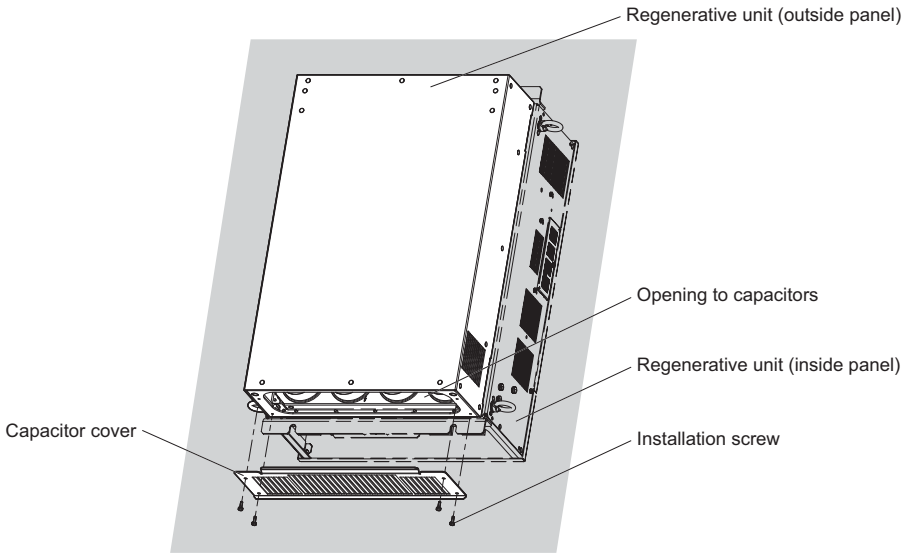


Figure C.4 Capacitor Cover

Appendix: D

RegenAC R1000 Sizing and Selection

This appendix outlines the drive sizing and selection guidelines.

D.1 Regen AC R1000 Drive Sizing and Selection

Voltage	Magnetek P/N	Ratings		
		HP	I_{AC}	I_{DC}
200V Class	R1000-230-0100	5	10	14
	R1000-230-0150	7	15	20
	R1000-230-0200	9	20	27
	R1000-230-0300	13	30	41
	R1000-230-0400	19	41	55
	R1000-230-0500	23	50	68
	R1000-230-0600	27	60	81
	R1000-230-0800	38	83	112
	R1000-230-1000	47	102	138
	R1000-230-1500	71	153	207
	R1000-230-2000	98	209	282
	R1000-230-3000	141	306	413
400V Class	R1000-460-0050	5	5	7
	R1000-460-0075	7	8	11
	R1000-460-0100	9	11	15
	R1000-460-0150	13	16	22
	R1000-460-0200	19	22	30
	R1000-460-0250	23	27	36
	R1000-460-0300	27	32	43
	R1000-460-0400	38	43	58
	R1000-460-0500	47	54	73
	R1000-460-0600	58	66	89
	R1000-460-0750	71	81	109
	R1000-460-1000	98	110	149
	R1000-460-1500	141	161	217
	R1000-460-2500	201	237	320
	R1000-460-3000	282	326	440
	R1000-460-4500	402	466	629

Voltage	Magnetek P/N	Ratings		
		HP	I_{AC}	I_{DC}
200V Class	ENC-R1000-2-0400	19	41	55
	ENC-R1000-2-0600	27	60	81
	ENC-R1000-2-0800	38	83	112
	ENC-R1000-2-1000	47	102	138
400V Class	ENC-R1000-4-0400	38	43	58
	ENC-R1000-4-0600	58	66	89
	ENC-R1000-4-0750	71	81	109
	ENC-R1000-4-1000	98	110	149

Voltage	Magnetek P/N	Ratings		
		HP	I_{AC}	I_{DC}
200V Class	PNL-R1000-2-0400	19	41	55
	PNL-R1000-2-0600	27	60	81
	PNL-R1000-2-0800	38	83	112
	PNL-R1000-2-1000	47	102	138
400V Class	PNL-R1000-4-0400	38	43	58
	PNL-R1000-4-0600	58	66	89
	PNL-R1000-4-0750	71	81	109
	PNL-R1000-4-1000	98	110	149

◆ RegenAC R1000 Applications

The R1000 Converter is intended for cyclic regenerative loads such as geared and gearless elevator applications. When continuous-regeneration or regenerative cycling exceeds the intended 25% duty cycle, consideration must be given to the selected product to avoid nuisance trips and/or product fatigue.

Note: A Duty Cycle of 25% indicates 60 seconds maximum on-time of every 240 seconds (25%).

■ Heavy Duty Applications

A Heavy Duty Application may be defined as one which regenerates continuously, or one which requires peak braking torque in excess of 200%. Consult the factory when the R1000 is applied to these applications.

◆ RegenAC R1000 Sizing/Selection Guidelines

Please use this procedure to estimate the appropriate rating for a given application.

1. Define Application Variables
A = 100% rating of the Motor Amperes
X1 = Efficiency of the Motor (0.75 for Induction Motors, or 0.85 for Permanent Magnet Motors)
X2 = Efficiency of the Gearbox (0.45 for Worm Gear, 0.75 for Planetary Gear, or 1.00 for Gearless Applications)

X3 = Multiplier for Motor overload amps, where 150% = 1.5, 200% = 2.0, and 250% = 2.5

2. Calculate Peak Regenerative Current
Peak Regen Current = A * X1 * X2 * X3

■ Sizing and Selection Notes

1. The X3 variable is dependent on the VFD (Variable Frequency Drive) which is being applied.
   Example: The M1000 has a 165%, 5-second Overload Rating; the HPV900 Series 2 has a 250%, 5-second Overload Rating.
2. When determining required peak regeneration amps, 125% over capacity testing should be considered.
3. The RegenAC Peak Current rating must be greater than or equal to that calculated in Step 2 from the ***RegenAC R1000 Sizing/Selection Guidelines***.
4. The RegenAC Peak Current rating must be greater than 50% of the VFD Peak Current Rating in all cases.

Appendix: E

Replacement Parts

This appendix lists the replacement parts for the R1000 Regenerative Unit Kits.

E.1 Section Safety

⚠ WARNING

Electrical Shock Hazard

Do not operate equipment with covers removed.

Failure to comply could result in death or serious injury.

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

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

Failure to comply will result in death or serious injury.

Always ground the motor-side grounding terminal.

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

Do not touch any terminals before the capacitors have fully discharged.

Failure to comply could result in death or serious injury.

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

Do not allow unqualified personnel to perform work on the regenerative unit.

Failure to comply could result in death or serious injury.

Installation, maintenance, inspection, and servicing must be performed only by authorized personnel familiar with installation, adjustment, and maintenance of regenerative units.

Do not perform work on the regenerative unit while wearing loose clothing, jewelry, or lack of eye protection.

Failure to comply could result in death or serious injury.

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

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

Failure to comply could result in death or serious injury.

Fire Hazard

Tighten all terminal screws to the specified tightening torque.

Loose electrical connections could result in death or serious injury by fire due to overheating of electrical connections.

Do not use an improper voltage source.

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

Verify that the rated voltage of the regenerative unit matches the voltage of the incoming power supply before applying power.

Do not use improper combustible materials.

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

Attach the regenerative unit to metal or other noncombustible material.

NOTICE

Observe proper electrostatic discharge procedures (ESD) when handling the regenerative unit and circuit boards.

Failure to comply may result in ESD damage to the regenerative unit circuitry.

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

Improper equipment sequencing could result in damage to the regenerative unit.

Do not use unshielded cable for control wiring.

Failure to comply may cause electrical interference resulting in poor system performance. Use shielded twisted-pair wires and ground the shield to the ground terminal of the regenerative unit.

Do not allow unqualified personnel to use the product.

Failure to comply could result in damage to the regenerative unit.

Do not modify the regenerative unit circuitry.

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

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

Check all the wiring to ensure that all connections are correct after installing the regenerative unit and connecting any other devices.

Failure to comply could result in damage to the regenerative unit.

If a fuse is open or a Ground Fault Circuit Interrupter (GFCI) is tripped, check the wiring and the selection of the peripheral devices.

Contact your supplier if the cause cannot be identified after checking the above.

Do not restart the regenerative unit immediately operate the peripheral devices if a fuse is open or a GFCI is tripped.

Check the wiring and the selection of peripheral devices to identify the cause. Contact your supplier before restarting the regenerative unit or the peripheral devices if the cause cannot be identified.

E.2 Replacement Parts

Table E.1 Replacement R1000 Model Numbers

Voltage Class	Kit Part Numbers	R1000 Model Number	Qty per Kit
Three-Phase 200 V Class	R1000-230-0100	RU2A03P5FAA	1
	R1000-230-0150	RU2A0005FAA	1
	R1000-230-0200	RU2A0007FAA	1
	R1000-230-0300	RU2A0010FAA	1
	R1000-230-0400	RU2A0014FAA	1
	R1000-230-0500	RU2A0017FAA	1
	R1000-230-0600	RU2A0020FAA	1
	R1000-230-0800	RU2A0028FAA	1
	R1000-230-1000	RU2A0035AAA	1
	R1000-230-1500	RU2A0053AAA	1
	R1000-230-2000	RU2A0073AAA	1
	R1000-230-3000	RU2A0105AAA	1
Three-Phase 400 V Class	R1000-460-0050	RU4A03P5FAA	1
	R1000-460-0075	RU4A0005FAA	1
	R1000-460-0100	RU4A0007FAA	1
	R1000-460-0150	RU4A0010FAA	1
	R1000-460-0200	RU4A0014FAA	1
	R1000-460-0250	RU4A0017FAA	1
	R1000-460-0300	RU4A0020FAA	1
	R1000-460-0400	RU4A0028FAA	1
	R1000-460-0500	RU4A0035AAA	1
	R1000-460-0600	RU4A0043AAA	1
	R1000-460-0750	RU4A0053AAA	1
	R1000-460-1000	RU4A0073AAA	1
	R1000-460-1500	RU4A0105AAA	1
	R1000-460-2500	RU4A0150AAA	1
	R1000-460-3000	RU4A0210AAA	1
	R1000-460-4500	RU4A0300AAA	1

Table E.2 Replacement Fuses and Fuse Blocks

Voltage Class	Kit Part Number	Magnetek Input Fuse Part Number	Manufacturer Input Fuse Part Number	Qty per Kit	Magnetek Fuse Holder Part Number	Manufacturer Fuse Holder Part Number	Qty per Kit
Three-Phase 200 V Class	R1000-230-0100	05P00017-0657	A30QS20-1	3	05P00019-0196	70318	1
	R1000-230-0150	05P00017-0658	A30QS30-1	3	05P00019-0196	70318	1
	R1000-230-0200	05P00017-0658	A30QS30-1	3	05P00019-0196	70318	1
	R1000-230-0300	05P00017-0653	A30QS50-4	3	05P00019-0197	P243G	3
	R1000-230-0400	05P00017-0600	A30QS80-4/ FWX-80A	3	05P00019-0175	P-243	3
	R1000-230-0500	05P00017-0600	A30QS80-4/ FWX-80A	3	05P00019-0175	P-243	3
	R1000-230-0600	05P00017-0601	A30QS100-4/ FWX-100A	3	05P00019-0175	P-243	3
	R1000-230-0800	05P00017-0602	A30QS150-4/ FWX-150A	3	05P00019-0175	P-243	3
	R1000-230-1000	05P00017-0602	A30QS150-4/ FWX-150A	3	05P00019-0175	P-243	3
	R1000-230-1500	05P00017-0670	A30QS200-4/ FWX-200A	3	05P00019-0175	P-243	3
	R1000-230-2000	05P00017-0671	170M2620	3	05P00019-0199	170H1007	3
	R1000-230-3000	05P00017-0672	170M3021	3	05P00019-0200	170H3003	3
Three-Phase 400 V Class	R1000-460-0050	05P00017-0504	A60Q10-2	3	05P00019-0198	30323	1
	R1000-460-0075	05P00017-0659	A60Q15-2	3	05P00019-0198	30323	1
	R1000-460-0100	05P00017-0659	A60Q15-2	3	05P00019-0198	30323	1
	R1000-460-0150	05P00017-0654	A60Q30-2	3	05P00019-0198	30323	1
	R1000-460-0200	05P00017-0654	A60Q30-2	3	05P00019-0198	30323	1
	R1000-460-0250	05P00017-0660	A50P50-4	3	05P00019-0197	P243G	3
	R1000-460-0300	05P00017-0660	A50P50-4	3	05P00019-0197	P243G	3
	R1000-460-0400	05P00017-0603	A50P80-4/ FWH-80B	3	05P00019-0176	P-243E	3
	R1000-460-0500	05P00017-0603	A50P80-4/ FWH-80B	3	05P00019-0176	P-243E	3
	R1000-460-0600	05P00017-0604	A50P100-4/ FWH-100B	3	05P00019-0176	P-243E	3
	R1000-460-0750	05P00017-0605	A50P150-4/ FWH-150B	3	05P00019-0176	P-243E	3
	R1000-460-1000	05P00017-0605	A50P150-4/ FWH-150B	3	05P00019-0176	P-243E	3
	R1000-460-1500	05P00017-0673	170M1371	3	05P00019-0199	170H1007	3
	R1000-460-2500	05P00017-0671	170M2620	3	05P00019-0199	170H1007	3
	R1000-460-3000	05P00017-0672	170M3021	3	05P00019-0200	170H3003	3
	R1000-460-4500	05P00017-0679	170M4016	3	05P00019-0200	170H3003	3

Table E.3 Replacement Power Reactors

Voltage Class	Kit Part Number	Magnetek Power Reactor Part Number	Manufacturer Reactor Part Number	Qty per Kit
Three-Phase 200 V Class	R1000-230-0100	05P00620-0134	RL-01201	1
	R1000-230-0150	05P00620-0136	RL-01801	1
	R1000-230-0200	05P00620-0205	RL-02501	1
	R1000-230-0300	05P00620-0044	RL-03501	1
	R1000-230-0400	05P00620-0140	RL-04501	1
	R1000-230-0500	05P00620-0141	RL-05501	1
	R1000-230-0600	05P00620-0143	RL-08001	1
	R1000-230-0800	05P00620-0143	RL-08001	1
	R1000-230-1000	05P00620-0146	RL-10001	1
	R1000-230-1500	05P00620-0216	RL-20002	1
	R1000-230-2000	05P00620-0209	RL-25001	1
	R1000-230-3000	05P00620-0211	RL-40002	1
Three-Phase 400 V Class	R1000-460-0050	05P00620-0132	RL-00402	1
	R1000-460-0075	05P00620-0133	RL-00802	1
	R1000-460-0100	05P00620-0134	RL-01201	1
	R1000-460-0150	05P00620-0137	RL-01802	1
	R1000-460-0200	05P00620-0138	RL-02502	1
	R1000-460-0250	05P00620-0139	RL-03502	1
	R1000-460-0300	05P00620-0139	RL-03502	1
	R1000-460-0400	05P00620-0049	RL-04502	1
	R1000-460-0500	05P00620-0142	RL-05502	1
	R1000-460-0600	05P00620-0144	RL-08002	1
	R1000-460-0750	05P00620-0144	RL-08002	1
	R1000-460-1000	05P00620-0145	RL-10002	1
	R1000-460-1500	05P00620-0216	RL-20002	1
	R1000-460-2500	05P00620-0212	RL-25002	1
	R1000-460-3000	05P00620-0211	RL-40002	1
	R1000-460-4500	05P00620-0094	RL-50002	1

Table E.4 Replacement Current Suppression Reactors

Voltage Class	Kit Part Number	Magnetek Current Suppression Part Number	Manufacturer Current Suppression Part Number	Qty per Kit
Three-Phase 200 V Class	R1000-230-0100	05P00620-0134	RL-01201	1
	R1000-230-0150	05P00620-0205	RL-02501	1
	R1000-230-0200	05P00620-0205	RL-02501	1
	R1000-230-0300	05P00620-0044	RL-03501	1
	R1000-230-0400	05P00620-0141	RL-05501	1
	R1000-230-0500	05P00620-0143	RL-08001	1
	R1000-230-0600	05P00620-0143	RL-08001	1
	R1000-230-0800	05P00620-0146	RL-10001	1
	R1000-230-1000	05P00620-0064	RL-13001	1
	R1000-230-1500	05P00620-0208	RL-16001	1
	R1000-230-2000	05P00620-0209	RL-25001	1
	R1000-230-3000	05P00620-0210	RL-20001	1

Voltage Class	Kit Part Number	Magnetek Current Suppression Part Number	Manufacturer Current Suppression Part Number	Qty per Kit
Three-Phase 400 V Class	R1000-460-0050	05P00620-0133	RL-00802	1
	R1000-460-0075	05P00620-0024	RL-00801	1
	R1000-460-0100	05P00620-0135	RL-01202	1
	R1000-460-0150	05P00620-0136	RL-01801	1
	R1000-460-0200	05P00620-0205	RL-02501	1
	R1000-460-0250	05P00620-0044	RL-03501	1
	R1000-460-0300	05P00620-0140	RL-04501	1
	R1000-460-0400	05P00620-0141	RL-05501	1
	R1000-460-0500	05P00620-0143	RL-08001	1
	R1000-460-0600	05P00620-0143	RL-08001	1
	R1000-460-0750	05P00620-0146	RL-10001	1
	R1000-460-1000	05P00620-0064	RL-13001	1
	R1000-460-1500	05P00620-0210	RL-20001	1
	R1000-460-2500	05P00620-0209	RL-25001	1
	R1000-460-3000	05P00620-0214	RL-40001	1
	R1000-460-4500	05P00620-0213	RL-50001	1

RegenAC™ R1000

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