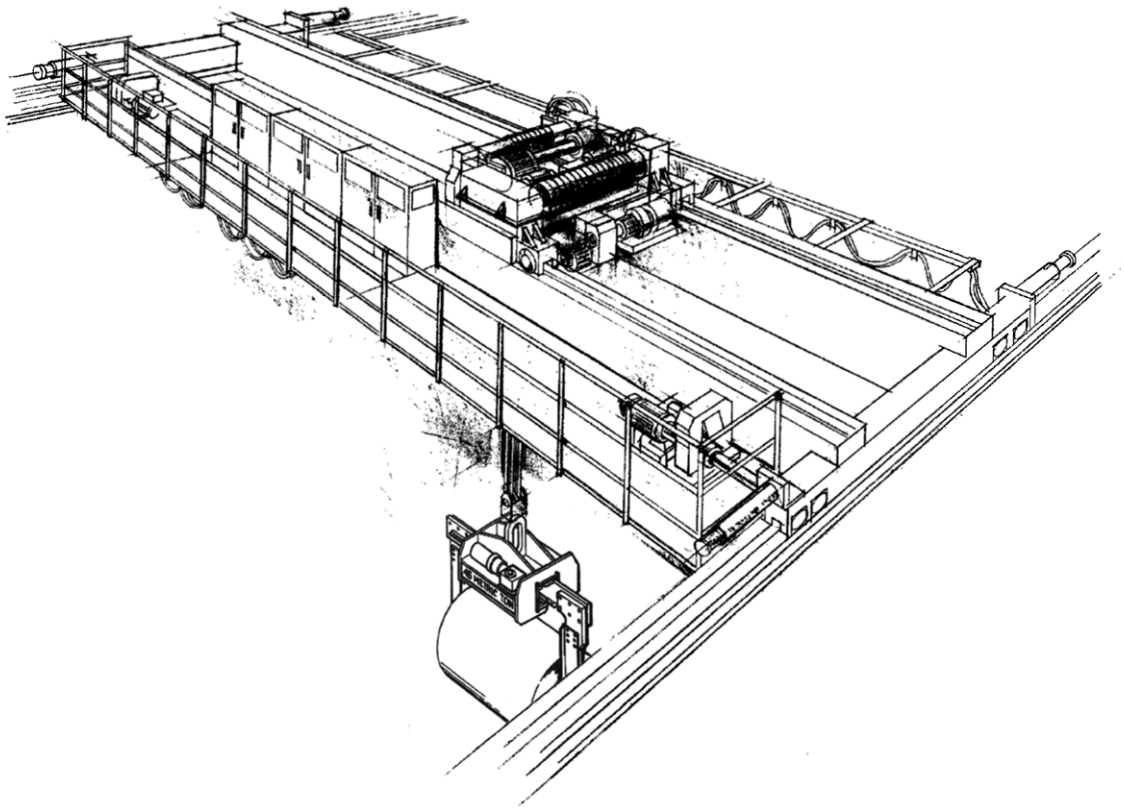




IMPULSE® R

AC Line Regeneration Unit

Instruction Manual



MAGNETEK
MATERIAL HANDLING

September 2012

Part Number: 146-17040

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Preface and Safety

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IMPULSE®•R is a power regenerative unit which has both braking and regenerative functions. This instruction manual describes installation, maintenance and inspection, troubleshooting, and specifications of the IMPULSE®•R. Read this instruction manual thoroughly before operation.

Product Safety Information

Magnetek, Inc. (Magnetek) offers a broad range of radio remote control products, control products and adjustable frequency drives, and industrial braking systems for material handling applications. This manual has been prepared by Magnetek to provide information and recommendations for the installation, use, operation and service of Magnetek's material handling products and systems (Magnetek Products). Anyone who uses, operates, maintains, services, installs or owns Magnetek Products should know, understand, and follow the instructions and safety recommendations in this manual for Magnetek Products.

The recommendations in this manual do not take precedence over any of the following requirements relating to cranes, hoists, lifting devices or other equipment which use or include Magnetek Products:

- Instructions, manuals, and safety warnings of the manufacturers of the equipment where the Magnetek Products are used,
- Plant safety rules and procedures of the employers and the owners of the facilities where the Magnetek Products are being used,
- Regulations issued by the Occupational Health and Safety Administration (OSHA),
- Applicable local, state, or federal codes, ordinances, standards and requirements, or
- Safety standards and practices for the industries in which Magnetek Products are used.

This manual does not include or address the specific instructions and safety warnings of these manufacturers or any of the other requirements listed above. It is the responsibility of the owners, users, and operators of the Magnetek Products to know, understand, and follow all of these requirements. It is the responsibility of the employer to make its employees aware of all of the above listed requirements and to make certain that all operators are properly trained. **No one should use Magnetek Products prior to becoming familiar with and being trained in these requirements and the instructions and safety recommendations for this manual.**

Product Warranty Information

Magnetek, hereafter referred to as Company, assumes no responsibility for improper programming of a drive by untrained personnel. A drive should only be programmed by a trained technician who has read and understands the contents of this manual. Improper programming of a drive can lead to unexpected, undesirable, or unsafe operation or performance of the drive. This may result in damage to equipment or personal injury. Company shall not be liable for economic loss, property damage, or other consequential damages or physical injury sustained by the purchaser or by any third party as a result of such programming. Company neither assumes nor authorizes any other person to assume for Company any other liability in connection with the sale or use of this product. For information on Magnetek's product warranties by product type, please visit www.magnetekmh.com.

Conditions of Acceptability

NEC, CEC and UL Compliance

In order to comply with the NEC, CEC and UL, the following conditions of use must be strictly adhered to:

Surge Protector Installation

An MOV must be installed on the input of the IMPULSE®•R.

Current Suppression Reactor Installation

The Current Suppression Reactor must be installed as shown in Figure 9.

Terminal Blocks

The Power Terminal Blocks of the IMPULSE®•R are for factory wiring use only.

Installation Environment

Install the IMPULSE®•R in a protective enclosure suitable to its environment if it was not purchased as an enclosed kit.

CSA Standards Compliance

The IMPULSE®•R is CSA certified as following.

Products

CLASS 3211 06
INDUSTRIAL CONTROL EQUIPMENT
Motor Controllers Miscellaneous

CLASS 2411 02
ELEVATOR EQUIPMENT
Enclosed Elevator and Escalator Electrical Equipment

Applicable Requirements

CAN/CSA C22.2 No.0.4-04
Bonding of Electrical Equipment

CAN/CSA C22.2 No.14-05
Industrial Control Equipment

CSA B44.1-04/ASME A17.5-2004
Elevator and Escalator Electrical Equipment



CSA B44.1 /
ASME A17.5

Figure 1: CSA B44.1-04/ASME A17.5-2004 Mark

Supplemental Safety Instructions

Read and understand this manual before installing, operating, or servicing this product. Install the product according to this manual and local codes.

The following conventions indicate safety messages, and may be used in this manual to emphasize important and critical information. Failure to heed these messages could cause fatal injury or damage products and related equipment and systems.



DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.



WARNING

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



CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It may also be used to alert against unsafe practices.

NOTICE

NOTICE indicates an equipment damage message.

NOTE: A *NOTE* statement is used to notify installation, operation, programming, or maintenance information that is important, but not hazard-related.

Notes for Safe Operation

Receiving



CAUTION

Do not install or operate any power regenerative unit which is damaged or has missing parts. Failure to observe this caution may result in personal injury or equipment damage (refer to page 10).

Installation



CAUTION

Lift the cabinet by the base. When moving the unit, never lift by the front cover or the front panel.

Otherwise, the main unit may be dropped, causing damage to the unit (refer to page 12).

Mount the power regenerative unit on nonflammable material (i.e. metal).

Failure to observe this caution can result in a fire (refer to page 12).

When mounting units in an enclosure, install a fan or other cooling device to keep the intake air temperature below 45°C.

Overheating may cause a fire or damage to the unit (refer to page 12).

In order to comply to UL regulations, the MOV and current suppression reactor must be installed on the input of the IMPULSE®•R.

Refer to the installation diagram (refer to page 12).

Wiring



WARNING

Only commence wiring after verifying that the power supply is turned OFF.

Failure to observe this warning can result in an electric shock or a fire (refer to page 19).

Wiring should be performed only by qualified personnel.

Failure to observe this warning can result in an electric shock or a fire (refer to page 19).

Make sure to ground the ground terminal before connecting the other terminals.

Failure to observe this warning can result in an electric shock or a fire (refer to page 19).

Install adequate branch short circuit protection according to applicable codes.

Failure to comply could result in damage to the drive.

The device is suitable for circuits capable of delivering up to 100 kA RMS Symmetrical Amperes, 240 VAC maximum (230 V Class), 480 VAC maximum (460 V Class), or equivalent to the SCCR rating of the VFD to which it is connected - whichever value is less.

IMPULSE®•R devices shall be connected to a VFD which incorporates Solid State Short Circuit Protection Circuitry and was found to comply with the High Fault Current Short Circuit Test.



CAUTION

Verify that the power regenerative unit rated voltage coincides with the AC power supply voltage.

Failure to observe this caution can result in personal injury or a fire (refer to page 19).

Do not perform a withstand voltage test of the power regenerative unit.

It may cause semiconductor elements to be damaged (refer to page 19).

Connect the power coordinating reactor and the power suppressing reactor as described in this instruction manual.

Improper connection may cause a fire (refer to page 19).

Verify that the rated voltage of the power regenerative unit coincides with the rated voltage of the power regenerative unit to be connected.

Failure to observe this caution can result in a fire (refer to page 19).

Tighten terminal screws.

Failure to observe this caution can result in a fire (refer to page 19).

Operation



WARNING

Only turn ON the input power supply after replacing the front cover or the terminal cover. Do not remove the cover while power is on.

Failure to observe this warning can result in an electric shock (refer to page 31).

Never operate the digital operator or other switches when your hand is wet.

Failure to observe this warning can result in an electric shock (refer to page 31).

Never touch the terminals while power is on, even if the power regenerative unit stops.

Failure to observe this warning can result in an electric shock (refer to page 31).



CAUTION

Never touch the heatsink or input reactors since their temperature may be very high.

Failure to observe this caution can result in harmful burns to the body (refer to page 31).

All the parameters of the power regenerative unit have been preset at the factory. Do not change the settings unnecessarily.

The power regenerative unit may be damaged (refer to page 31).

Maintenance and Inspection



WARNING

Never touch high-voltage terminals in the power regenerative unit.

Failure to observe this warning can result in an electric shock (refer to page 40).

Perform maintenance or inspection only after verifying that the CHARGE LED goes OFF, after the main circuit power supply is turned OFF.

The capacitors are still charged and can be dangerous (refer to page 40).

Only authorized personnel should be permitted to perform maintenance, inspections, or parts replacement.

[Remove all metal objects (watches, bracelets, etc.) before operation.] Use tools which are insulated against electric shock.

Failure to observe this warning can result in an electric shock. (Refer to page 40)

Never modify the product.

Failure to observe this warning can result in an electric shock or personal injury and will invalidate the guarantee (refer to page 40).



CAUTION

The power regenerative unit employs semi-conductor elements. Do not touch the CMOS elements.

They are easily damaged by static electricity (refer to page 40).

Do not connect or disconnect wires or connectors while power is applied to the circuit.

Failure to observe this caution can result in personal injury (refer to page 40).

Receiving

Section Safety



CAUTION

Do not install or operate any power regenerative unit which is damaged or has missing parts. Failure to observe this caution may result in personal injury or equipment damage.

Inspection Checkpoints

Receiving Checkpoints

Table 1: Checkpoints

Checkpoints	Description
Does the power regenerative unit model number correspond with the purchase order?	Check the model number on the nameplate on the side of the IMPULSE®•R.
Are any parts damaged?	Visually check the exterior and verify that there was no damage during transport.
Is hardware properly seated and securely tightened?	Remove the front cover of the power regenerative unit. Check all visible hardware with appropriate tools.

If any of the above checkpoints are not satisfactory, contact your Magnetek representative.

Model Designation

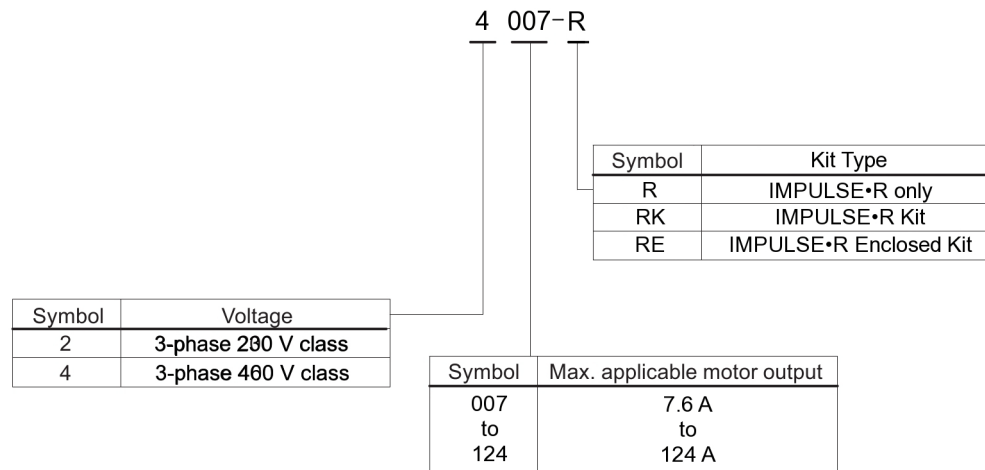


Figure 2: Model Designation

Productive Structure

- Open Chassis Type (IEC IP00)
Protected so that parts of the human body cannot reach electrically charged parts from the front when the power regenerative unit is mounted in a control panel.
- Enclosed Wall-mounted Type (IEC IP20, NEMA 1)
The power regenerative unit is structured so that the power regenerative unit is shielded from the exterior, and can thus be mounted to the interior wall of a standard building (not necessarily enclosed in a control panel). The protective structure conforms to the standards of NEMA 1 in the USA.

Installation

Section Safety



CAUTION

Lift the cabinet by the base. When moving the unit, never lift by the front cover or the front panel.

Otherwise, the main unit may be dropped causing damage to the unit.

Mount the power regenerative unit on nonflammable material (i.e. metal).

Failure to observe this caution can result in a fire.

When mounting units in an enclosure, install a fan or other cooling device to keep the intake air temperature below 45°C.

Overheating may cause a fire or damage to the unit.

Checking Installation Site

Installation Site

Install the power regenerative unit under the following conditions.

NOTICE

Do not install the power regenerative unit to an area greater than pollution degree 2 (UL standard).

Table 2: Acceptable Installation Conditions

Type	Ambient Operating Temperature	Humidity
Enclosed wall-mounted	–10 to +40°C	90% RH or less (no condensation)
Open chassis	–10 to +45°C	90% RH or less (no condensation)

To ensure proper performance and long operating life, follow the recommendations below when choosing a location for installing the IMPULSE®•R. Make sure the power regenerative unit is protected from the following conditions:

- Extreme cold and heat. Use only within ambient temperature range: -10°C to +40°C
- Rain, moisture. (For enclosed wall-mounted type)
- Oil sprays, splashes
- Salt spray.
- Direct sunlight. (Avoid using outdoors.)
- Corrosive gases or liquids.
- Dust or metallic particles in the air. (For enclosed wall-mounted type)
- Physical shock, vibration.
- Magnetic noise. (Example: welding machines, power devices, etc.)
- High humidity.
- Radioactive materials.
- Combustibles: thinners, solvents, etc.

Controlling the Ambient Temperature

To enhance the reliability of operation, the power regenerative unit should be installed in an environment free from extreme temperature increases. If the power regenerative unit is installed in an enclosed environment, such as a box, use a cooling fan or air conditioner to maintain the internal air temperature below 45°C.

Protecting the Power Regenerative Unit from Foreign Matter

Place a cover over the power regenerative unit during installation to shield it from metal power produced by drilling.

Always remove the cover from the power regenerative unit after completing installation. Otherwise, ventilation will be reduced, causing the power regenerative unit to overheat.

Clearances

Install the unit vertically and allow sufficient clearances for effective cooling as shown in Figure 3.

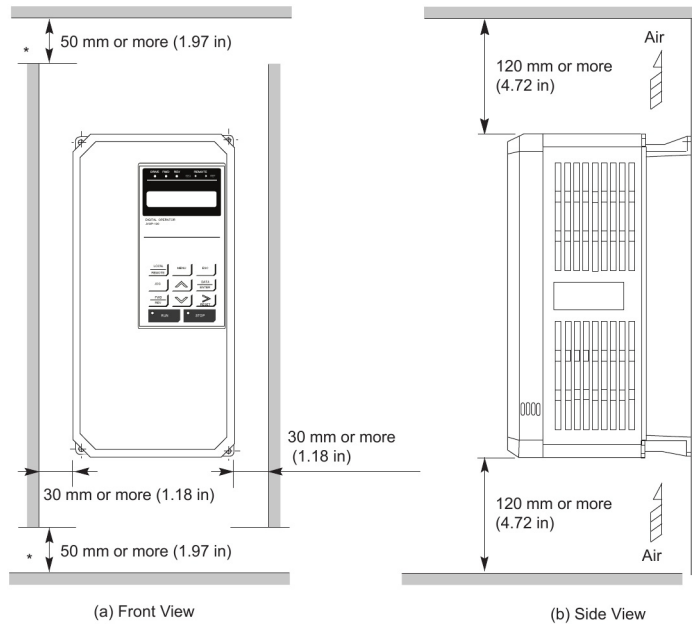


Figure 3: Clearances

NOTE: The clearances required at top/bottom and both sides are common in open chassis type (IP00) and enclosed wall-mounted type (NEMA 1). When installing the models of 230 V (130 A) or 460 V (65 A or greater) equipped with eyebolts, extra spacing will be required on either side. For detailed dimensions, contact your Magnetek representative. Ensure sufficient space for the sections at the upper and lower parts marked with * in order to permit the flow of intake/exhaust air to/from the unit.

Dimensions

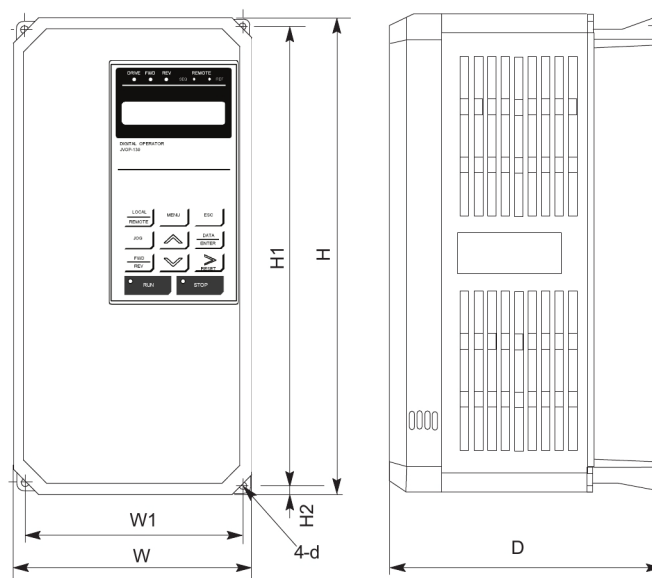


Figure 4: Dimensions of the IMPULSE®•R

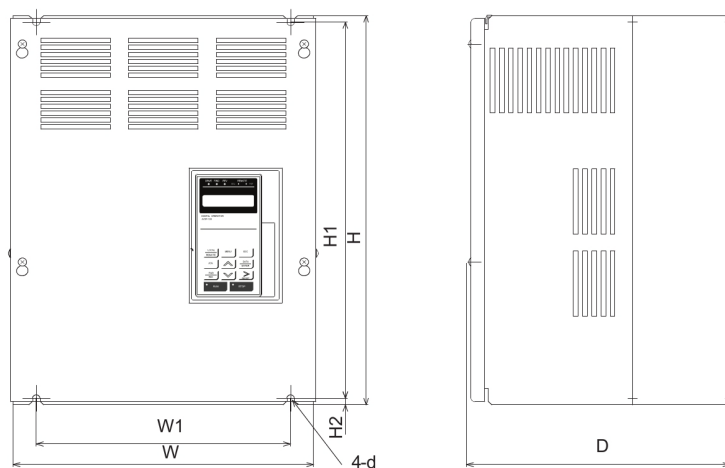


Figure 5: Dimensions of the IMPULSE®•R

Table 3: IMPULSE®•R Dimensions in (mm) and Approx. Weight lb (kg)

Voltage	Model Number	Figure	Dimensions in (mm)			Mounting Dimension in (mm)			Approx. Weight lb (kg)	Mounting Hole d	Enclosure Type
			W	H	D	W1	H1	H2			
230 V Class	2015	4	5.51 (140)	11.02 (280)	7.09 (180)	4.96 (126)	10.47 (266)	0.28 (7.0)	9.9 (4.5)	M5	IP20
	2022										
	2028										
	2042		7.87 (200)	11.81 (300)	8.07 (205)	7.32 (186)	11.22 (285)	0.32 (8.0)	12.1 (5.5)	M6	
	2054								13.2 (6)		
	2068		9.84 (250)	14.96 (380)	8.86 (225)	9.29 (236)	14.37 (365)	0.30 (7.5)	22 (10)		
	2080			15.75 (400)				1.08 (27.5)	24.3 (11)		
	2104										
	2130	5	12.80 (325)	17.72 (450)	11.22 (285)	10.83 (275)	17.13 (435)	0.30 (7.5)	50.7 (23)		IP00
460 V Class	4007	4	5.51 (140)	11.02 (280)	7.09 (180)	4.96 (126)	10.47 (266)	0.28 (7.0)	7.7 (3.5)	M5	IP20
	4011								8.8 (4)		
	4014										
	4021		7.87 (200)	11.81 (300)	8.07 (205)	7.32 (186)	11.22 (285)	0.32 (8.0)	13.2 (6)	M6	
	4027										
	4034		9.84 (250)	14.96 (380)	8.86 (225)	9.29 (236)	14.37 (365)	0.30 (7.5)	23.1 (10.5)		
	4040										
	4052										
460 V Class	4065	5	12.80 (325)	17.72 (450)	11.22 (285)	10.83 (275)	17.13 (435)	0.30 (7.5)	55.1 (25)	M6	IP00
	4077				11.22 (285)	10.83 (275)			57.3 (26)		
	4096			25.0 (635)	11.22 (285)	10.83 (275)	24.02 (610)		75 (34)		
	4124				11.22 (285)	10.83 (275)			79.4 (36)		

Removing and Replacing the Front Cover

To remove the front cover, first move the LCD monitor/digital operator in the direction shown by arrow 1. Then squeeze the cover in the direction shown by arrows 2 on both sides and lift in the direction shown by arrow 3.

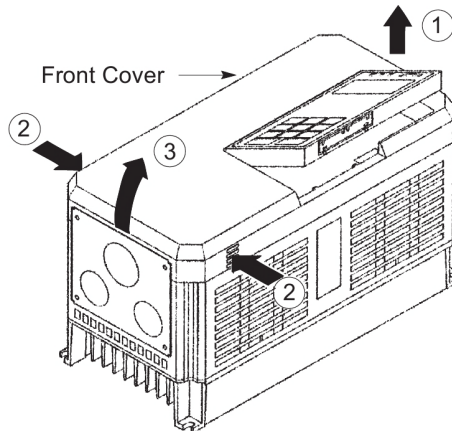


Figure 6: Removing and Replacing the Front Cover

NOTE: Do not replace the front cover with the LCD monitor/digital operator connected. The LCD monitor/digital operator will not be connected to the power regenerative unit. Replace the front cover first and then install the LCD monitor/digital operator on the cover. Refer to Removing and Replacing the LCD Monitor/Digital Operator section for replacing the LCD monitor/digital operator.

Removing and Replacing the LCD Monitor/Digital Operator

Remove and replace the LCD monitor/digital operator as follows.

Removing the LCD Monitor/Digital Operator

Push the LCD monitor/digital operator lever in the direction shown by arrow 1 and lift the LCD monitor/digital operator in the direction shown by arrow 2 to remove the LCD monitor/digital operator from the front cover.

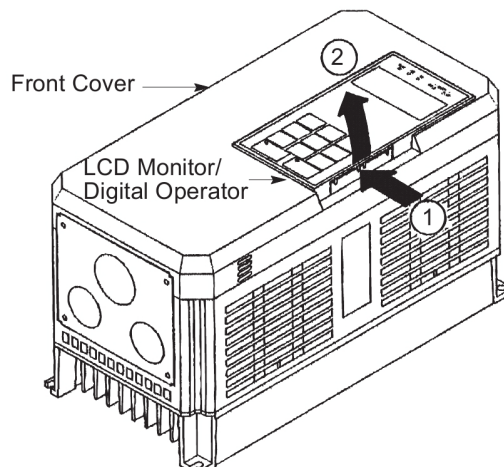


Figure 7: Removing the LCD Monitor/Digital Operator

Replacing the LCD Monitor/Digital Operator

Engage the LCD monitor/digital operator on claws A in the direction shown by arrow 1 and then on claws B in the direction shown by arrow 2 to lock the LCD monitor/digital operator.

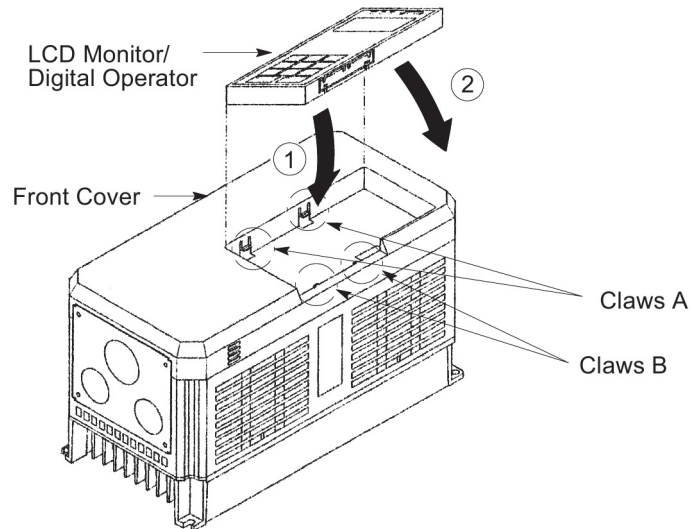


Figure 8: Replacing the LCD Monitor/Digital Operator

NOTE: Never fit the LCD monitor/digital operator in any other direction or by any other method. The LCD monitor/digital operator will not be connected to the inverter.

Wiring

Section Safety



WARNING

Only commence wiring after verifying that the power supply is turned OFF.
Failure to observe this warning can result in an electric shock or a fire.

Wiring should be performed only by qualified personnel.
Failure to observe this warning can result in an electric shock or a fire.

Make sure to ground the ground terminal $\oplus$ before connecting the other terminals.
Failure to observe this warning can result in an electric shock or a fire.

Install adequate branch short circuit protection according to applicable codes.
Failure to comply could result in damage to the drive.

The device is suitable for circuits capable of delivering up to 100 kA RMS Symmetrical Amperes, 240 VAC maximum (230 V Class), 480 VAC maximum (460 V Class) or equivalent to the SCCR rating of the VFD to which it is connected - whichever value is less.

R5 Series of Power Regenerative devices shall be connected to a VFD which incorporates Solid State Short Circuit Protection Circuitry and was found to comply with the High Fault Current Short Circuit Test.



CAUTION

Verify that the power regenerative unit rated voltage coincides with the AC power supply voltage.

Failure to observe this caution can result in personal injury or a fire.

Do not perform a withstand voltage test of the power regenerative unit.

It may cause semi-conductor elements to be damaged.

Connect the power coordinating reactor and the power suppressing reactor as described in this instruction manual.

Improper connection may cause a fire.

Verify that the rated voltage of the power regenerative unit coincides with the rated voltage of the power regenerative unit to be connected.

Failure to observe this caution can result in a fire.

Tighten terminal screws.

Failure to observe this caution can result in a fire.

Connection Diagram

Connection Diagram with Drive

Figure 9 shows a diagram of a typical connection of the IMPULSE®•R with a Magnetek drive.

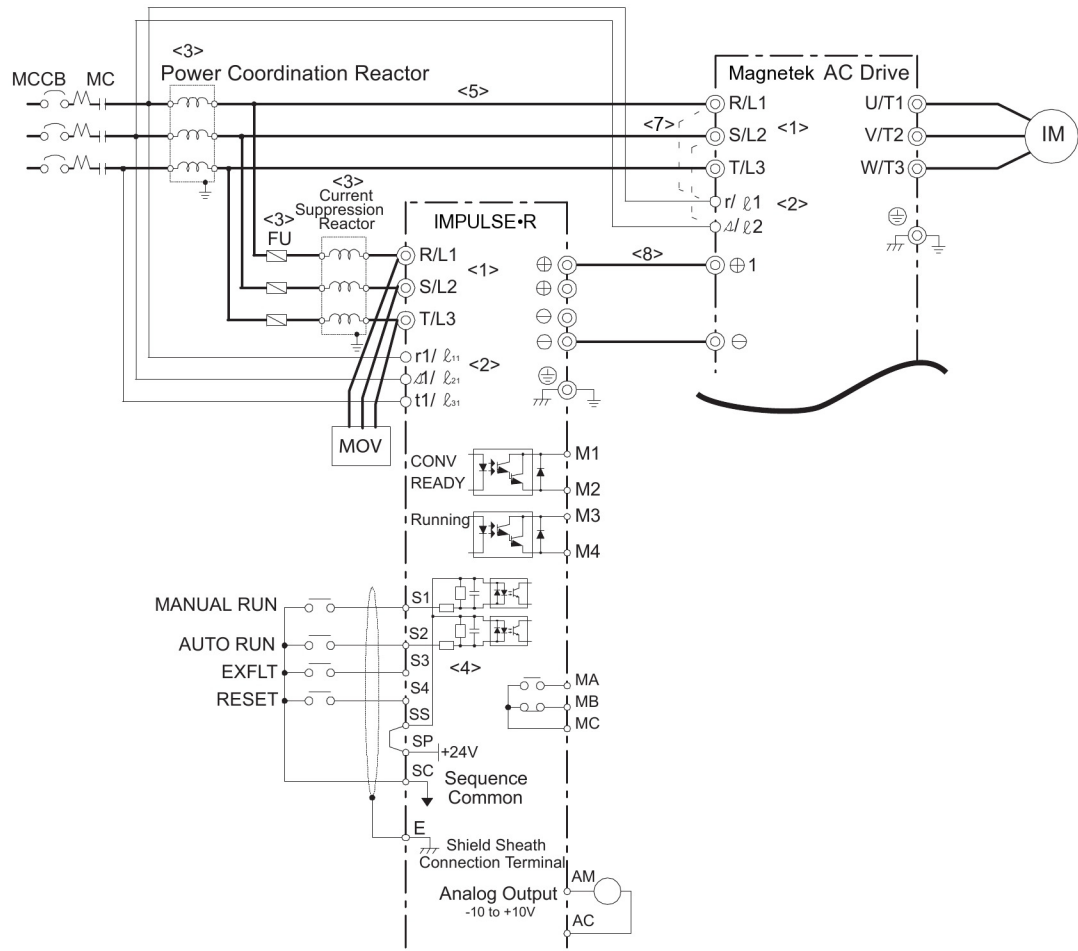


Figure 9: Connection Diagram (when connecting an IMPULSE®•R and a Magnetek drive)

<1> Connect the Magnetek AC Drive power supply terminals R/L1, S/L2, and T/L3 to the secondary side of the power coordinating reactor. Connect the IMPULSE®•R AC power supply terminals R/L1, S/L2, and T/L3 to the secondary side of the power suppressing reactor.

<2> Connect terminals r/l 1, s/l 2 of IMPULSE®•R, and terminals r1/l 11, s1/l 21, and t1/l 31 of the unit to the primary side of the power coordinating reactor.

<3> Make sure to use the specified reactor, fuse, and fuse holder.

<4> The sequence input terminal of IMPULSE®•R is the same as terminal S1. Typically, the only needed input connection would be a jumper between SC and S2 to use AutoRun mode.

<5> The wiring distance between the power coordinating reactor, and IMPULSE®•R and a Magnetek AC Drive should be 10 m or less.

<6> DC bus wiring [(+) 1 - (+), ⊖ ⊖] between the Drive and the power regenerative unit should be 5 m or less.

<7> Remove the wiring of terminals r/l 1 and s/l 2 since they were connected at the factory.

<8> If installing a circuit breaker or a magnetic contactor on the unit output (DC) side to shut down the power supply in an emergency, observe the following precautions:

- Be sure to confirm that the charge lamps on the unit and the Inverter are not lit, and then turn on the circuit breaker or contactor. If the circuit breaker or contactor is turned on while power is supplied to the unit and the Inverter, an overcurrent may occur and damage the circuit breaker or contactor.
- Be sure to confirm that the circuit breaker or contactor is turned on before the power is turned on for the IMPULSE®•R.

Selecting Devices

Selecting Standard Duty or Heavy Duty IMPULSE®•R Application

The IMPULSE®•R overload rating has the capability of 150% braking torque for 30 seconds and 200% peak braking torque. The overload capability is based on the standard duty rating. The unit overload rating can be applied to heavy duty applications. Typically, the heavy duty rating is used when not operating or driving through a gear box. The following is a description of the standard duty and heavy duty ratings.

Standard Duty

Standard duty applications require intermittent full energy dissipation. The continuous rating is 80% or less braking torque and 100% braking torque for 60 seconds with a duty cycle of 25% (60 seconds maximum on-time of every 240 seconds). The overload rating is 150% braking torque for 30 seconds. Please note the peak torque should be less than 200%.

The IMPULSE®•R requires selecting Power Coordination and Current Suppression reactors according to specifications in Table 6.

Heavy Duty

Heavy duty applications require continuous energy dissipation (100% braking torque).

The overload rating is 125% for 60 seconds with a duty cycle of 25%. Braking torque of 187.5% is available for 30 seconds. Please note the peak torque should be less than 250%.

The IMPULSE®•R requires selecting Power Coordination and Current Suppression reactors according to specifications in Table 6.

Table 4: 230 V Class Input Fuse

IMPULSE®•R			Input fuse		Fuse holder	
Model Number	Motor Rated Current (Aac)	Rated input current (Aac) 25%ED	Magnetek Part Number	Amount per unit	Magnetek Part Number	Amount per unit
2015	15.2	10	146-17022	3	146-17035	1
2022	22	15	146-17023	3	146-17035	1
2028	28	20	146-17023	3	146-17035	1
2042	42	30	146-17024	3	146-17036	3
2054	54	40	146-17025	3	146-17037	3
2068	68	50	146-17025	3	146-17037	3
2080	80	60	146-17026	3	146-17037	3
2104	104	80	146-17027	3	146-17037	3
2130	130	100	146-17027	3	146-17037	3

Table 5: 460 V Class Input Fuse

IMPULSE®•R			Input fuse		Fuse holder	
Model Number	Motor Rated Current (Aac)	Rated input current (Aac) 25%ED	Magnetek Part Number	Amount per unit	Magnetek Part Number	Amount per unit
4007	7.6	5	146-17028	3	146-17038	1
4011	11	7.5	146-17029	3	146-17038	1
4014	14	10	146-17029	3	146-17038	1
4021	21	15	146-17030	3	146-17038	1
4027	27	20	146-17030	3	146-17038	1
4034	34	25	146-17031	3	146-17036	3
4040	40	30	146-17031	3	146-17036	3
4052	52	40	146-17032	3	146-17044	3
4065	65	50	146-17032	3	146-17044	3
4077	77	60	146-17033	3	146-17044	3
4096	96	75	146-17034	3	146-17044	3
4124	124	100	146-17034	3	146-17044	3

Power Coordination and Current Suppression Reactors

Both Power Coordination and Current Suppression Reactors are 3-phase input reactors that correspond to each IMPULSE®•R model and are necessary when operating the unit. Use a single Power Coordination and a single Current Suppression reactor for each IMPULSE®•R application.

Recommended IMPULSE®•R Power Coordination and Suppression Reactor Specifications

Table 6 shows Magnetek's recommended specifications for Power Coordination and Current Suppression reactors for each IMPULSE®•R model.

Table 6: Recommended IMPULSE®•R Power Coordination and Suppression Reactor Specifications

IMPULSE®•R		Power Coordination Reactor*		Current Suppression Reactor*	
Drive Model Number		Model Number	Rated Current	Model Number	Rated Current
230 V Class	2015	REA230-5	18	REA230-3	12
	2022	REA230-7.5	25	REA230-7.5	25
	2028	REA230-10	35	REA230-7.5	25
	2042	REA230-15	45	REA230-10	35
	2054	REA230-20	55	REA230-20	55
	2068	REA230-25	80	REA230-25	80
	2080	REA230-25	80	REA230-25	80
	2104	REA230-40	100	REA230-40	100
	2130	REA230-50	130	REA230-50	130
460 V Class	4007	REA460-5	8	REA460-3R	8
	4011	REA460-7.5	12	REA460-5	8
	4014	REA460-10	18	REA460-7.5	12
	4021	REA460-15	25	REA460-10	18
	4027	REA460-20	35	REA230-7.5	25
	4034	REA460-20	35	REA230-10	35
	4040	REA460-30R	45	REA460-30R	45
	4052	REA460-40	55	REA460-40	55
	4065	REA460-50	80	REA460-50	80
	4077	REA460-50	80	REA230-25	80
	4096	REA460-75	100	REA230-40	100
	4124	REA460-100	130	REA230-50	130

* Reactor models shown are for standard duty. For heavy duty models, consult your Magnetek representative.

Wiring Precautions

The external interconnection wiring must be performed with following procedures. After completing IMPULSE®•R interconnections, be sure to check that the connections are correct. Never use control circuit buzzer check.

Precautions on Control Circuit Wiring

- Separate control circuit wires from main circuit wires and other power cables to prevent erroneous operation caused by noise interference.
- Separate the wiring of control circuit terminals from other control terminals or main circuit wirings.
- Wiring distance should be less than 50 m.
- Insert the wire into the lower part of the terminal block and connect it tightly with a screwdriver. Wire sheath strip length must be 7 mm.

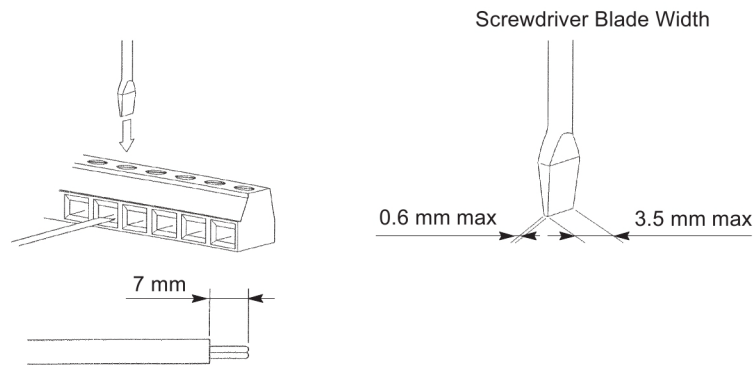


Figure 10: Control Circuit Terminal Wiring

Use twisted shielded or twisted-pair shielded wire for the control circuit line and connect the shielded sheath to inverter terminal E (see Figure 11).

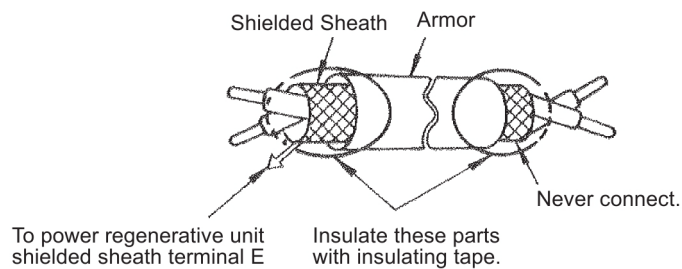


Figure 11: Shielded Wire Termination

Ground Wiring

- Do not share the ground wire with other devices, such as welding machines or power tools. Separate the grounding cables from the wirings for power tools.
- Always use a ground wire that complies with technical standards on electrical equipment and minimize the length of the ground wire. Leakage current flows through the power regenerative unit. Therefore, if the distance between the ground electrode and the ground terminal is too long, potential on the ground terminal of the power regenerative unit will become unstable.
- When using more than one power regenerative unit, be careful not to loop the ground wire.

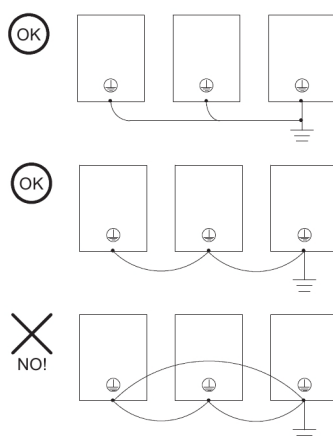


Figure 12: Ground Wiring

Wiring Main Circuit Terminals

Required Wire Size

Select wires to be used for wiring from Table 7 and Table 8.

Table 7: 230 V Class Wire Size

Circuit	Model Number	Terminal Symbol	Terminal Screw	Wire Size <1>		Wire Type
				mm ²	AWG	
Main	2015	R/L1, S/L2, T/L3, (+), (+), ⊖, ⊖	M4	2 to 5.5	14 to 10	Power cable: 600 V vinyl sheathed wire or equivalent
		r1/l 11, s1/l 21, t1/l 31				
		⊖				
	2022	R/L1, S/L2, T/L3, (+), (+), ⊖, ⊖	M4	3.5 to 5.5	12 to 10	
		r1/l 11, s1/l 21, t1/l 31		2 to 5.5	14 to 10	
		⊖		3.5 to 5.5	12 to 10	

<1> Wire size is determined by 75°C temperature-rated copper wire.

Circuit	Model Number	Terminal Symbol	Terminal Screw	Wire Size <1>		Wire Type
				mm ²	AWG	
Main	2028	R/L1, S/L2, T/L3, (+), (+), ⊖, ⊖	M4	5.5	10	Power cable: 600 V vinyl sheathed wire or equivalent
		r1/l 11, s1/l 21, t1/l 31		2 to 5.5	14 to 10	
		⊕		3.5 to 5.5	12 to 10	
	2042	R/L1, S/L2, T/L3, (+), (+), ⊖, ⊖	M5	8	8	
		r1/l 11, s1/l 21, t1/l 31		2 to 5.5	14 to 10	
		⊕		5.5 to 8	10 to 8	
	2054	R/L1, S/L2, T/L3, (+), (+), ⊖, ⊖	M5	8	8	
		r1/l 11, s1/l 21, t1/l 31		2 to 5.5	14 to 10	
		⊕		5.5 to 8	10 to 8	
	2068	R/L1, S/L2, T/L3, (+), (+), ⊖, ⊖	M8	22	4	
		r1/l 11, s1/l 21, t1/l 31	M4	2 to 5.5	14 to 10	
		⊕	M6	8	8	
	2080	R/L1, S/L2, T/L3, (+), (+), ⊖, ⊖	M8	22	4	
		r1/l 11, s1/l 21, t1/l 31	M4	2 to 5.5	14 to 10	
		⊕	M6	8	8	
	2104	R/L1, S/L2, T/L3, (+), (+), ⊖, ⊖	M8	30 to 38	3 to 2	
		r1/l 11, s1/l 21, t1/l 31	M4	2 to 5.5	14 to 10	
		⊕	M6	14	6	
	2130	R/L1, S/L2, T/L3, (+), (+), ⊖, ⊖	M8	50 to 60	1 to 1/0	
		r1/l 11, s1/l 21, t1/l 31	M4	2 to 5.5	14 to 10	
		⊕	M6	14	6	
Control	Common to all models	S1, S2, S3, S4, SS, SP, SC, M1, M2, M3, M4, MA, MB, MC, AM, AC	--	twisted wire 0.5 to 1.25 single 0.5 to 1.25	twisted wire 20 to 16 single 20 to 16	Shielded twisted-pair wires
		E (G)	M3.5	0.5 to 2	20 to 14	

<1> Wire size is determined by 75°C temperature-rated copper wire.

NOTE: Cable size is selected assuming external wiring of single 3-core cables at an ambient temperature of 30°C.

NOTE: For model number 2054, use closed-loop connectors that are recommended by JST (JST 14-5).

Table 8: 460 V Class Wire Size

Circuit	Model Number	Terminal Symbol	Terminal Screw	Wire Size <1>		Wire Type
				mm ²	AWG	
Main	4007	R/L1, S/L2, T/L3, (+), (+), (+), ⊖, ⊖, ⊖	M4	2 to 5.5	14 to 10	Power cable: 600 V vinyl sheathed wire or equivalent
		r1/ℓ 11, s1/ℓ 21, t1/ℓ 31				
		⊕				
	4011	R/L1, S/L2, T/L3, (+), (+), (+), ⊖, ⊖, ⊖	M4	2 to 5.5	14 to 10	
		r1/ℓ 11, s1/ℓ 21, t1/ℓ 31				
		⊕				
	4014	R/L1, S/L2, T/L3, (+), (+), ⊖, ⊖	M4	2 to 5.5	14 to 10	
		r1/ℓ 11, s1/ℓ 21, t1/ℓ 31				
		⊕				
	4021	R/L1, S/L2, T/L3, (+), (+), ⊖, ⊖	M5	3.5 to 5.5	10	
		r1/ℓ 11, s1/ℓ 21, t1/ℓ 31		2 to 5.5	14 to 10	
		⊕				
	4027	R/L1, S/L2, T/L3, (+), (+), ⊖, ⊖	M5	5.5	10	
		r1/ℓ 11, s1/ℓ 21, t1/ℓ 31		2 to 5.5	14 to 10	
		⊕		8	8	
	4034	R/L1, S/L2, T/L3, (+), (+), ⊖, ⊖	M6	8 to 14	8 to 6	
		r1/ℓ 11, s1/ℓ 21, t1/ℓ 31	M4	2 to 5.5	14 to 10	
		⊕	M6	8	8	
	4040	R/L1, S/L2, T/L3, (+), (+), ⊖, ⊖	M6	8 to 14	8 to 6	
		r1/ℓ 11, s1/ℓ 21, t1/ℓ 31	M4	2 to 5.5	14 to 10	
		⊕	M6	8	8	
	4052	R/L1, S/L2, T/L3, (+), (+), ⊖, ⊖	M6	14	6	
		r1/ℓ 11, s1/ℓ 21, t1/ℓ 31	M4	2 to 5.5	14 to 10	
		⊕	M6	8	8	
	4065	R/L1, S/L2, T/L3, (+), (+), ⊖, ⊖	M6	14 to 22	6 to 4	
		r1/ℓ 11, s1/ℓ 21, t1/ℓ 31	M4	2 to 5.5	14 to 10	
		⊕	M6	8	8	

<1> Wire size is determined by 75°C temperature-rated copper wire.

Circuit	Model Number	Terminal Symbol	Terminal Screw	Wire Size <1>		Wire Type
				mm ²	AWG	
Main	4077	R/L1, S/L2, T/L3, (+), (+), ⊖, ⊖	M8	22 to 38	4 to 2	Power cable: 600 V vinyl sheathed wire or equivalent
		r1/ℓ 11, s1/ℓ 21, t1/ℓ 31	M4	2 to 5.5	14 to 10	
		⊕	M6	8	8	
	4096	R/L1, S/L2, T/L3, (+), (+), ⊖, ⊖	M8	38 to 60	2 to 1/0	
		r1/ℓ 11, s1/ℓ 21, t1/ℓ 31	M4	2 to 5.5	14 to 10	
		⊕	M6	14	6	
	4124	R/L1, S/L2, T/L3, (+), (+), ⊖, ⊖	M8	50 to 60	1 to 1/0	
		r1/ℓ 11, s1/ℓ 21, t1/ℓ 31	M4	2 to 5.5	14 to 10	
		⊕	M6	14	6	
Control	Common to all models	S1, S2, S3, S4, SS, SP, SC, M1, M2, M3, M4, MA, MB, MC, AM, AC	--	twisted wire 0.5 to 1.25 single 0.5 to 1.25	twisted wire 20 to 16 single 20 to 16	Shielded twisted-pair wires
		E (G)	M3.5	0.5 to 2	20 to 14	

<1> Wire size is determined by 75°C temperature-rated copper wire.

NOTE: Cable size is selected assuming external wiring of single 3-core cables at an ambient temperature of 30°C

NOTE: For model number 4021 and 4027, use closed-loop connectors that are recommended by JST (JST 3.5 - R5).

Closed-Loop Connectors Size

Magnetek recommends using closed-loop crimp terminals.

UL/cUL approval requires the use of closed-loop crimp terminals when wiring the main circuit terminals.

Use only the tools recommended by the terminal manufacturer for crimping.

Table 9: Closed Loop Connectors Sizes (JIS C 2805) (For 230 V/460 V classes)

Wire Size		Terminal Screw	Tightening Torque (N•m)	Closed Loop Connectors
mm ²	AWG			
0.5	20	M3.5 M4	0.8 to 1.0 1.2 to 1.4	R1.25-3.5 R1.25-4
0.75	18			
1.25	16			
2	14	M4	1.2 to 1.4	R2-4
		M5	2.1 to 2.5	R2-5
3.5	12	M4	1.2 to 1.4	3.5-4
		M5	2.1 to 2.5	3.5-R5
5.5	10	M4	1.2 to 1.4	R5.5-4
		M5	2.1 to 2.5	R5.5-5

Wire Size		Terminal Screw	Tightening Torque (N•m)	Closed Loop Connectors
mm ²	AWG			
8	8	M5	2.1 to 2.5	R8-5
		M6	3.6 to 5.1	R8-6
14	6	M6	3.6 to 5.1	R14-6
22	4	M8	8.2 to 10.2	R22-8
30/38	3/2	M8	8.2 to 10.2	R38-8
30/38	3/2	M10	18 to 23	R38-10
50/60	1/1/0			R60-10
80	3/0			R80-10
100	4/0			R100-10
100	4/0	M12	31.5 to 39.5	R100-12
150	300			R150-12
200	400			R200-13

NOTE: Determine the wire size for the main circuit so that line voltage drop is within 2% of the rated voltage. Line voltage drop is calculated as follows:
(If there is a possibility of excessive voltage drop, use a larger wire suitable to the required length.)

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

External Terminals

Main Circuit Terminal Functions

Table 10: Main Circuit Terminal Functions

Terminal Symbol		Description
R/L1 S/L2 T/L3	Power Regenerative Unit Main Circuit Input	Main circuit AC power supply terminal for the power regenerative unit.
(+), ⊖		Connect to the Drive's DC power supply voltage input terminals. • Two terminals are provided for both (+) and ⊖.
r1/ℓ 11, s1/ℓ 21, t1/ℓ 31	Power Supply Voltage Detection	Detects the phase sequence and the voltage level. • Connect to the power side of the power coordinating reactor.
	Power Input for FAN and MC	Supplies power for the cooling fan and inrush prevention MC of the power regenerative unit.

Control Circuit Terminal Functions

Table 11: Control Circuit Terminal Functions

Type	No. <1>	Signal Input	Function	Function	Signal Level	
Sequence Input	S1	MANUAL RUN	Run when CLOSED, stops when OPEN		24 VDC 8 mA Photocoupler isolation	
	S2	AUTO RUN	Auto run (regenerative operation) when CLOSED			
	S3	EXTERNAL FAULT INPUT	External fault when CLOSED	Multi-function Contact Inputs (H1-01 to H1-02)		
	S4	FAULT RESET INPUT	Fault reset when CLOSED			
	SC	Sequence Common				
	SS	Photocoupler internal common				
	SP	Sequence +24 V Power Supply				
Photocoupler Output	M1 - M2	CONV READY	Closed when power regenerative unit is READY	H2-01 to H2-02	48 VDC 80 mA or less	
	M3 - M4	RUN	CLOSE during run			
Relay Output	MA - MC MB - MC	FAULT Output	Outputs when a fault is detected. Terminal MA-MC: Closed during fault detection Terminal MB-MC: Open during fault detection	Outputs when a fault is detected. Terminal MA-MC: Closed during fault detection Terminal MB-MC: Open during fault detection	250 VAC 1 A or less 30 VDC 1 A or less	
Analog Output	AM	Input Current	5 V: 100% of rated input current	Multi-function Analog Output (H1-04)	- 10 V to + 10 VDC 2 mA or less)	
	AC	Analog Ground				

<1> Indicates the terminal number of the control card.

Operation

Section Safety



WARNING

Only turn ON the input power supply after replacing the front cover or the terminal cover. Do not remove the cover while power is on.

Failure to observe this warning can result in an electric shock.

Never operate the digital operator or other switches when your hand is wet.

Failure to observe this warning can result in an electric shock.

Never touch the terminals while current is flowing, even if the power regenerative unit stops.

Failure to observe this warning can result in an electric shock.



CAUTION

Never touch the heatsink or input reactors since their temperature may be very high.

Failure to observe this caution can result in harmful burns to the body.

All the constants of the power regenerative unit have been preset at the factory. Do not change the settings unnecessarily.

The power regenerative unit may be damaged.

Checks Prior to Main Power Application

Check the following before turning ON the power supply:

- Check that the power supply is of the correct voltage.
230 V class: 200 to 230 VAC, 50/60 Hz
460 V class: 380 to 460 VAC, 50/60 Hz
- Make sure that the power regenerative unit and the Drive are connected correctly.
- Make sure that the phase sequence of the main circuit terminals (R/L1, S/L2, T/L3) and the power supply voltage detection terminals (r1/ℓ 11, s1/ℓ 21, t1/ℓ 31) are correct.
- Make sure that the power regenerative unit and the control device are wired correctly.
- Set the run command of the power regenerative unit and the drive to OFF.

Setting the Power Supply Voltage Jumper

NOTE: 460 V CLASS REGENERATIVE UNITS OF 65 A OR HIGHER

Set the power supply voltage jumper for 460 V class power regenerative unit of 65 A or higher. Insert the jumper into the voltage connector nearest to the actual power supply voltage.

Incorrect connector setting may negatively impact the performance of the power regenerative unit.

The jumper is factory-set to 460 V when shipped. If the power supply voltage is not 460 V, use the following procedure to change the setting.

1. Turn OFF the power supply switch and wait for at least five minutes before removing the front panel and setting the jumper.
2. Remove the front cover.
3. Insert the jumper at the position for the voltage supplied to the power regenerative unit (see Figure 13).
4. Replace the front cover.

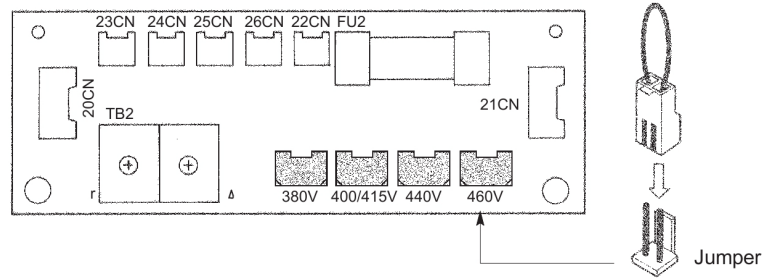


Figure 13: Setting the Power Supply Voltage (For 460 V Class Power Regenerative Unit between 65 A and 248 A)

Using the Digital Operator

This section describes the component names and functions of the Digital Operator. The component names and functions are shown in Figure 14 and the key functions are described in Table 12.

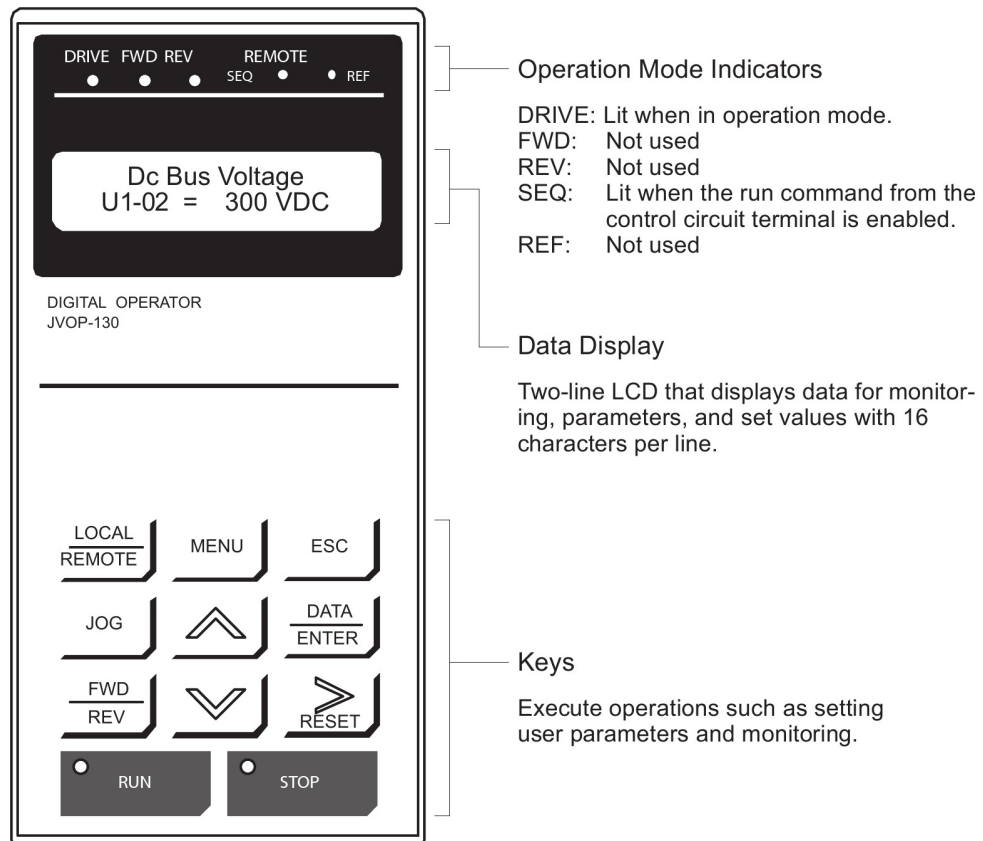


Figure 14: Digital Operator Component Names and Functions

Table 12: Key Function

Key	Name	Function
	LOCAL/REMOTE Key	Switches between operation (LOCAL) via the Digital Operator and control circuit terminal (REMOTE) operation. This key can be enabled or disabled by setting O2-01.
	MENU Key	Displays menus.
	ESC Key	Returns to the status before the DATA/ENTER Key was pressed.
	JOG Key	Not used.
	FWD/REV Key	Not used.
	RESET Key	Set the number of digits for parameter settings. Also acts as the reset Key when a fault has occurred.
	Increment Key	Selects menu items, groups, functions, and parameter names, and increments set values.
	Decrement Key	Selects menu items, groups, functions, and parameter names, and decrements set values.
	DATA/ENTER Key	Enters menu items, functions, parameters, and set values after they are set.
	RUN Key	Starts the IMPULSE®•R operation when the unit is in operation with the Digital Operator.
	STOP Key	Stops IMPULSE®•R operation. This Key can be enabled or disabled by setting O2-02 when operating from the control circuit terminal.

NOTE: Except diagrams, keys are referred to using the key names listed in the above table.

Digital Operator Modes

This section describes the unit's monitor modes, switching between modes, and accessing/setting user parameters.

Modes

The IMPULSE®•R's user parameters and monitoring functions have been organized in groups called modes that make it easier to read and set user parameters.

The unit is equipped with four modes, as shown in Table 13.

Table 13: Modes

Mode	Primary Function(s)
Operation mode	The power regenerative unit can be run in this mode. Use this mode when monitoring values such as frequency references or output current, displaying fault information, or displaying the fault history.
Initialize mode	Use this mode when selecting the language displayed on the Digital Operator, selecting the access level for reading/setting user parameters, selecting the control mode, or initializing the user parameters. Factory setting: English (A1-00=0)
Programming mode	Use this mode when reading/setting the user constants required for operation. The program mode functions are subdivided into the following groups: • Application: Operation mode selection • Tuning: No Auto-Tuning • Option: No Option Card support • Terminal: Settings for sequential I/O and analog I/O • Protection: Settings for the motor and power regenerative unit protection function • Operator: Selects the Digital Operator's display and Key function
Modified constants mode	Use this mode to read/set user parameters that have been changed from their factory set values.

Navigating Digital Operator Modes

Once the power regenerative unit has been put into operation mode by pressing the Menu Key, the Increment and Decrement Keys can be pressed to switch to other modes. Press the DATA/ENTER Key to read/set the user parameters in each mode.

Press the ESC Key to return to the mode display from the user parameter display.

Press the DATA/ENTER Key twice to write a parameter and then press the ESC Key to return to the mode display. This is the most Basic operation, so please remember it.

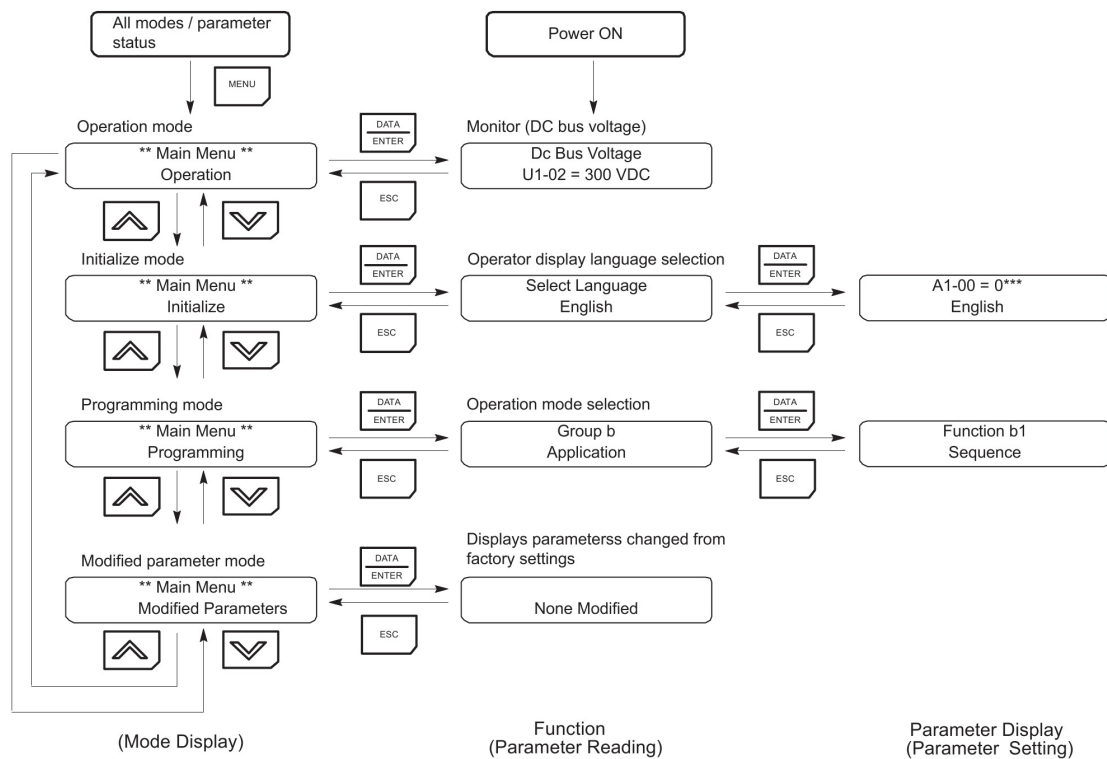


Figure 15: Mode Transitions

NOTE: When running the power regenerative unit after using the digital operator, press the MENU Key to enter the operation mode and then press the DATA/ENTER Key from the operation mode display to bring up the monitor display. Run commands can't be received from any other display (monitor display in the operation mode appears when the power is turned ON).

Parameter Setting Example

The group level will be displayed when the DATA/ENTER Key is pressed at the programming mode display.

Step	Key Sequence	Digital Operator Display	Remarks
1	MENU	** Main Menu ** Operation	Changed to parameter reading (function) level.
2	 Press twice.	** Main Menu ** Programming	
3	DATA ENTER	Group b Application	
4	DATA ENTER	Function b1 Sequence	
5	DATA ENTER	Run Source Terminals	
6	DATA ENTER	b1-02 = 1*** Terminals	
7	 Press twice.	b1-02 = 0 Operator	
8	DATA ENTER	Entry Accepted	Writes-in the new setting.
9	ESC	Run Source Operator	After a few seconds, the operator display is as shown on the left.
		Function b1 Sequence	

Figure 16: Parameter Setting Example

The parameter setting has been completed (operation mode has changed from the external terminals to the operator).

Operation Mode

Operation mode is the mode in which the power regenerative unit can be operated.

Many user parameters can't be changed when the power regenerative unit is operating.

Viewing monitor displays, fault information, and fault history are possible in operation mode.

NOTE: When running the power regenerative unit after using digital operator, press the MENU Key to enter the operation mode and then press the DATA/ENTER Key from the operation mode display to bring up the monitor display. Run commands can't be received from any other display (monitor display in the operation mode appears when the power is turned ON).

Operations in Operation Mode

Key operations in operation mode are shown in Figure 17.

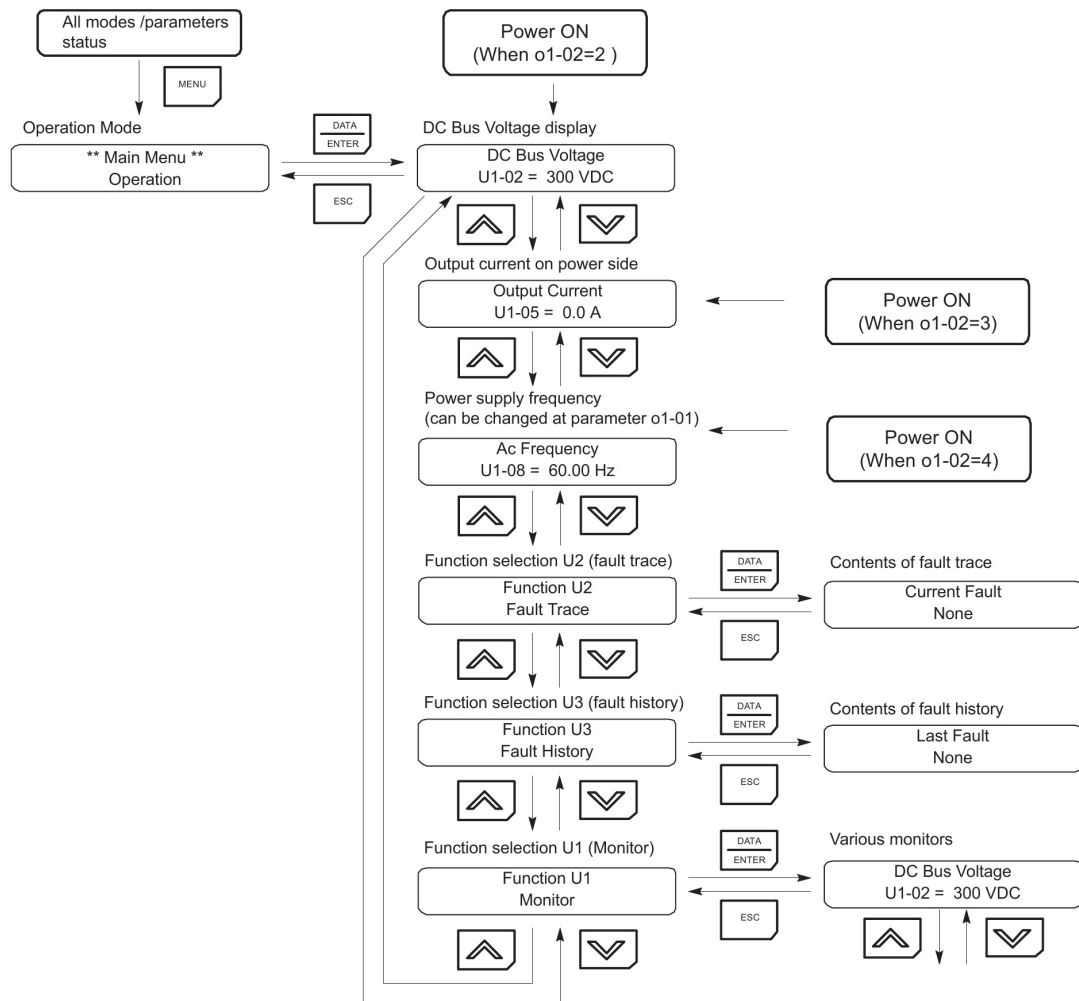


Figure 17: Operations in Operation Mode

Power On/Off Sequence

Refer to Figure 18 when building a power ON/OFF sequence for the IMPULSE®•R.

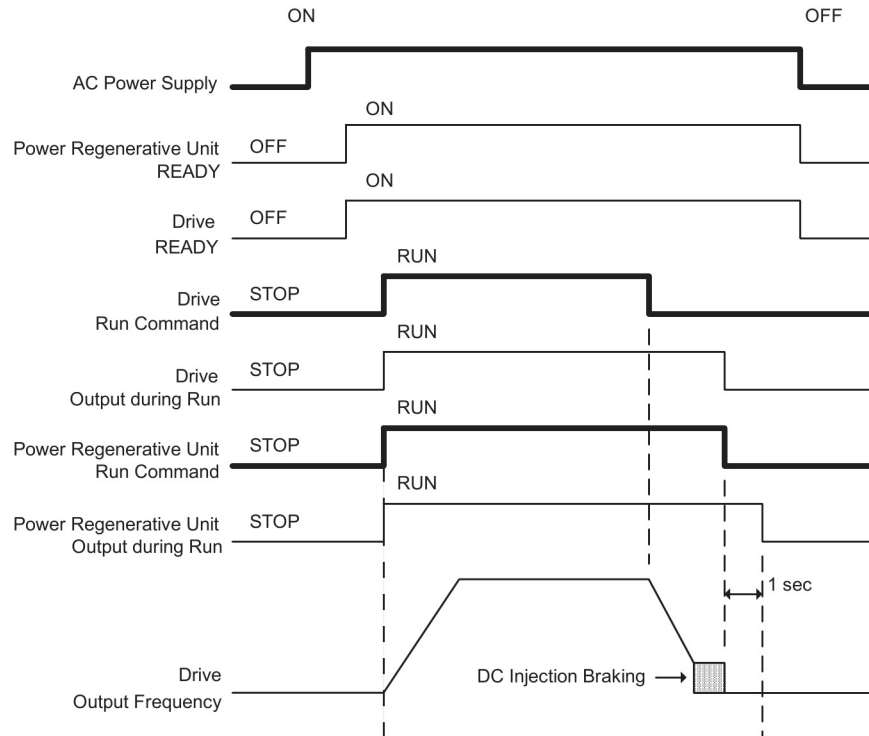


Figure 18: Power Supply ON/OFF Sequence

Check the following when using the power regenerative unit.

- Run commands of the drive and the power regenerative unit should be turned ON after confirming that the drive and the power regenerative unit are READY.
- Run commands of the drive and the power regenerative unit should be turned ON at the same time.
- Never turn the run command of the power regenerative unit OFF while the drive output during run is ON.
- Run output of the power regenerative unit turns OFF one second after the run command is turned OFF.
- Turn the power OFF after the run output of the power regenerative unit is OFF.

Run Command Selection

This section explains the two run command modes of the power regenerative unit. Select the mode according to the application.

Auto Run

Auto run is the mode in which the power regenerative unit detects any increase/decrease of the bus voltage and performs an auto run/stop if the terminal S2-SC is “closed.”

When the DC voltage is less than the voltage set at the auto run/stop level, the IMPULSE®•R will stop after the preset time value in parameter C8-20 is passed (default: 1 sec).

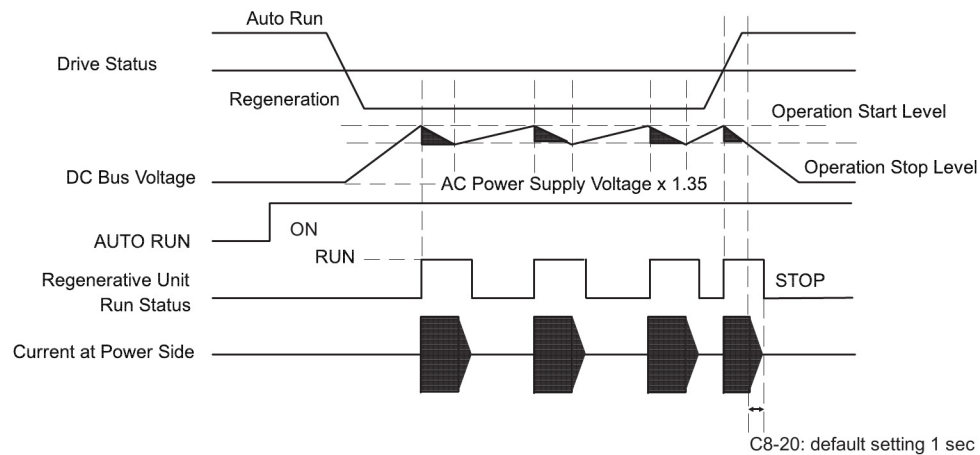


Figure 19: Time chart of the Auto Run Mode

Manual Run

Manual run is the mode in which the IMPULSE®•R starts running when the terminal S1-SC is “closed,” and stops one second after S1-SC is “open.”

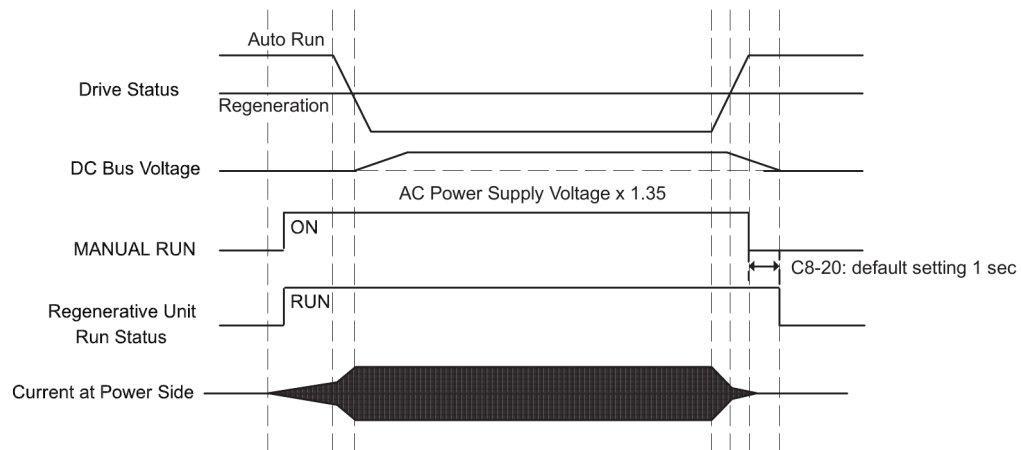


Figure 20: Time chart of the Manual Run mode

Build a sequence so that the run commands of the power regenerative unit and the inverter are turned ON at the same time.

Maintenance and Inspection

Section Safety



WARNING

Never touch high-voltage terminals in the power regenerative unit.
Failure to observe this warning can result in an electric shock.

Perform maintenance or inspection only after verifying that the CHARGE LED goes OFF, after the main circuit power supply is turned OFF.

The capacitors are still charged and can be dangerous.

Only authorized personnel should be permitted to perform maintenance, inspections or parts replacement.

[Remove all metal objects (watches, bracelets, etc.) before operation.] (Use tools which are insulated against electric shock.) Failure to observe this warning can result in an electric shock.

Never modify the product.

Failure to observe this warning can result in an electric shock or personal injury and will invalidate the guarantee.



CAUTION

The power regenerative unit employs semi-conductor elements. Do not touch the CMOS elements.

They are easily damaged by static electricity.

Do not connect or disconnect wires or connectors while power is applied to the circuit.

Failure to observe this caution can result in personal injury.

Periodic Inspection and Maintenance

The maintenance period of the power regenerative unit is as follows.

Maintenance period: Within 18 months of shipping from the factory or within 12 months of being delivered to the final user, whichever comes first.

Daily Inspection

Check the following items with the system in operation:

- There should be no abnormal heat generation.
- The ambient temperature should not be too high.
- The cooling fan on the power regenerative unit should be operating normally.

Periodic Inspection

Check the following items during periodic maintenance.

Always turn OFF the power supply before beginning inspection. Confirm that the LED indicators on the front cover have all turned OFF, and then wait at least five minutes have elapsed before beginning the inspection. Be sure not to touch terminals right after the power has been turned OFF. Doing so can result in an electric shock.

Table 14: Periodic Inspections

Item	Inspection	Corrective Procedure
External terminals, mounting bolts, connectors, etc.	Are all screws and bolts tight?	Tighten loose screws and bolts firmly.
	Are connectors tight?	Reconnect the loose connectors.
Heatsink	Are the fins dirty?	Clean off any dirt and dust with an air gun using dry air at a pressure of 39.2×10^4 to 58.8×10^4 Pa (4 to 6 kg·cm ²).
PCBs	Is there any conductive dirt or oil mist on the PCBs?	Clean off any dirt and dust with an air gun using dry air at a pressure of 39.2×10^4 to 58.8×10^4 Pa (4 to 6 kg·cm ²). Replace the boards if they cannot be made clean.
Cooling fan	Is there any abnormal noise or vibration or has the total operating time exceeded 20,000 hours? <1>	Replace the cooling fan.
Power elements	Is there any conductive dirt or oil mist on the elements?	Clean off any dirt and dust with an air gun using dry air at a pressure of 39.2×10^4 to 58.8×10^4 Pa (4 to 6 kg·cm ²).
Smoothing capacitor	Are there any irregularities, such as discoloration or odor?	Replace the capacitor or power regenerative unit.

<1> Unit power must be ON to perform this check.

Periodic Maintenance of Parts

The power regenerative unit is configured of many parts, and these parts must be operating properly in order to make full use of its functionality.

Among the electronic components, there are some that require maintenance depending on their usage conditions. In order to keep the power regenerative unit operating normally over a long period of time, it is necessary to perform period inspections and replace parts according to their service life.

When replacing parts, be careful not to drop any, such as screws, inside the unit. Failure to observe this caution may result in a short-circuit and a fire.

Periodic inspection standards vary depending the installation environment and usage conditions of the power regenerative unit. The power regenerative unit's maintenance periods are noted below. Keep them as reference.

Table 15: Part Replacement Guidelines

Part	Standard Replacement Period	Replacement Method
Smoothing capacitor	5 years	Replace with new part (determine need by inspection).
Breaker relays	--	Determine need by inspection.
Fuses	10 years	Replace with new part.
Aluminum capacitors on PCBs	5 years	Replace with new board (determine need by inspection).

NOTE: *Usage conditions are as follows: • Ambient temperature: Yearly average of 30°C • Load factor: 80% max. • Operating rate: 12 hours max. per day.*

Troubleshooting

Fault Detection

When the power regenerative unit detects a fault, the fault code is displayed on the Digital Operator and the fault contact output operates.

When a fault has occurred, refer to the following table to identify and correct the cause of the fault.

Use one of the following methods to reset the fault after restarting the power regenerative unit.

- Turn ON the fault reset signal.
- Press the RESET Key on the Digital Operator.
- Turn the main circuit power supply OFF and then ON again.

Table 16: Fault Displays and Processing

Fault Display	Meaning	Probable Causes	Corrective Actions
PUF IGBT, Fuse Failure	Fuse Blown The fuse in the main circuit is blown. The main transistor has damaged.	The output transistor has failed because of a short-circuit or overcurrent.	Replace the power regenerative unit after correcting the cause.
UV1 Dc Bus Undervolt	Main Circuit Undervoltage The main circuit DC voltage is below the undervoltage detection level (L2-05). 230 V class: Approx. 190 VDC 460 V class: Approx. 380 VDC	• An open-phase occurred with the input power supply. • A momentary power loss occurred. • The wiring terminals for the input power supply are loose.	Reset the fault after correcting its cause.
UV2 CTR PS Undervolt	Control Power Fault The control power supply voltage dropped.	--	• Try turning the power supply off and on. • Replace the power regenerative unit if the fault continues to occur.
UV3 MC Answerback	Inrush Prevention Circuit Fault A fault occurred in the inrush prevention circuit.	--	• Try turning the power supply off and on. • Replace the power regenerative unit if the fault continues to occur.
AUV Ac Undervoltage	AC Power Undervoltage AC power undervoltage occurred during running. 230 V class: Approx. 150 VAC or less 460 V class: Approx. 300 VAC or less	• An open-phase occurred with the input power supply. • A momentary power loss occurred. • The wiring terminals for the input power supply are loose.	Reset the fault after correcting its cause.
FdVe Power F Fault	Power Supply Frequency Fault AC power supply frequency has exceeded the setting value (F1-10).	• The power supply fluctuations occurred during running. • Power loss occurred during running.	Reset the fault after correcting its cause.

Fault Display	Meaning	Probable Causes	Corrective Actions
SrC Power Supply Flt.	Power Supply Fault The phase of the input power supply has changed after turning ON the control power supply.	- An open-phase occurred with the input power supply. - A momentary power loss occurred. - The wiring terminals for the input power supply are loose.	Reset the fault after correcting its cause.
OC Over Current	Overcurrent The output current of the power regenerative unit exceeded the overcurrent detection level. (200% of rated current)	- A short-circuit occurred at the power regenerative output. - Power supply drop - Faulty wiring	Reset the fault after correcting its cause.
SC Short Circuit	IGBT Short-circuit The IGBT gate signal was short-circuited.	A short-circuit of the PWM signal occurred.	Replace the control card.
OV Dc Bus Overvolt	Main Circuit Overvoltage The main circuit DC voltage exceeded the overvoltage detection level. 230 V class: Approx. 400 VDC 460 V class: Approx. 800 VDC	The deceleration time is too short and the regenerative energy from the motor is too large.	- Increase the deceleration time. - Check the capacity of the power regenerative unit. (Increase the capacity.)
		The power supply voltage is too high.	Decrease the voltage so it is within specifications.
OH Heatsink Overtmp	Heatsink Overheating The temperature of the power regenerative unit's cooling fins exceeded the setting in L8-02. (Stopping method can be changed by L8-03.)	The ambient temperature is too high.	Install a cooling unit.
		There is a heat source nearby.	Remove the heat source.
		The cooling fan of the power regenerative unit has stopped.	Replace the cooling fan. (Contact your Magnetek representative.)
OH1 Heatsink Max temp	Heatsink Overheating The temperature of the power regenerative unit's cooling fins exceeded 105°C. (Stopping method: Coast to stop)	The ambient temperature is too high.	Install a cooling unit.
		There is a heat source nearby.	Remove the heat source.
		The cooling fan of the power regenerative unit has stopped.	Replace the cooling fan. (Contact your Magnetek representative.)
OL Input Over Loaded	Power Regenerative Unit Input Overload Power regenerative unit input exceeded the overload capacity.	The load is too heavy.	Check the size of the load.
EF3 External Fault 3	External fault (terminal S3-SC)	An external fault was input from a multi-function input.	- Reset external fault inputs to the multi-function inputs. - Remove the cause of the external fault.
EF4 External Fault 4	External fault (terminal S4-SC)		
OPR Oper Disconnect	Operator Connection Fault The Operator was disconnected during operation started by a run command from the Operator.	--	Check the Operator connection.

Fault Display	Meaning	Probable Causes	Corrective Actions
ERR EEPROM R/W Err	EEPROM Write Error	--	A verification error occurred when writing EEPROM. Try turning the power supply off and on again. Try setting the constants again.
CPF00 COM-ERR (OP&CONV)	Control Circuit Error 1 (Operator Communications Error)	- Communications with the digital operator were not established within 5 seconds after the power was turned on. - MPU peripheral element check fault.	- Disconnect the digital operator and then connect it again. - Check the wiring of the control circuit power supply. - Replace the control card.
CPF01 COM-ERR (OP&CONV)	Control Circuit Error 2 (Operator Communications Error)	- After communications were established, there was a transmission error with the digital operator for more than 2 seconds. - MPU peripheral element check fault	- Disconnect the digital operator and then connect it again. - Check the wiring of the control circuit power supply. - Replace the control card.
CPF02 BB Circuit Err	Baseblock Circuit Error	The control circuit is damaged.	Replace the control card.
CPF03 EEPROM Err	EEPROM Error		
CPF04 Internal A/D Err	CPU Internal A/D Converter Error		

Minor Fault Detection

Table 17: Minor Fault Detection

Minor Fault Display	Meaning	Probable Causes	Corrective Actions
UV Dc Bus Undervolt	Main Circuit Undervoltage The main circuit DC voltage was below the undervoltage detection level (L2-05). 230 V class: Approx. 190 VDC or less 460 V class: Approx. 380 VDC or less	See causes for AUv, FdVe, SrC, and UV3 faults.	--
OV Dc Bus Overvolt	Main Circuit Overvoltage The main circuit DC voltage exceeded the overvoltage detection level. 230 V class: Approx. 400 VDC 460 V class: Approx. 800 VDC	- The regenerative energy from the motor is too large. - The power supply voltage is too high.	- Check the capacity of the power regenerative unit. (Increase the capacity.) - Decrease the voltage so it is within specifications.
OH Heatsink Overtmp	Heatsink Overheating The temperature of the power regenerative unit's cooling fins exceeded the setting in L8-02. (Stopping method can be changed by L8-03.)	- The ambient temperature is too high. - There is a heat source nearby. - The cooling fan of the power regenerative unit has stopped.	- Install a cooling unit. - Remove the heat source. - Replace the cooling fan. (Contact your Magnetek representative.)

Minor Fault Display	Meaning	Probable Causes	Corrective Actions
OL Input Over Loaded	Power Regenerative Unit Input Overload Power regenerative unit input exceeded the overload capacity.	The load is too heavy.	Check the size of the load.
EF3 External Fault 3	External fault (terminal S3-SC)	An external fault was input from a multi-function input.	- Reset external fault inputs to the multi-function inputs. - Remove the cause of the external fault.
EF4 External Fault 4	External fault (terminal S4-SC)		

Operation Errors

After the parameters have been set, an operation error will occur if there is an invalid setting or a contradiction between two parameter settings.

It won't be possible to start the power regenerative unit until the parameters have been set correctly (the minor fault output and fault contact output will not operate, either).

When an operation error has occurred, refer to the following table to identify and correct the cause of the errors.

Table 18: Operation Error Displays and Incorrect Settings

Display	Meaning	Incorrect settings
OPE01 kVA Selection	Incorrect Power Regenerative Unit Capacity Setting	The power regenerative unit capacity setting does not match the Unit. (Contact your Magnetek representative.)
OPE02 Limit	Parameter Setting Range Error	The parameter setting is outside of the valid setting range.
OPE03 Terminal	Multi-function Input Selection Error	The same setting has been selected for two or more multi-function inputs (H1-01, H1-02)

Specifications

Table 19: 230 V Class Specifications

Model Number				2015	2022	2028	2042	2054	2068	2080	2104	2130
Rating	Rated Capacity	Standard Duty <1>	Motor Rated Current	15.2	22	28	42	54	68	80	104	130
			HP (kW)	5 (3.7)	7.5 (5.5)	10 (7.5)	15 (11)	20 (15)	25 (18.5)	30 (22)	40 (30)	50 (37)
			Rated Current on Input Side (100%, 60s)	10	15	20	30	40	50	60	80	100
		Heavy Duty <2>	Motor Rated Current	9.6	15.2	22	28	42	54	68	80	104
			HP (kW)	3 (2.2)	5 (3.7)	7.5 (5.5)	10 (7.5)	15 (11)	20 (15)	25 (18.5)	30 (22)	40 (30)
			Rated Current on Input Side (100% Cont.)	8	12	16	24	32	40	48	64	80
		Rated DC Current A			13	19	26	37	51	64	77	102
	Regenerative Torque			Heavy Duty: 100% cont., 125% for 60 s (25% ED), 187.5% for 30 s, max. torque < 250% Standard Duty: 80% cont., 100% for 60s (25% ED), 150% for 30s, max. torque < 200%								

NOTE: Consult the factory if connecting more than one inverter to one power regenerative unit.

<1> Standard duty applications require intermittent full energy dissipation. The continuous rating is 80% or less braking torque and 100% braking torque for 60 seconds with a duty cycle of 25% (60 seconds maximum on-time of every 240 seconds). The overload rating is 150% braking torque for 30 seconds. Please note the peak torque should be less than 200%.

<2> Heavy duty applications require continuous energy dissipation (100% braking torque). The overload rating is 125% for 60 seconds with a duty cycle of 25%. Braking torque of 187.5% is available for 30 seconds. Please note the peak torque should be less than 250%.

Table 20: 230 V Class Specifications (cont)

Input Power Supply	Voltage Frequency	200 to 220 VAC 50 Hz, 200 to 230 VAC 60 Hz
	Allowable Voltage Fluctuation	+ 10 to - 15% (Imbalance rate between phases: within 2%) <2>
	Allowable Frequency Fluctuation	± 3 Hz (3 phase rotation)
Control Characteristics	Control Method	120° current conduction
	Input Power Factor	0.9 or more (Rated current)
	Overload Capacity	Standard Duty: 150% for 30 seconds Heavy Duty: 187.5% for 30 seconds
	Programmable Input/Output	Two Digital Inputs, Two Digital Outputs, One Analog Output.
Operation Input		External Terminals
Status Output	Fault	1C contact output
	PHC Output	Photocoupler output: 1 point can be selected (ready)
	Analog Output	Analog output: 1 point can be selected (current monitor)
Protective Function	Instantaneous Overcurrent	Standard Duty: Stops at approx. 200% of the current on power side Heavy Duty: Stops at approx. 250% of the current on power side
	Blown Fuse	Motor stops by blown fuse.
	Overload	Standard Duty: Stops after 30 seconds at 150% of rated current. Heavy Duty: Stops after 30 seconds at 187.5% of rated current.
	Undervoltage (DC Voltage)	Stops at approx. 190 VDC or less.
	Undervoltage (Power Side Voltage)	Stops at approx. 150 VAC or less.
	Overload	Stops at approx. 400 VDC or more.
	Fin Overheat	Protected by thermistor
	Power Supply Open Phase <1>	Stops at power supply open phase detection.
	Power Frequency Error	Stops by fluctuation more than ± 3 Hz of rated input frequency.
	Power Charge Indication	Indicated until main output voltage is approx. 50 V or less.
Environmental Conditions	Location	Indoor (Protected from corrosive gases and dust)
	Ambient Temperature	- 10°C to + 40°C (Enclosed wall-mounted type) - 10°C to + 45°C (Open chassis type)
	Humidity	90% RH or less (non-condensing)
	Vibration	9.8 m/s ² (1G) less than 20 Hz, up to 1.96 m/s ² (0.2G) at 20 to 50 Hz

NOTE: <1> Do not use this unit with single-phase power. Use three-phase power.

<2> Imbalance rate between phases can be calculated using the following formula (conforming to IEC1800-3): Imbalance rate between phases [%] = Three-phase average voltage divided by (Max. voltage - Min. voltage) x 67. Use a power regenerative unit with larger output capacity if the imbalance rate between phases exceeds 2%

Table 21: 460 V Class Specifications

Model Number				4007	4011	4014	4021	4027	4034	4040	4052	4065	4077	4096	4124		
Rating	Rated Capacity	Standard Duty <1>	Motor Rated Current	7.6	11	14	21	27	34	40	52	65	77	96	124		
			HP (kW)	5 (3.7)	7.5 (5.5)	10 (7.5)	15 (11)	20 (15)	25 (18.5)	30 (22)	40 (30)	50 (37)	60 (45)	75 (55)	100 (75)		
			Rated Current on Input Side (100%, 60s)	5	7.5	10	15	20	25	30	40	50	60	75	100		
		Heavy Duty <2>	Motor Rated Current	4.8	7.6	11	14	21	27	34	40	52	65	77	96		
			HP (kW)	3 (2.2)	5 (3.7)	7.5 (5.5)	10 (7.5)	15 (11)	20 (15)	25 (18.5)	30 (22)	40 (30)	50 (37)	60 (45)	75 (55)		
			Rated Current on Input Side (100% Cont.)	4	6	8	12	16	20	24	32	40	48	60	80		
		Rated DC Current A			6	9	13	19	26	32	37	51	64	77	96	128	
		Regenerative Torque			Heavy Duty: 100% cont., 125% for 60 s (25% ED), 187.5% for 30 s, max. torque < 250% Standard Duty: 80% cont., 100% for 60s (25% ED), 150% for 30s, max. torque < 200%												

NOTE: Consult the factory if connecting more than one inverter to one power regenerative unit.

<1> Standard duty applications require intermittent full energy dissipation. The continuous rating is 80% or less braking torque and 100% braking torque for 60 seconds with a duty cycle of 25% (60 seconds maximum on-time of every 240 seconds). The overload rating is 150% braking torque for 30 seconds. Please note the peak torque should be less than 200%.

<2> Heavy duty applications require continuous energy dissipation (100% braking torque). The overload rating is 125% for 60 seconds with a duty cycle of 25%. Braking torque of 187.5% is available for 30 seconds. Please note the peak torque should be less than 250%.

Table 22: 460 V Class Specifications (cont)

Input Power Supply	Voltage Frequency	380 to 460 VAC 50/60 Hz
	Allowable Voltage Fluctuation	+ 10 to - 15% (Imbalance rate between phases: within 2%) <2>
	Allowable Frequency Fluctuation	± 3 Hz (3 phase rotation)
Control Characteristics	Control Method	120° current conduction
	Input Power Factor	0.9 or more (Rated current)
	Overload Capacity	Standard Duty: 150% for 30 seconds Heavy Duty: 187.5% for 30 seconds
Operation Input		External terminals
Status Output	Fault	1C contact output
	PHC Output	Photocoupler output
	Analog Output	Analog output: 1 point can be selected (current monitor)
Protective Function	Instantaneous Overcurrent	Standard Duty: Stops at approx. 200% of the current on power side Heavy Duty: Stops at approx. 250% of the current on power side
	Blown Fuse	Motor stops by blown fuse.
	Overload	Standard Duty: Stops after 30 seconds at 150% of rated current. Heavy Duty: Stops after 30 seconds at 187.5% of rated current.
	Undervoltage (DC Voltage)	Stops at approx. 380 VDC or less.
	Undervoltage (Power Side Voltage)	Stops at approx. 300 VAC or less.
	Overload	Stops at approx. 800 VDC or less.
	Fin Overheat	Protected by thermistor
	Power Supply Open Phase <1>	Stops at power supply open phase detection.
	Power Frequency Error	Stops by fluctuation more than ± 3 Hz of rated input frequency.
	Power Charge Indication	Indicated until main output voltage is approx. 50 V or less.
Environmental Conditions	Location	Indoor (Protected from corrosive gases and dust)
	Ambient Temperature	- 10°C to + 40°C (Closed wall-mounted); - 10°C to + 45°C (Open chassis type)
	Humidity	90% RH or less (non-condensing)
	Vibration	9.8 m/s ² (1G) less than 20 Hz, up to 1.96 m/s ² (0.2G) at 20 to 50 Hz

NOTE: <1> Do not use this unit with single-phase power. Use three-phase power.
 <2> Imbalance rate between phases can be calculated using the following formula (Conforming to IEC1800-3). Imbalance rate between phases [%] = Three-phase average voltage divided by (Max. voltage - Min. voltage) x 67. Use a power regenerative unit with larger output capacity if the imbalance rate between phases exceeds 2%

Appendix

Parameter List

Table 23 shows the items that can be monitored in operation mode. The output signal levels for multi-function analog outputs shown in the table are for a gain of 100.0 and a bias of 0.00.

Parameters Monitored in Operation Mode

Table 23: Status Monitor Parameters

Parameter Code	Display	Function	Output Signal Level for Multi-function Analog Outputs	Min. Unit
U1-02	DC Bus Voltage	Monitors the DC voltage of the power regenerative unit's internal main circuit.	230 V class: 400 V/10 V 460 V class: 800 V/10 V (0 to +10 V Output)	1 V
U1-04	AC Voltage	Monitors the AC power supply voltage.	230 V class: 200 V/5 V 460 V class: 400 V/5 V (0 to +10 V Output)	1 V
U1-05	AC Current	Monitors the AC power supply current.	Rated current /10 V (0 to +10 V Output)	1 A
U1-07	AC Power	Monitors the AC power supply power.	Rated power /10 V (0 to +10 V Output)	1 kW
U1-08	AC Frequency	Monitors the AC power supply frequency.	60 Hz /10 V (0 to +10 V Output)	0.01 Hz
Shows input ON/OFF status.				
U1-10	Input Term Sts	U1-10 = 00000000 <1 > : Can be selected by H1-01 or H1-02.	Cannot be output.	--
Shows output ON/OFF status.				
U1-11	Output Term Sts	U1-11 = 00000000 <2 > : Can be selected by H2-02 or H2-03.	Cannot be output.	--

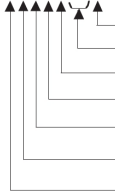
Parameter Code	Display	Function	Output Signal Level for Multi-function Analog Outputs	Min. Unit
Power regenerative unit operating status.				
U1-12	Int Ct1 Sts 1	U1-12 = 00000000  1 : Running 0 : Not used. (always 0) 1 : Reset input ON 0 : Not used. (always 0) 1 : Power regenerative unit ready 0 : Minor fault detected 1 : Major fault detected	Cannot be output.	--
U1-13	Elapsed Time	Monitors the power regenerative unit's elapsed operating time. Can be set with parameter O2-07 or O2-08.	Cannot be output.	--
U1-14	FLASH ID	(Manufacturer's ID number)	Cannot be output.	--
U1-21	V Deviation	Monitors the deviation between the AC power supply voltage and the main circuit DC voltage.	230 V class: 400 V/10 V 460 V class: 800 V/10 V	1 V
U1-28	CPU ID	(Manufacturer's ID number)	Cannot be output.	--

Table 24: Fault Trace Parameters

Parameter Code	Display	Function	Output Signal Level for Multi-function Analog Outputs	Min. Unit
U2-01	Current Fault	Information on current fault.	Cannot be output.	--
U2-02	Last Fault	Information on the last fault.	Cannot be output.	--
U2-04	DC Bus Voltage	Main circuit DC voltage value when the "last fault" occurred.	Cannot be output.	1 V
U2-06	AC Voltage	AC power supply voltage value when the "last fault" occurred.	Cannot be output.	1 V
U2-07	AC Current	Current value at AC power side when the "last fault" occurred.	Cannot be output.	1 A
U2-08	AC Power	Power at AC power side when the "last fault" occurred.	Cannot be output.	1 kW
U2-10	AC Frequency	Frequency at AC power side when the "last fault" occurred.	Cannot be output.	0.01 Hz
U2-11	Input Term Sts	Input terminal status when the "last fault" occurred. (Same format as U1-10.)	Cannot be output.	--
U2-12	Output Term Sts	Output terminal status when the "last fault" occurred. (Same format as U1-11.)	Cannot be output.	--
U2-13	Regen Unit Sts	Operating status when the "last fault" occurred. (Same format as U1-12.)	Cannot be output.	--
U2-14	Elapsed Time	Elapsed operating or power-on time when the "last fault" occurred.	Cannot be output.	1 H
U2-20	V Deviation	Voltage deviation when the "last fault" occurred.	Cannot be output.	1 V

Table 25: Fault History Parameters

Parameter Code	Display	Function	Output Signal Level for Multi-function Analog Outputs	Min. Unit
U3-01	Last Fault	Information on the last fault.	Cannot be output.	--
U3-02	Fault Message 2	Information on the 2nd to last fault.	Cannot be output.	--
U3-03	Fault Message 3	Information on the 3rd to last fault.	Cannot be output.	--
U3-04	Fault Message 4	Information on the 4th to last fault.	Cannot be output.	--
U3-05	Elapsed Time 1	Elapsed running or power-on time when the last fault occurred.	Cannot be output.	1 H
U3-06	Elapsed Time 2	Elapsed running or power-on time when the 2nd to last fault occurred.	Cannot be output.	1 H
U3-07	Elapsed Time 3	Elapsed running or power-on time when the 3rd to last fault occurred.	Cannot be output.	1 H
U3-08	Elapsed Time 4	Elapsed running or power-on time when the 4th to last fault occurred.	Cannot be output.	1 H

Table 26: Parameter List

Parameter Code	Display	Function	Range	Initial Value	Access Level
A1-00	Select Language <i>0 English</i> <i>1 Japanese</i>	Language selection for the Digital Operator. This parameter is not reset to the factory setting by A1-03.	0, 1	0	A
A1-01	Access Level <i>0 Operation Only</i> <i>1 Advanced Level</i>	Selects which parameters are accessible via the Digital Operator.	0 to 9999	4	A
A1-03	Init Parameters	Used to return all parameters to their factory or user default settings. (Initializes and then returns A1-03 to zero.) 2220: 2-Wire Initialization	0000 to 9999	0000	A
A1-04	Enter Password	When the value set into A1-04 does NOT match the value set into A1-05, parameters A1-01 through A1-03 cannot be changed. All other parameters as determined by A1-01 can be changed. Parameter A1-05 can be accessed by pressing the MENU key while holding the RESET key.	0000 to 9999	0	A
B1-02	Run Source <i>0 Operator- RUN and STOP keys on Digital Operator.</i> <i>1 Terminals - Contact closure on terminals S1 or S2.</i>	Selects the run command input source.			
B1-06	Cntl Input Scans <i>0 500 ms - 2 scans (for quick response)</i> <i>1 5 ms - 2 scans (for noisy environments)</i>	Sets the scan rate of terminals S1 to S4.	0, 1	1	A
C8-17	Autorun lout	See Figure 19	10 to 100%	50	A
C8-18	V Bias of Run	For 460 V class power regenerative units, double the initial setting and setting range.	0.0 to 50.0 V	2.0	A
C8-19	V Width of Stop	For 460 V class power regenerative units, double the initial setting and setting range.	0.5 to 50.0 V	3.0	A

Parameter Code	Display	Function	Range	Initial Value	Access Level
C8-20	Minimum Run Time	--	0.0 to 600.0 sec	1.0	A
F1-10	FDEV DetectLevel	Configures the frequency deviation fault (DEV) detection. DEV fault will occur if the frequency deviation is greater than the F1-10 setting for a time longer than F1-11. F1-10 is set as a percentage of the maximum output frequency (E1-04). Frequency deviation is the difference between actual input supply frequency and the frequency reference command.	1.0 to 10.0 Hz	3.0	A
F1-11	FDEV Detect Time	Configures the frequency deviation fault (DEV) detection. DEV fault will occur if the frequency deviation is greater than the F1-10 setting for a time longer than F1-11. F1-10 is set as a percentage of the maximum output frequency (E1-04). Frequency deviation is the difference between actual input supply frequency and the frequency reference command.	0.0 to 255.0 sec	70.0	A
H1-01	Terminal S3 Sel	Selects the function of terminal S3. 24: External fault, Normally Open, Always Detected, Coast To Stop. Refer to Table 27.	0 to 2F	24	A
H1-02	Terminal S4 Sel	Selects the function of terminal S4. 14: Fault reset Closed = Resets the Drive after the fault and the run command have been removed. Refer to Table 27.	0 to 2F	14	A
H2-02	Terminal M1 Sel	Selects the function of terminals M1 to M2. 6: Drive ready Closed - When the Drive is powered up, not in a fault state and in the DRIVE mode. Refer to Table 28.	0 to 20	6	A
H2-03	Terminal M3 Sel	Selects the function of terminals M2 - M4. 0: During Run 1 Closed - When a run command is input or the Drive is outputting voltage. Refer to Table 28.	0 to 20	0	A
H4-01	Terminal AM Sel	Selects which monitor will be output on terminals AM and AC. Refer to Table 29.	0 to 21	5	A
	0 Not Used				
	2 DC bus voltage (U1-02)				
	4 AC power supply voltage (U1-04)				
	5 Current at power side (U1-05)				
	7 Power at power side (U1-07)				
	8 AC power supply frequency (U1-08)				
	21 Voltage deviation (U1-21)				
H4-02	Terminal AM Gain	Sets terminal AM output level when selected monitor is at 100%.	0.00 to 2.50	0.50	A
H4-03	Terminal AM Bias	Selects the signal level of terminal AM.	0, 1	1	A
	0 0 to 10 VDC				
	1 -10 to +10 VDC				

Parameter Code	Display	Function	Range	Initial Value	Access Level
L2-01	PwrL Selection	Enables and disables the momentary power loss function.	0 to 2	0	A
	0 Disabled - Unit trips on (UV1) fault when power is lost.				
	1 Power Loss Ride Thru Time - Unit will restart if power returns within the time set in L2-02.*				
	2 CPU Power Active - Unit will restart if power returns prior to control power supply shut down.*				
	* In order for a restart to occur, the run command must be maintained throughout the ride thru period.				
L2-02	PwrL Ridethru t	Sets the power loss ride-thru time. This value is dependent on the capacity of the Unit. Only effective when L2-01 = 1.	0.0 to 2.0	2.0	A
L2-05	PUV Det Level	Sets the Unit's DC Bus undervoltage trip level. If this is set lower than the factory setting, additional AC input reactance or DC bus reactance may be necessary. Consult the factory before changing this parameter setting.	150 to 210 V	190	A
L5-01	Num of Restarts	Sets the counter for the number of times the Unit will perform an automatic restart. Auto restart will check to see if the fault has cleared every 5 ms. When no fault is present, the Unit will attempt an auto restart. If the Unit faults after an auto restart attempt, the counter is incremented. When the Unit operates without fault for 10 minutes, the counter will reset to the value set in L5-01.	0 to 10	0	A
L5-02	Restart Sel	Determines if the fault contact activates during an automatic restart attempt.	0, 1	0	A
	0 No Fault Relay - fault contact will not activate during an automatic restart attempt.				
	1 Fault Relay Active - fault contact will activate during an automatic restart attempt.				
L8-02	OH Pre-Alarm Lvl	When the cooling fin temperature exceeds the value set in this parameter, an overheat alarm (OH) will occur.	50 to 110 deg	95	A
L8-03	OH Pre-Alarm Sel	Selects the Unit operation upon an OH pre-alarm detection.	1, 3	3	A
	0 Coast to Stop				
	1 Alarm Only				
L8-07	Ph Loss In Sel	Selects the detection of output current open-phase. When applied motor capacity is too small for Unit capacity, output phase loss may be detected inadvertently. In this case, set to 0.	0, 1	0	A
	0 Disabled				
	1 Enabled				
O1-01	User Monitor Sel	Selects which monitor will be displayed in the operation menu upon power-up when O1-02 = 4.	4 to 8	8	A
	4 Power supply voltage (U1-04)				
	7 Power at power side (U1-07)				
	8 Power supply frequency (U1-08)				

Parameter Code	Display	Function	Range	Initial Value	Access Level
O1-02	Power-On Monitor	Selects which monitor will be displayed upon power-up.	2 to 4	2	A
	2 DC Bus Voltage (U1-02)				
	3 Output Current at the power side (U1-05)				
	4 Monitor set in O1-01				
O2-01	Local/Remote Key	Determines if the Digital Operator Local/Remote key is functional.	0, 1	1	A
	0 Disabled				
	1 Enabled				
O2-02	Oper Stop Key	Determines if the STOP key on the Digital Operator will stop the Unit when the Unit is operating from external terminals.	0, 1	0	A
	0 Enabled during run command from the digital operator				
	1 Enabled				
O2-04	Regen Unit Model	Sets the kVA of the Unit. Enter the number based on the Unit model number. Use the last four digits of the model number. This parameter only needs to be set when installing a new control board. Do not change for any other reason.	00 to FF	*	A
O2-06	Oper Detection	Determines if the Unit will stop when the Digital Operator is removed when in LOCAL mode or B1-02 = 0.	0, 1	0	A
	0 Disabled - the Unit will not stop when the Digital Operator is removed.				
	1 Enabled - The Unit will fault (OPR) and coast to stop when the Digital Operator is removed.				
O2-07	Elapsed Time Set	Sets the initial value of the elapsed operation timer U1-13.	0 to 65535H	--	A
O2-08	Elapsed Time Run	Sets how time is accumulated for the elapsed operation timer U1-13.	0, 1	0	A
	0 Power-On Time - Time accumulates when the Unit is powered.				
	1 Running Time - time accumulates only when the Unit is running.				

Table 27: Multi-function Input Functions

Setting Value	Function (H1-01, 02)	Remarks
8	External baseblock (NO contact) [Ext BaseBlk N.O.]	--
9	External baseblock (NC contact) [Ext BaseBlk N.C.]	--
F	Not used [Term Not Used]	--
14	Fault reset [Fault Reset]	--

Setting Value	Function (H1-01, 02)	Remarks
24-2F	External fault [External Fault]	24: External Fault, Normally Open, Always Detected, Coast To Stop 25: External Fault, Normally Closed, Always Detected, Coast To Stop 26: External Fault, Normally Open, During Run, Coast To Stop 27: External Fault, Normally Closed, During Run, Coast To Stop 28: External Fault, Normally Open, Always Detected, Fast Stop 29: External Fault, Normally Closed, Always Detected, Fast Stop 2A: External Fault, Normally Open, During Run, Fast Stop 2B: External Fault, Normally Closed, During Run, Fast Stop 2C: External Fault, Normally Open, Always Detected, Alarm Only 2D: External Fault, Normally Closed, Always Detected, Alarm Only 2E: External Fault, Normally Open, During Run, Alarm Only 2F: External Fault, Normally Closed, During Run, Alarm Only

Table 28: Multi-function Output Functions

Setting Value	Function (H2-02, 03)	Remarks
0	During run [During RUN 1]	Closed = When a run command is input or the Unit is outputting voltage.
6	Regenerative unit ready [Regen Unit Ready]	Closed = When the Unit is powered up, not in a fault state, and in the DRIVE mode.
7	During DC bus undervoltage (UV) detection [DC Bus Undervolt]	Closed = When the DC bus voltage falls below the UV trip level set in L2-05.
8	During baseblock [BaseBlk 1]	Closed = When the Unit is not outputting voltage.
A	During MCON [Mc On]	Closed = When the pre-charge contactor contact is energized.
E	Fault [Fault]	Closed = When the Unit experiences a major fault.
F	Not used [Not Used]	--
10	Alarm [Minor Fault]	Closed = When the Unit experiences an alarm.
11	Fault reset command active [Reset Cmd Active]	Closed = When the Unit receives a reset command from a digital input terminal or serial communication.
1E	Restart enabled [Restart Enabled]	Closed = When the Unit is performing an automatic restart attempt. Automatic restart is configured by parameter L5-01.
1F	Overload (OL1) pre-alarm [Overload (OL1)]	Closed = When OL1 is 80% of its trip point or greater.
20	Overheat pre-alarm [OH Prealarm]	Closed = When the Unit's heatsink temperature exceeds the setting of parameter L8-02.

Table 29: Multi-function Analog Output Functions

Setting Value	Function (H4-01)	Output signal level	Remarks
0	Not used [Not Used]	--	--
2	DC bus voltage [DC Bus Voltage]	230 V class: 400 V/10 V 460 V class: 800 V/10 V	100% = 400 / 800 VDC depending on the Unit voltage rating.
4	Power supply voltage [AC Voltage]	230 V class: 200 V/5 V 460 V class: 400 V/5 V (0 to +10 V output)	100% = 400 / 800 VDC depending on the Unit voltage rating.

Setting Value	Function (H4-01)	Output signal level	Remarks
5	Current at power side [AC Current]	Rated current /10 V	100% = Unit current at the power side.
7	Power at power side [AC Power]	Rated power /10 V	100% = Unit power at the power side.
8	Power supply frequency [AC Frequency]	60 Hz/10 V	100% = Unit power supply frequency.
21	Voltage deviation input [V Deviation]	230 V class: 400 V/10 V 460 V class: 800 V/10 V	100% = 400 / 800 VDC depending on the Unit voltage rating.