

REGAL

MD100G Series, Low Voltage, 30kW to 75kW Variable Frequency Drive Brief Manual



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This operation manual is intended for users with basic knowledge of electricity and electric devices.

* MARATHON DRIVE-MD100G is the official name for MDLV-100G.

Safety Information

Read and follow all safety instructions in this manual precisely to avoid unsafe operating conditions, property damage, personal injury, or death.

Safety symbols in this manual

Danger

Indicates an imminently hazardous situation which, if not avoided, will result in severe injury or death.

Warning

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

Caution

Indicates a potentially hazardous situation that, if not avoided, could result in minor injury or property damage.

Safety information

Danger

- Do not open the cover of the equipment while it is on or operating. Likewise, do not operate the inverter while the cover is open. Exposure of high voltage terminals or charging area to the external environment may result in an electric shock. Do not remove any covers or touch the internal circuit boards (PCBs) or electrical contacts on the product when the power is on or during operation. Doing so may result in serious injury, death, or serious property damage.
- Do not open the cover of the equipment even when the power supply to the inverter has been turned off unless it is necessary for maintenance or regular inspection. Opening the cover may result in an electric shock even when the power supply is off.
- The equipment may hold charge long after the power supply has been turned off. Use a multi-meter to make sure that there is no voltage before working on the inverter, motor or motor cable.

Warning

- This equipment must be grounded for safe and proper operation.
- Do not supply power to a faulty inverter. If you find that the inverter is faulty, disconnect the power supply and have the inverter professionally repaired.
- The inverter becomes hot during operation. Avoid touching the inverter until it has cooled to avoid burns.
- Do not allow foreign objects, such as screws, metal chips, debris, water, or oil to get inside the inverter. Allowing foreign objects inside the inverter may cause the inverter to malfunction or result in a fire.
- Do not operate the inverter with wet hands. Doing so may result in electric shock.
- Check the information about the protection level for the circuits and devices.

The following connection terminals and devices are the Electrical Protection level 0. It means that the circuit protection level depends on the basic insulation. If there is no basic insulation is failed, it may cause electric shock accident. When installing or wiring the connection terminals and devices, take the same protective action as with the power wire.

- Multi-function Input: P1-P7, CM
- Analog Frequency Input: VR, V1, I2, T1
- Safety Function: SA, SB, SC
- Analog Output: AO1, AO2, TO
- Contact: Q1, EG, 24, A1, B1, C1, A2, C2, S+, S-, SG
- Fan

The protection level of this equipment (inverter) is the Electrical Protection level I.

⚠ Caution

- Do not modify the interior workings of the inverter. Doing so will void the warranty.
- The inverter is designed for 3-phase motor operation. Do not use the inverter to operate a single phase motor.
- Do not place heavy objects on top of electric cables. Doing so may damage the cable and result in an electric shock.

Note

Maximum allowed prospective short-circuit current at the input power connection is defined in IEC 60439-1 as 100 kA. Depending on the selected MCCB, the MARATHON DRIVE-MD100G Series is suitable for use in circuits capable of delivering a maximum of 100 kA RMS symmetrical amperes at the drive's maximum rated voltage. The following table shows the recommended MCCB for RMS symmetrical amperes.

Note

Le courant maximum de court-circuit présumé autorisé au connecteur d'alimentation électrique est défini dans la norme IEC 60439-1 comme égal à 100 kA. Selon le MCCB sélectionné, la série MARATHON DRIVE-MD100G peut être utilisée sur des circuits pouvant fournir un courant RMS symétrique de 100 kA maximum en ampères à la tension nominale maximale du variateur. Le tableau suivant indique le MCCB recommandé selon le courant RMS symétrique en ampères.

Working Voltage	UTS150 (N/H/L)	UTS250 (N/H/L)	UTS400 (N/H/L)	ABS103c	ABS203c	ABS403c
480V(50/60Hz)	35/65/100	35/65/100	35/65/100	26kA	26kA	35kA

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1 Preparing the Installation

This chapter provides details on product identification, part names, correct installation and cable specifications. To install the inverter correctly and safely, carefully read and follow the instructions.

1.1 Product Identification

The MD100G Inverter is manufactured in a range of product groups based on drive capacity and power source specifications. Product name and specifications are detailed on the rating plate. The illustration on the next page shows the location of the rating plate. Check the rating plate before installing the product and make sure that the product meets your requirements. For more detailed product specifications, refer to [9.1 Input and Output Specification](#) on page [254](#).

Note

Check the product name, open the packaging, and then confirm that the product is free from defects. Contact your supplier if you have any issues or questions about your product.



MDLV0550 100G-4CONDS			
INPUT	380-480V	3 Phase	50/60Hz
	HD: 103.0A,	ND: 134.0A	
OUTPUT	0-Input V	3 Phase	0.01-400Hz
	HD: 110.0A,	ND: 142.0A	
	84kVA		
	Ser. No 55025310146		
	Inspected by D. K. YU		
	KCC-REM-LSR-XXXXXXX		
marathon™ Drives		Made in KOREA	

Model name

Power source specifications

Output specifications

MDLV 0550 100G -4 CONDS

Motor capacity

0300 - 30 KW
0370 - 37 KW
0450 - 45 KW
0550 - 55 KW
0750 - 75 KW

Series name

Input voltage

4: 3-phase 400V

Keypad

C: LCD Keypad

UL type

O: UL Open Type

EMC filter

F: Built-in EMC
N: Non-EMC

Reactor

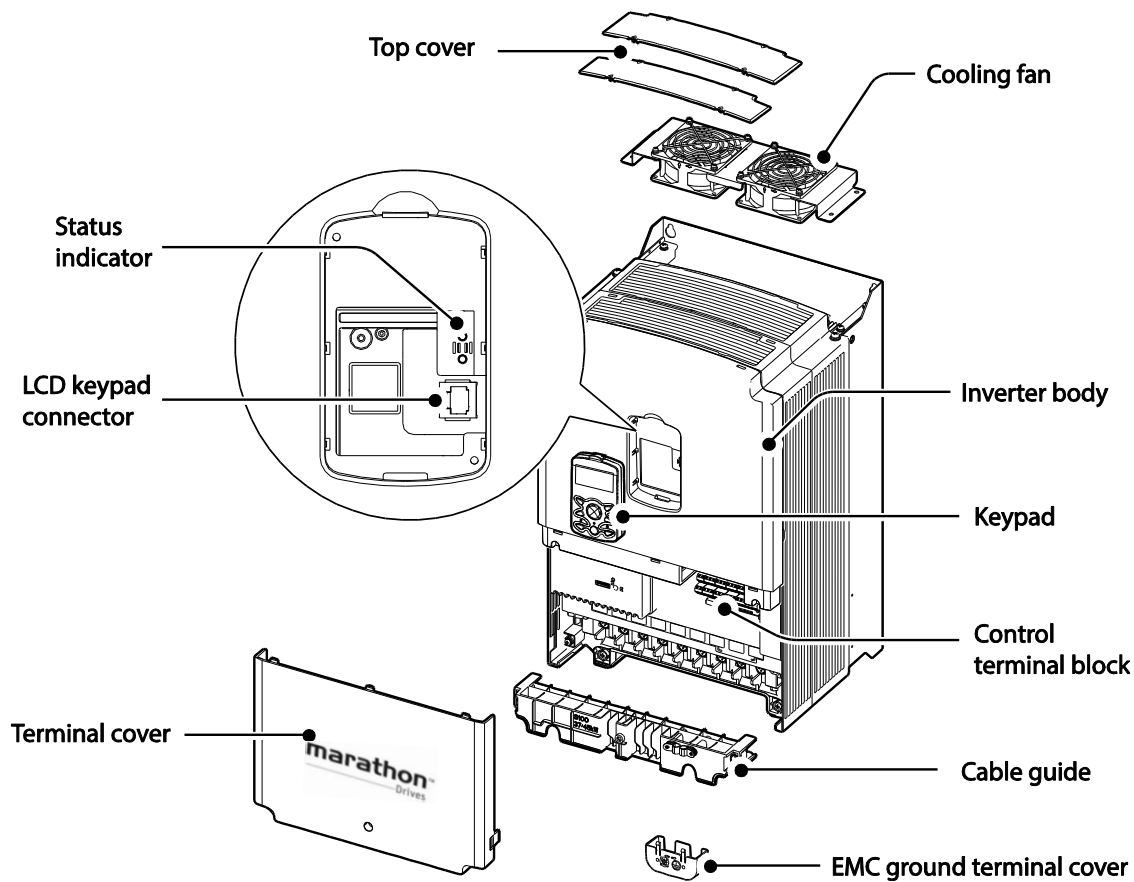
D: Built-in DCL

I/O type

S: Standard

1.2 Part Names

The illustration below displays part names. Details may vary between product groups.



Note

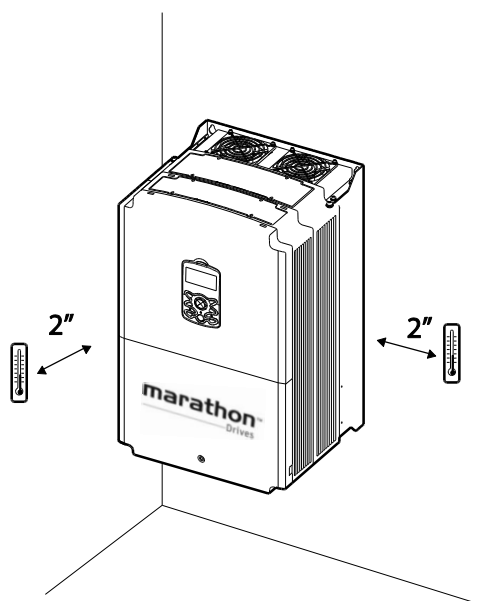
The grounding terminal cover of EMC is not existed in the 55-75kW inverters.

1.3 Installation Considerations

Inverters are composed of various precision, electronic devices, and therefore the installation environment can significantly impact the lifespan and reliability of the product. The table below details the ideal operation and installation conditions for the inverter.

Items	Description
Ambient Temperature*	Heavy Duty: 14–104°F (-10–50°C) Normal Duty: 14–122°F (-10– 40°C)
Ambient Humidity	90% relative humidity (no condensation)
Storage Temperature	- 4–149°F (-20–65°C)
Environmental Factors	An environment free from corrosive or flammable gases, oil residue or dust
Altitude/Vibration	Lower than 3,280 ft (1,000 m) above sea level/less than 9.8m/sec ² (1G)
Air Pressure	70 –106kPa

* The ambient temperature is the temperature measured at a point 2" (5 cm) from the surface of the inverter.



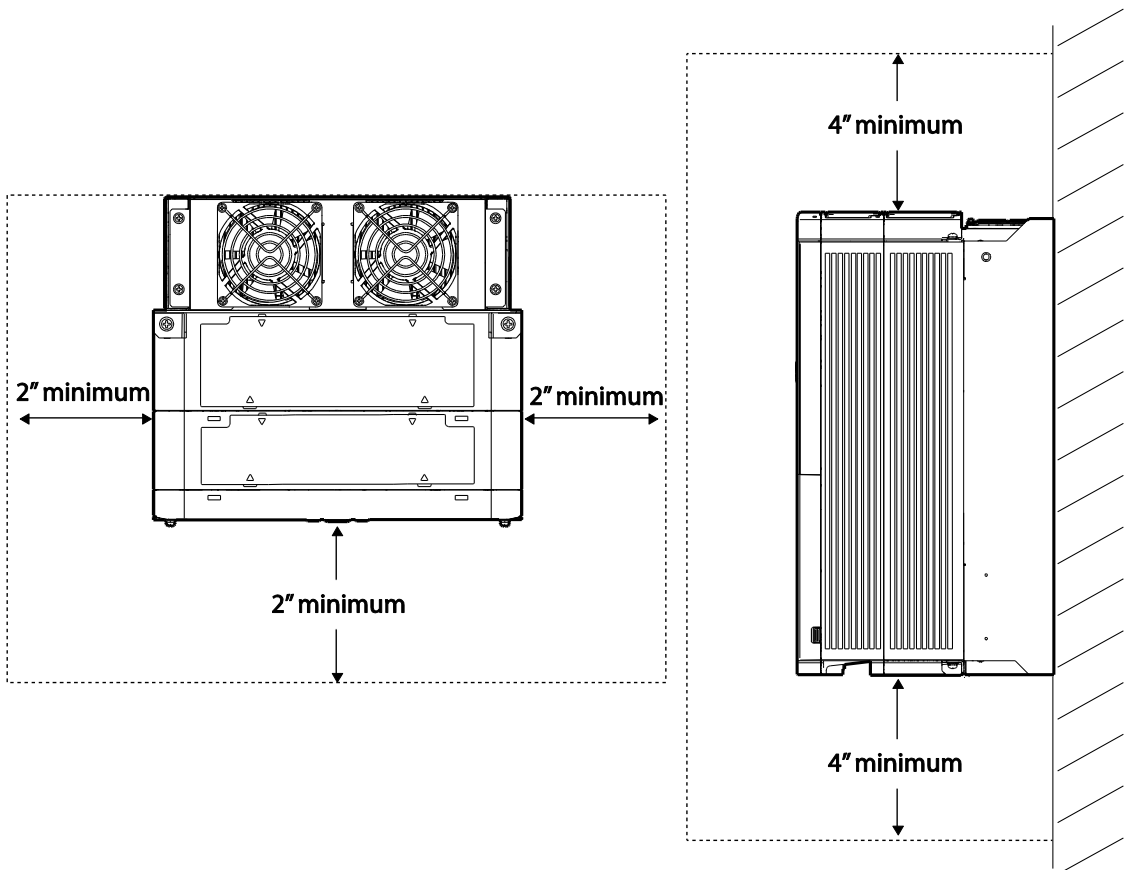
⚠ Caution

Do not allow the ambient temperature to exceed the allowable range while operating the inverter.

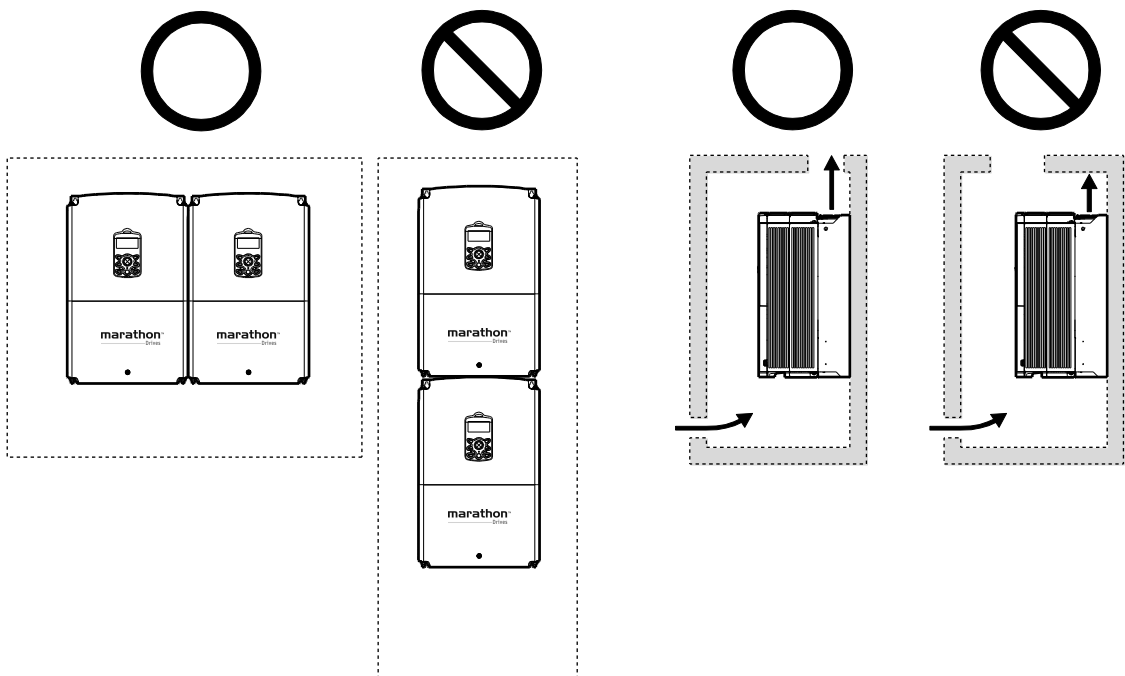
1.4 Selecting and Preparing a Site for Installation

When selecting an installation location consider the following points:

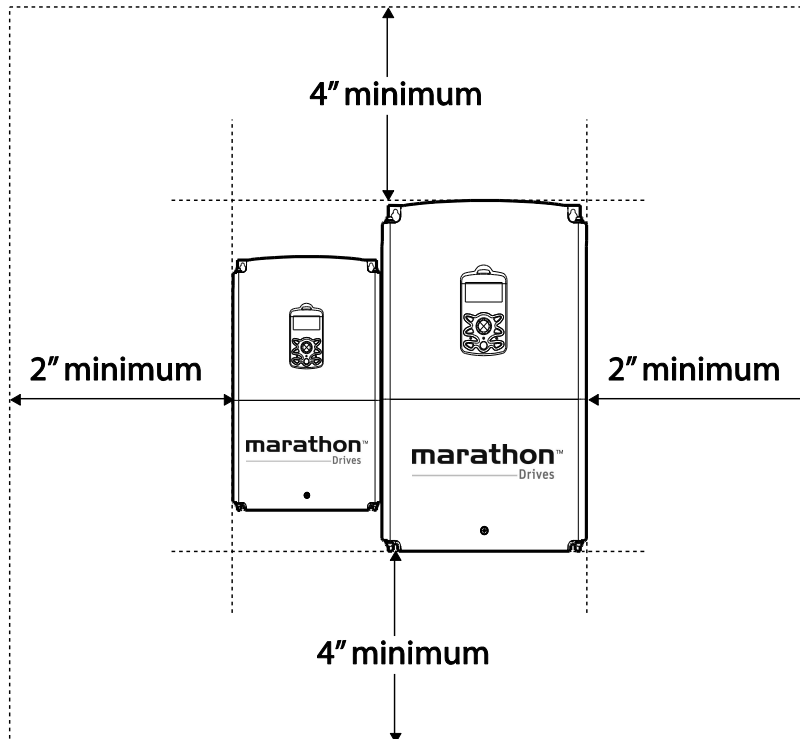
- The inverter must be installed on a wall that can support the inverter's weight.
- The location must be free from vibration. Vibration can adversely affect the operation of the inverter.
- The inverter can become very hot during operation. Install the inverter on a surface that is fire-resistant or flame-retardant and with sufficient clearance around the inverter to allow air to circulate. The illustrations below detail the required installation clearances.



- Ensure sufficient air circulation is provided around the inverter when it is installed. If the inverter is to be installed inside a panel, enclosure, or cabinet rack, carefully consider the position of the inverter's cooling fan and the ventilation louver. The cooling fan must be positioned to efficiently transfer the heat generated by the operation of the inverter.



- If you are installing multiple inverters, of different ratings, provide sufficient clearance to meet the clearance specifications of the larger inverter.



1.5 Cable Selection

When you install power and signal cables in the terminal blocks, only use cables that meet the required specification for the safe and reliable operation of the product. Refer to the following information to assist you with cable selection.

⚠ Caution

- Wherever possible use cables with the largest cross-sectional area for mains power wiring, to ensure that voltage drop does not exceed 2%.
- Use copper cables rated for 600 V, 75°C for power terminal wiring.
- Use copper cables rated for 300 V, 75°C for control terminal wiring.

Ground Cable and Power Cable Specifications

Load (kW)		Ground		Power I/O			
		mm ²	AWG	mm ²		AWG	
				R/S/T	U/V/W	R/S/T	U/V/W
3-Phase 400V	30	16	5	25	25	4	4
	37						
	45						
	55	35	3	70	70	1/0	1/0
	75		2				

Signal (Control) Cable Specifications

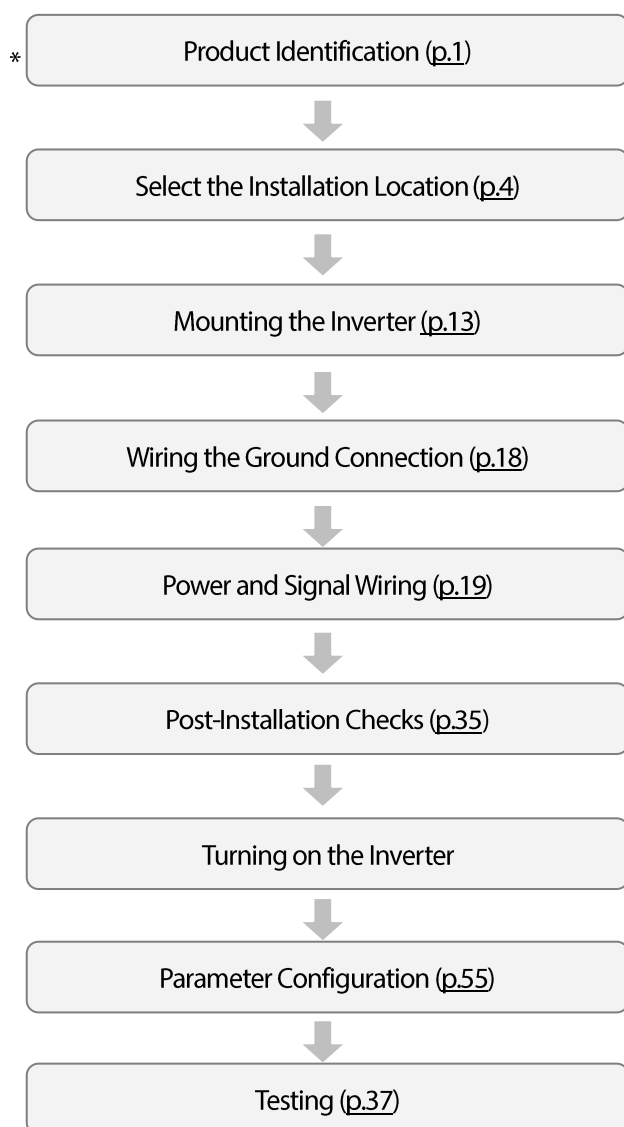
Terminal	Recommended wire thickness mm ² (AWG)		Terminal screw	Torque [Nm]	Electrical Specifications
	Without Crimp Terminal Connections (Bare wire)	With Crimp Terminal Connectors (Bootlace Ferrule)			
P1–P7, CM	1.0 (17)	1.5 (15)	M2-6	0.4	-
VR					Output current/voltage: 12V, 20 mA volume resistance: 1–5 kΩ
V1					Maximum input voltage: -12V – +12V
I2					0–24 mA input (internal resistance: 249 Ω)
AO1, AO2					Maximum output current/voltage: 12 V, 24 mA
Q1					Less than DC 26V, 100 mA
EG					-
24					Maximum output current: 100 mA
TI					0–32 kHz, 0–12 V
TO					0–32 kHz, 0–12 V
SA, SB, SC					Less than DC 24V, 25 mA
S+, S-, SG					Less than AC 250V, 1 A Less than DC 30V, 1 A
A1, B1, C1					Less than AC 250V, 5 A
A2, C2					Less than DC 30V, 5 A

2 Installing the Inverter

This chapter describes the physical and electrical installation methods, including mounting and wiring of the product. Refer to the flowchart and basic configuration diagram provided below to understand the procedures and installation methods to be followed to install the product correctly.

Installation Flowchart

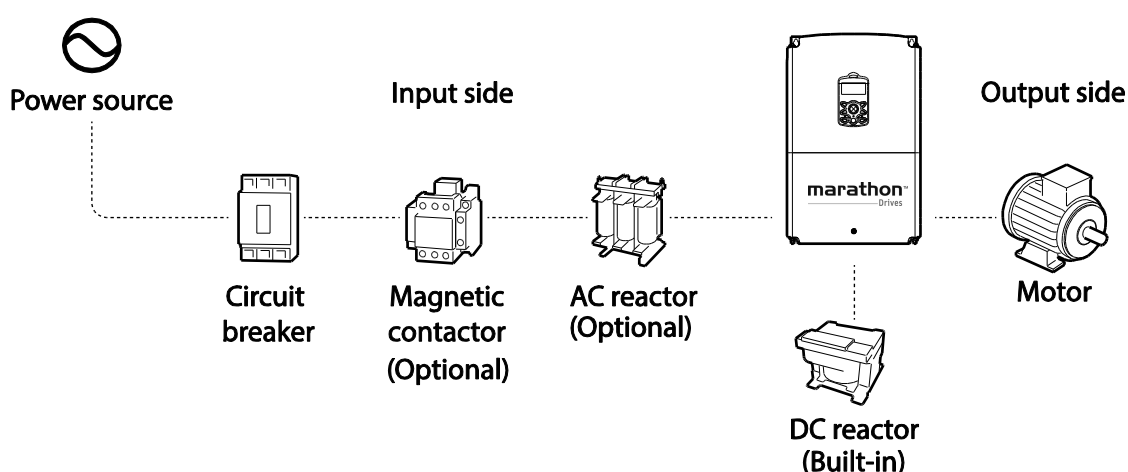
The flowchart lists the sequence to be followed during installation. The steps cover equipment installation and testing of the product. More information on each step is referenced in the steps.



Basic Configuration Diagram

The reference diagram below shows a typical system configuration showing the inverter and peripheral devices.

Prior to installing the inverter, ensure that the product is suitable for the application (power rating, capacity, etc). Ensure that all of the required peripherals and optional devices (resistor brakes, contactors, noise filters, etc.) are available. For more details on peripheral devices, refer to [9.4 Peripheral Devices on page 260](#).



⚠ Caution

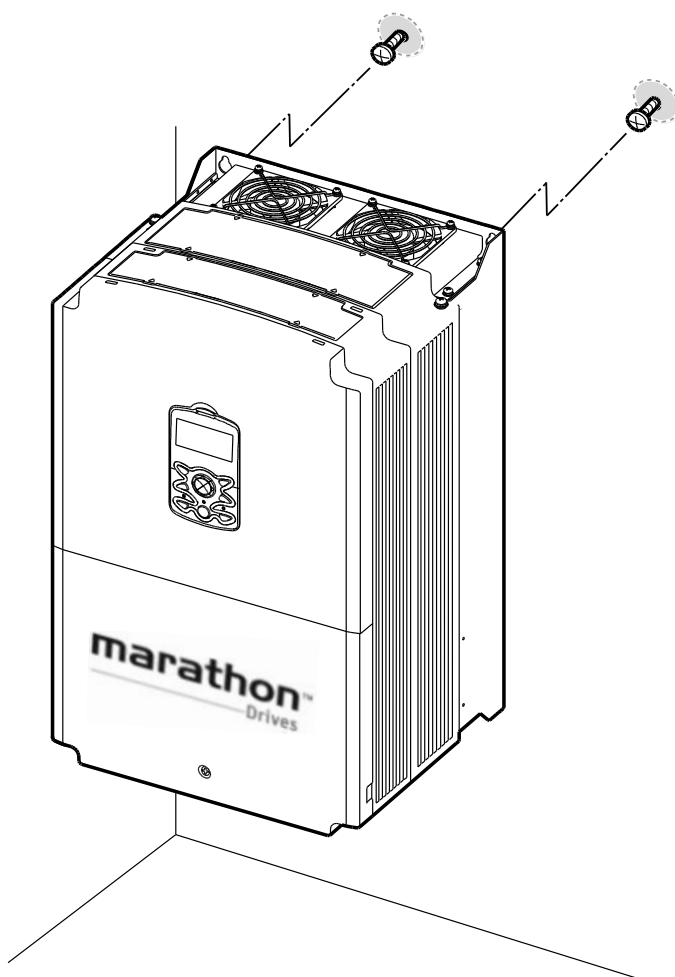
- Figures in this manual are shown with covers or circuit breakers removed to show a more detailed view of the installation arrangements. Install covers and circuit breakers before operating the inverter. Operate the product according to the instructions in this manual.
- Do not start or stop the inverter using a magnetic contactor, installed on the input power supply.
- If the inverter is damaged and loses control, the machine may cause a dangerous situation. Install an additional safety device such as an emergency brake to prevent these situations.
- High levels of current draw during power-on can affect the system. Ensure that correctly rated circuit breakers are installed to operate safely during power-on situations.
- Reactors can be installed to improve the power factor. Note that reactors may be installed within 30 ft (9.14 m) from the power source if the input power exceeds 10 times Of inverter capacity. Refer to [9.5 Fuse](#) and Reactor Specifications on page [260](#) and carefully select a reactor that meets the requirements.

2.1 Mounting the Inverter

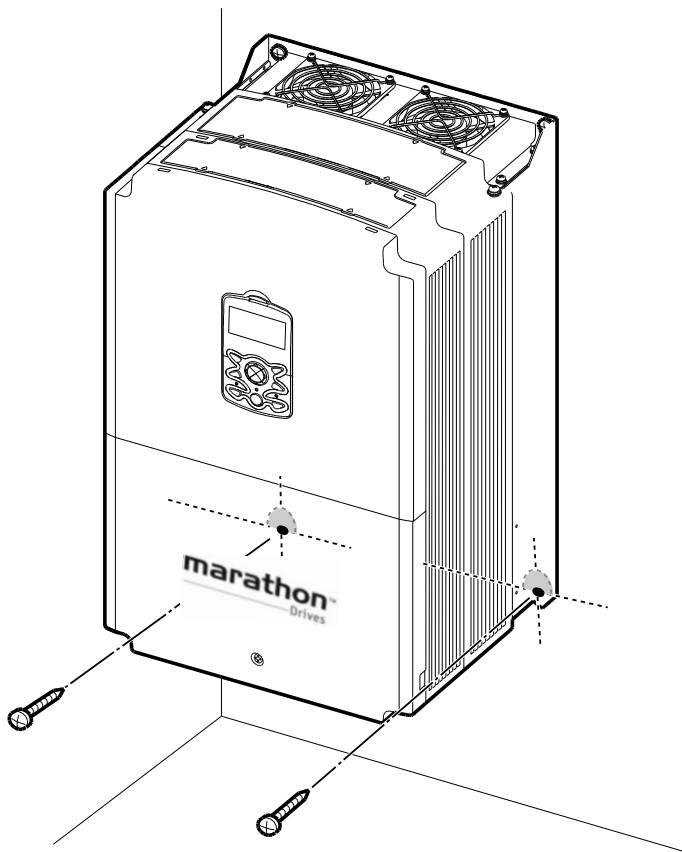
Mount the inverter on a wall or inside a panel following the procedures provided below. Before installation, ensure that there is sufficient space to meet the clearance specifications, and that there are no obstacles impeding the cooling fan's air flow.

Select a wall or panel suitable to support the installation. Refer to 9.3 External Dimensions (IP 20 Type) on page 258 and check the inverter's mounting bracket dimensions.

- 1 Use a level to draw a horizontal line on the mounting surface, and then carefully mark the fixing points.
- 2 Drill the two upper mounting bolt holes, and then install the mounting bolts. Do not fully tighten the bolts at this time. Fully tighten the mounting bolts after the inverter has been mounted.

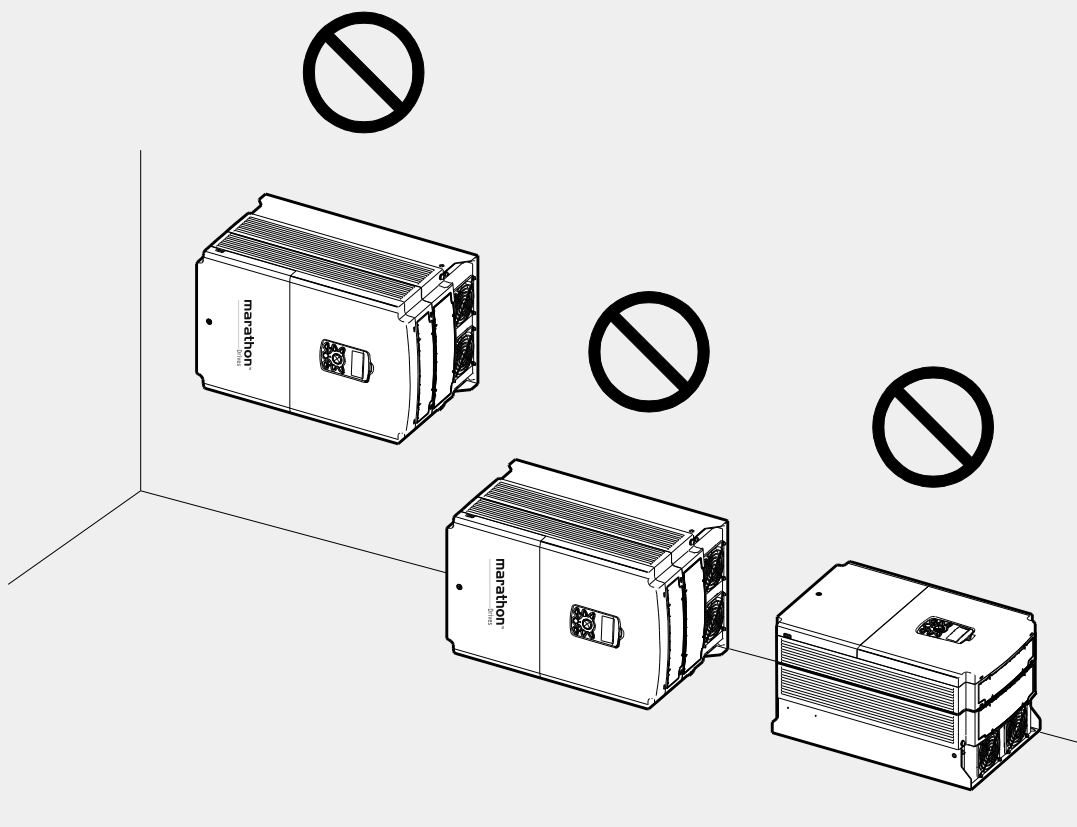


- 3 Mount the inverter on the wall or inside a panel using the two upper bolts, and then fully tighten the mounting bolts. Ensure that the inverter is placed flat on the mounting surface, and that the installation surface can securely support the weight of the inverter.



⚠ Caution

- Do not transport the inverter by lifting with the inverter's covers or plastic surfaces. The inverter may tip over if covers break, causing injuries or damage to the product. Always support the inverter using the metal frames when moving it.
- Hi-capacity inverters are very heavy and bulky. Use an appropriate transport method that is suitable for the weight.
- Do not install the inverter on the floor or mount it sideways against a wall. The inverter **MUST** be installed vertically, on a wall or inside a panel, with its rear flat on the mounting surface.



2.2 Cable Wiring

Open the front cover, remove the cable guides and control terminal cover, and then install the ground connection as specified. Complete the cable connections by connecting an appropriately rated cable to the terminals on the power and control terminal blocks.

Read the following information carefully before carrying out wiring connections to the inverter. All warning instructions must be followed.

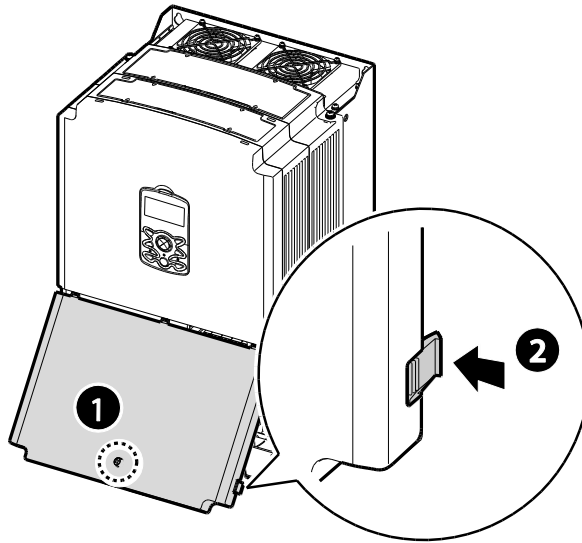
⚠ Caution

- Install the inverter before carrying out wiring connections.
- Ensure that no small metal debris, such as wire cut-offs, remain inside the inverter. Metal debris in the inverter may cause inverter failure.
- Tighten terminal screws to their specified torque. Loose terminal block screws may allow the cables to disconnect and cause short circuit or inverter failure. Refer to [9.6 Terminal Screw Specification](#) on page [261](#) for torque specifications.
- Do not place heavy objects on top of electric cables. Heavy objects may damage the cable and result in electric shock.
- The power supply system for this equipment (inverter) is a grounded system. Only use a grounded power supply system for this equipment (inverter). Do not use a TT, TN, IT, or corner grounded system with the inverter.
- The equipment may generate direct current in the protective ground wire. When installing the residual current device (RCD) or residual current monitoring (RCM), only Type B RCDs and RCMs can be used.
- Use cables with the largest cross-sectional area, appropriate for power terminal wiring, to ensure that voltage drop does not exceed 2%.
- Use copper cables rated at 600 V, 75 °C for power terminal wiring.
- Use copper cables rated at 300 V, 75 °C for control terminal wiring.
- Check for short circuits or wiring failure in the control circuit. They could cause system failure or device malfunction.
- Use shielded cables when wiring the control circuit. Failure to do so may cause malfunction due to interference. If a ground is needed, use STP (Shielded Twisted Pair) cables.
- If you need to re-wire the terminals due to wiring-related faults, ensure that the inverter keypad display is turned off and the charge lamp under the front cover is off before working on wiring connections. The inverter may hold a high voltage electric charge long after the power supply has been turned off.

Step 1 Front Cover, Control Terminal Cover and Cable Guide

The front cover, control terminal cover and cable guide must be removed to install cables. Refer to the following procedures to remove the covers and cable guide. The steps to remove these parts may vary depending on the inverter model.

- 1 Loosen the bolt that secures the terminal cover (❶). Push and hold the latch on the right side of the cover (❷). Then remove the cover by lifting it from the bottom and moving it away from the front of the inverter.

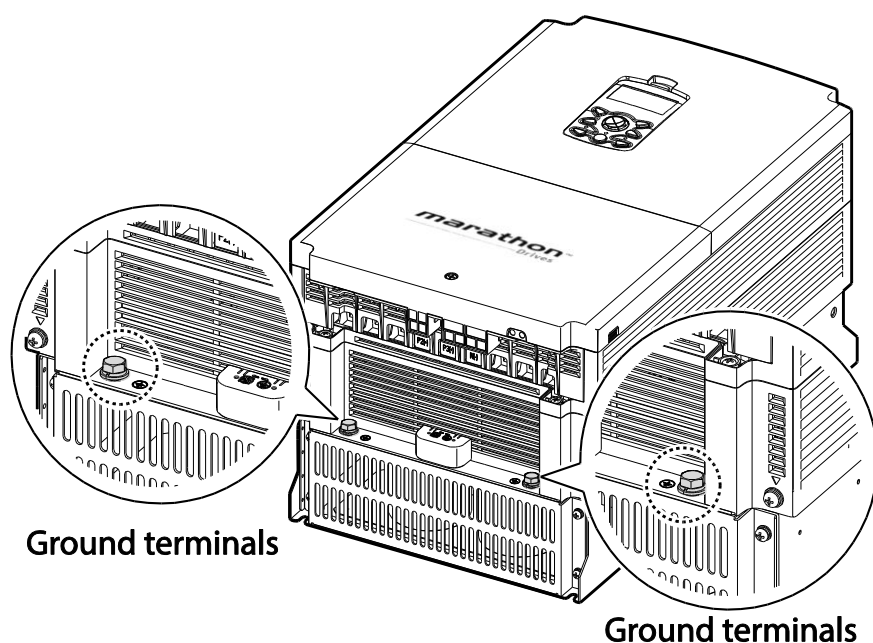


- 2 Connect the cables to the power terminals and the control terminals. For cable specifications, refer to [*1.5 Cable Selection*](#) on page 8.

Step 2 Ground Connection

Remove the front cover, cable guide, and the control terminal cover. Then follow the instructions below to install the ground connection for the inverter.

- 1 Locate the ground terminal and connect an appropriately rated ground cable to the terminals. Refer to [1.5 Cable Selection](#) on page 8 to find the appropriate cable specification for your installation.



- 2 Connect the other ends of the ground cables to the supply earth (ground) terminal.

Note

400 V products require Special Class 3 grounding. Resistance to ground must be $< 10 \Omega$.

⚠ Warning

Install ground connections for the inverter and the motor by following the correct specifications to ensure safe and accurate operation. Using the inverter and the motor without the specified grounding connections may result in electric shock.

Step 3 Power Terminal Wiring

The following illustration shows the terminal layout on the power terminal block. Refer to the detailed descriptions to understand the function and location of each terminal before making wiring connections. Ensure that the cables selected meet or exceed the specifications in 1.5 Cable Selection on page 8 before installing them.

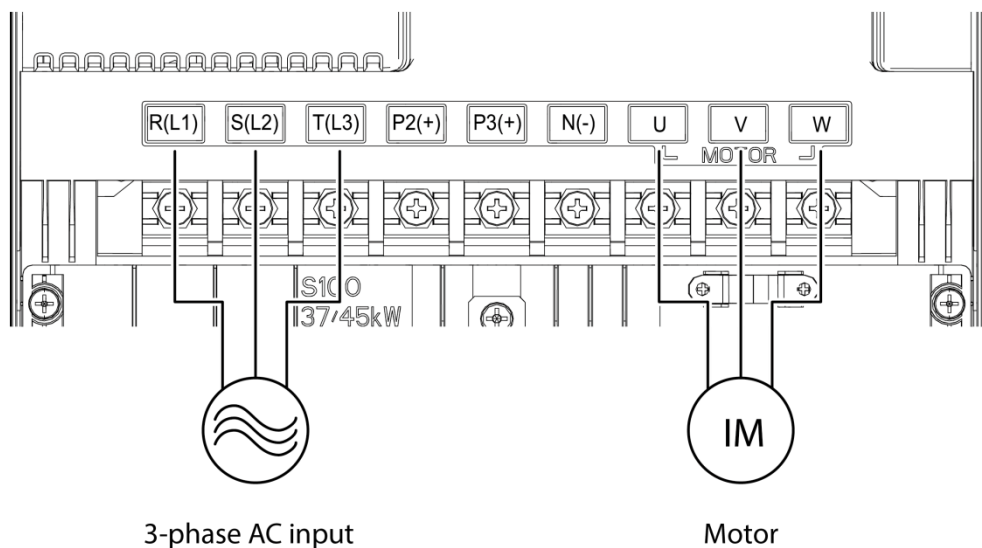
⚠ Caution

- Tighten terminal screws to their specified torque. Loose terminal screws may allow the cables to disconnect and cause short circuit or inverter failure. Over tightening terminal screws may damage the terminals and cause short circuits and malfunctions.
- Use copper cables rated for 600 V, 75°C for power terminal wiring.
- Use copper cables rated for 300 V, 75°C for control terminal wiring.
- Do not connect two wires in a single terminal for power cable connections.
- Power supply cables must be connected to the R, S, and T terminals. Connecting power cables to the U, V, and W terminals will cause internal damage to the inverter. Connect motors to the U, V, and W terminals. Phase sequence arrangement is not necessary.

⚠ Attention

- Appliquer des couples de marche aux vis des bornes. Des vis desserrées peuvent provoquer des courts-circuits et des dysfonctionnements. Ne pas trop serrer la vis, car cela risque d'endommager les bornes et de provoquer des courts-circuits et des dysfonctionnements.
- Utiliser uniquement des fils de cuivre avec une valeur nominale de 600 V, 75 °C pour le câblage de la borne d'alimentation, et une valeur nominale de 300 V, 75 °C pour le câblage de la borne de commande.
- Ne jamais connecter deux câbles à une borne lors du câblage de l'alimentation.
- Les câblages de l'alimentation électrique doivent être connectés aux bornes R, S et T. Leur connexion aux bornes U, V et W provoque des dommages internes à l'onduleur. Le moteur doit être raccordé aux bornes U, V et W. L'arrangement de l'ordre de phase n'est pas nécessaire.

30~75kW (3-phase)



Power Terminal Labels and Descriptions

Terminal Labels	Name	Description
R(L1)/S(L2)/T(L3)	AC power input terminal	Mains supply AC power connections.
P2(+)/N(-)	DC link terminal	DC voltage terminals.
P3(+)/N(-)	Brake unit terminals	Brake unit wiring connection.
U/V/W	Motor output terminals	3-phase induction motor wiring connections.

Note

- Use STP (Shielded Twisted Pair) cables to connect a remotely located motor with the inverter. Do not use 3 core cables.
- Make sure that the total cable length does not exceed 665ft (202m).
- Long cable runs can cause reduced motor torque in low frequency applications due to voltage drop. Long cable runs also increase a circuit's susceptibility to stray capacitance and may trigger over-current protection devices or result in malfunction of equipment connected to the inverter.
- Voltage drop is calculated by using the following formula:

$$\text{Voltage Drop (V)} = [\sqrt{3} \times \text{cable resistance (m}\Omega/\text{m)} \times \text{cable length (m)} \times \text{current(A)}] / 1000$$

- Use cables with the largest possible cross-sectional area to ensure that voltage drop is minimized over long cable runs. Lowering the carrier frequency and installing a micro surge filter may also help to reduce voltage drop.

Distance	< 330ft (100m)	> 330ft (100m)
Allowed Carrier Frequency	< 5 kHz	< 2.5 kHz

⚠ Warning

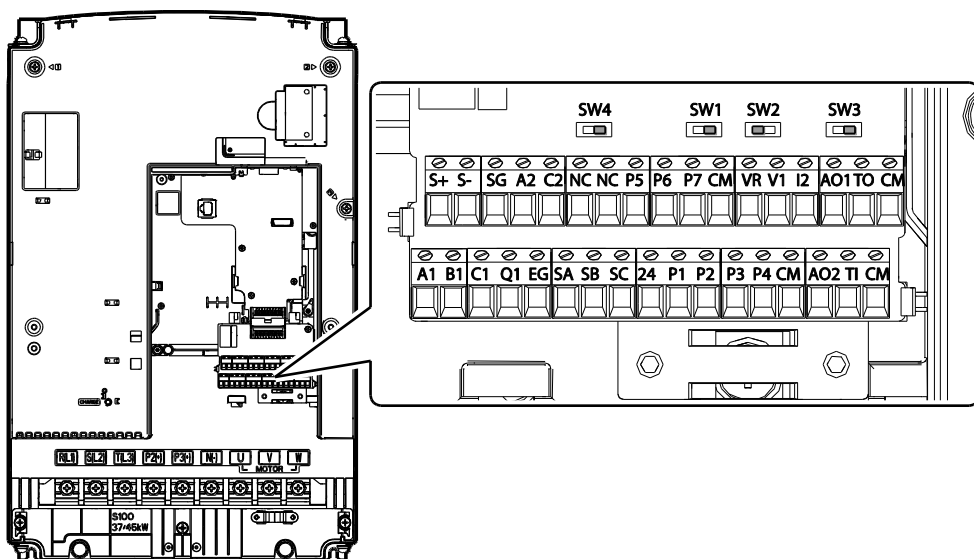
Do not connect power to the inverter until installation has been fully completed and the inverter is ready to be operated. Doing so may result in electric shock.

⚠ Caution

- Power supply cables must be connected to the R, S, and T terminals. Connecting power cables to other terminals will damage the inverter.
- Use insulated ring lugs when connecting cables to R/S/T and U/V/W terminals.
- The inverter's power terminal connections can cause harmonics that may interfere with other communication devices located near to the inverter. To reduce interference the installation of noise filters or line filters may be required.
- To avoid circuit interruption or damaging connected equipment, do not install phase-advanced condensers, surge protection, or electronic noise filters on the output side of the inverter.
- To avoid circuit interruption or damaging connected equipment, do not install magnetic contactors on the output side of the inverter.

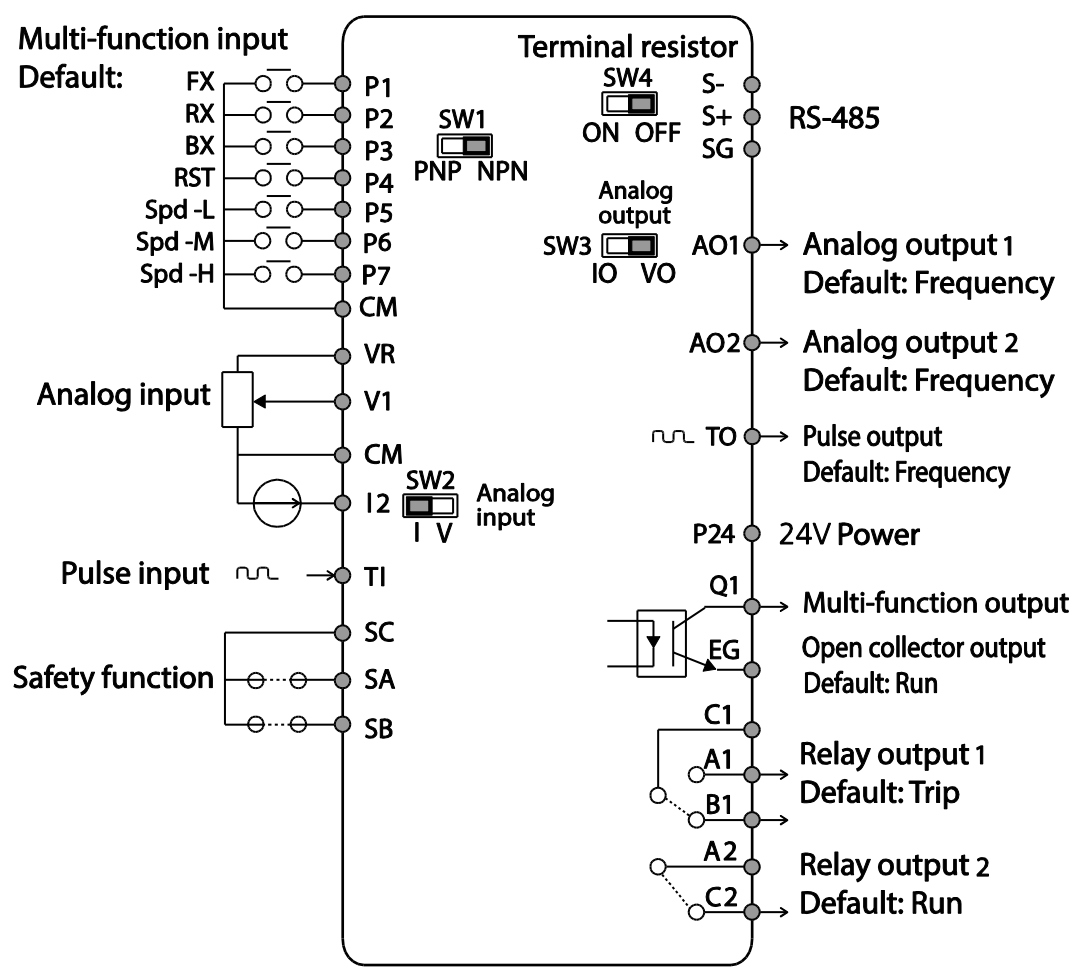
Step 4 Control Terminal Wiring

The illustrations below show the detailed layout of control wiring terminals, and control board switches. Refer to the detailed information provided below and [1.5 Cable Selection](#) on page 8 before installing control terminal wiring and ensure that the cables used meet the required specifications.



Control Board Switches

Switch	Description
SW1	PNP/NPN mode selection switch
SW2	analog voltage/current input terminal selection switch
SW3	analog voltage/current output terminal selection switch
SW4	Terminal resistor DIP switch



Input Terminal Labels and Descriptions

Function	Label	Name	Description
Multi-function terminal configuration	P1–P7	Multi-function Input 1-7	Configurable for multi-function input terminals.
	CM	Common Sequence	Common terminal for analog terminal inputs and outputs.
Analog input configuration	VR	Potentiometer frequency reference input	Used to setup or modify a frequency reference via analog voltage or current input. <ul style="list-style-type: none"> Maximum Voltage Output: 12V Maximum Current Output: 100 mA, Potentiometer: 1–5 kΩ
	V1	Voltage input for frequency reference input	Used to setup or modify a frequency reference via analog voltage input terminal. <ul style="list-style-type: none"> Unipolar: 0–10V (12V Max.) Bipolar: -10–10V (\pm12V Max.)
	I2	Voltage/current input for frequency reference input	Used to setup or modify a frequency reference via analog voltage or current input terminals. Switch between voltage (V2) and current (I2) modes using a control board switch (SW2). <p>V2 Mode:</p> <ul style="list-style-type: none"> Unipolar: 0–10V (12V Max.) <p>I2 Mode</p> <ul style="list-style-type: none"> Input current: 4–20 mA Maximum Input current: 24 mA Input resistance: 249 Ω
	TI	Pulse input for frequency reference input (pulse train)	Setup or modify frequency references using pulse inputs from 0 to 32 kHz. <ul style="list-style-type: none"> Low Level: 0–0.8V High Level: 3.5–12V
Safety functionality configuration	SA	Safety input A	Used to block the output from the inverter in an emergency. Conditions: <ul style="list-style-type: none"> Normal Operation: Both the SA and SB terminals are connected to the SC terminal. Output Block: One or both of the SA and SB terminals lose connection with the SC terminal.
	SB	Safety input B	
	SC	Safety input power source	DC 24V, < 25 mA

Output/Communication Terminal Labels and Descriptions

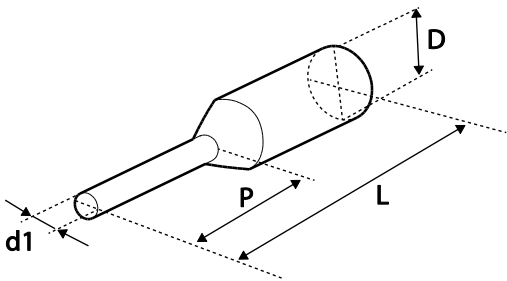
Function	Label	Name	Description
Analog output	AO1	Voltage/Current Output	Used to send inverter output information to external devices: output frequency, output current, output voltage, or a DC voltage. Operate switch (SW2) to select the signal output type (voltage or current) at the AO terminal. Output Signal Specifications: <ul style="list-style-type: none"> • Output voltage: 0–10V • Maximum output voltage/current: 12V/10 mA • Output current: 0–20 mA (Load resistance: Less than 500 Ω) • Maximum output current: 24 mA
	AO2	Analog voltage output terminal	Use to send inverter output information, such as output frequency, output current, output voltage, or DC voltage to external devices. <ul style="list-style-type: none"> • Output voltage: 0–10 V • Maximum output voltage/current: 12V/10 mA
	TO	Pulse Output	Sends pulse signals to external devices to provide a single output value from the inverter of either: output frequency, output current, output voltage, or DC voltage. Output Signal Specifications: <ul style="list-style-type: none"> • Output frequency: 0–32 kHz • Output voltage: 0–12V
Digital output	Q1	Multi-functional (open collector)	DC 26V, 100 mA or less
	EG	Common	Common ground contact for an open collector (with external power source)
	24	External 24V power source	Maximum output current: 150 mA
	A1/C1/B1	Fault signal output	Sends out alarm signals when the inverter's safety features are activated (AC 250 V < 1A, DC 30 V < 1A). <ul style="list-style-type: none"> • Fault condition: A1 and C1 contacts are connected (B1 and C1 open connection) • Normal operation: B1 and C1 contacts are connected (A1 and C1 open connection)
	A2, C2	Multi-functional relay output terminal	The signal is generated while operating. Define and use the multi-functional relay output terminal (Less than AC250 V 5A, Less than DC30 V 5A).
Terminal contacts	S+/S-/SG	RS-485 signal line	Used to send or receive RS-485 signals. Refer to 5 RS-485 Communication Features on page 129 for more details.

Installing the Inverter

Function	Label	Name	Description
	NC	NC	Not in use.

Preinsulated Crimp Terminal Connectors (Bootlace Ferrule).

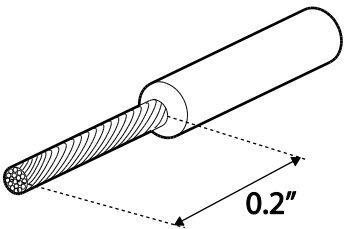
Use preinsulated crimp terminal connectors to increase reliability of the control terminal wiring. Refer to the specifications below to determine the crimp terminals to fit various cable sizes.



P/N	Cable Spec.		Dimensions (inches/mm)				Manufacturer
	AWG	mm ²	L*	P	d1	D	
CE002506	26	0.25	10.4	0.4 / 6.0	0.04 / 1.1	0.1 / 2.5	JEONO (Jeono Electric, http://www.jeono.com/)
CE002508			12.4	0.5 / 8.0			
CE005006	22	0.50	12.0	0.45 / 6.0	0.05 / 1.3	0.125 / 3.2	
CE007506	20	0.75	12.0	0.45 / 6.0	0.06 / 1.5	0.13 / 3.4	

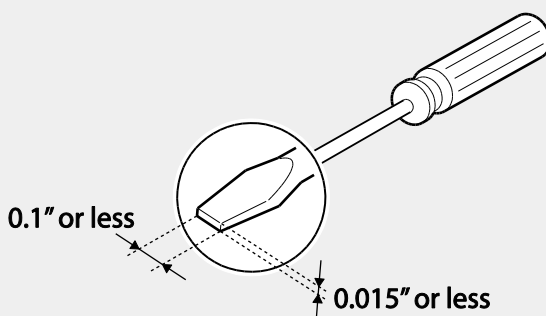
* If the length (L) of the crimp terminals exceeds 0.5" (12.7mm) after wiring, the control terminal cover may not close fully.

To connect cables to the control terminals without using crimp terminals, refer to the following illustration detailing the correct length of exposed conductor at the end of the control cable.



Note

- While making wiring connections at the control terminals, ensure that the total cable length does not exceed 165ft (50m).
- Ensure that the length of any safety related wiring does not exceed 100ft (30m).
- Ensure that the cable length between an LCD keypad and the inverter does not exceed 10ft (3.04m). Cable connections longer than 10ft (3.04m) may cause signal errors.
- Use ferrite material to protect signal cables from electro-magnetic interference.
- Take care when supporting cables using cable ties, to apply the cable ties no closer than 6 inches from the inverter. This provides sufficient access to fully close the front cover.
- When making control terminal cable connections, use a small flat-tip screw driver (0.1in wide (2.5mm) and 0.015in thick (0.4mm) at the tip).

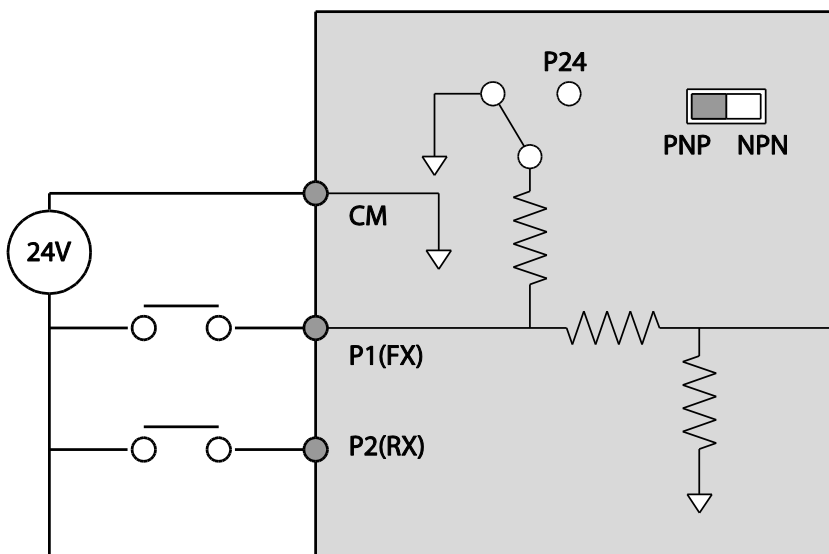


Step 5 PNP/NPN Mode Selection

The MD100G inverter supports both PNP (Source) and NPN (Sink) modes for sequence inputs at the terminal. Select an appropriate mode to suit requirements using the PNP/NPN selection switch (SW1) on the control board. Refer to the following information for detailed applications.

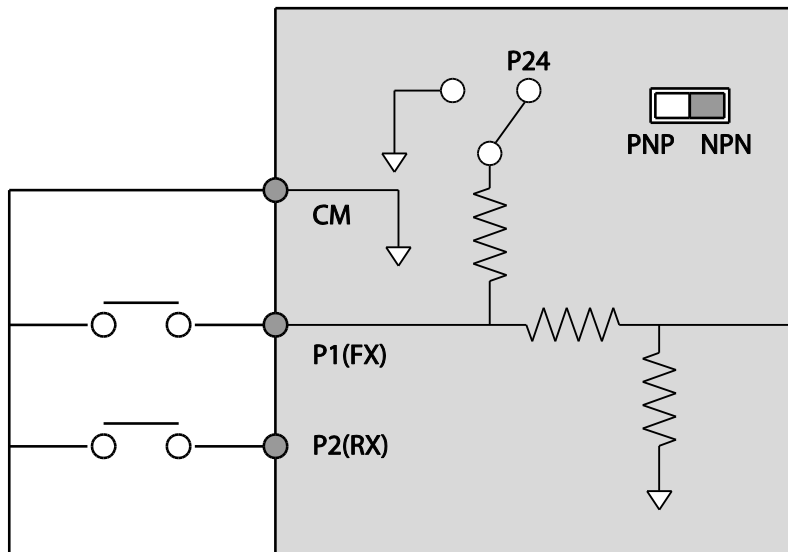
PNP Mode (Source)

Select PNP using the PNP/NPN selection switch (SW1). Note that the factory default setting is NPN mode. CM is the common ground terminal for all analog inputs at the terminal, and P24 is 24V internal source. If you are using an external 24V source, build a circuit that connects the external source (-) and the CM terminal.



NPN Mode (Sink)

Select NPN using the PNP/NPN selection switch (SW1). Note that the factory default setting is NPN mode. CM is the common ground terminal for all analog inputs at the terminal, and P24 is 24V internal source.

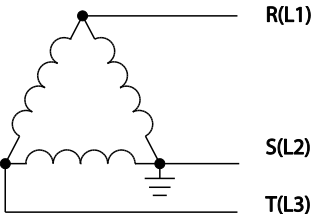
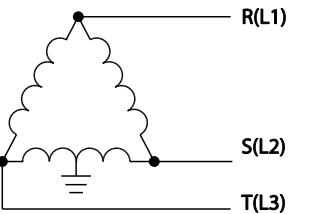
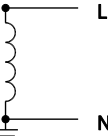
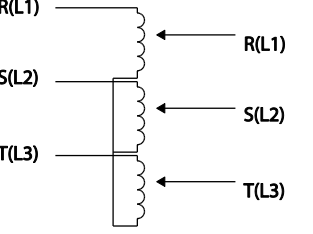


Step 6 Disabling the EMC Filter for Power Sources with Asymmetrical Grounding

MD100G, 400 V 30–45 kW (3 phase) inverters have EMC filters built-in and activated as a factory default design. An EMC filter prevents electromagnetic interference by reducing radio emissions from the inverter. EMC filter use is not always recommended, as it increases leakage current. If an inverter uses a power source with an asymmetrical grounding connection, the EMC filter must be turned off.

Note

MD100G, 400 V, 55–75 kW products do not have built-in EMC filters.

Asymmetrical Grounding Connection			
One phase of a delta connection is grounded		Intermediate grounding point on one phase of a delta connection	
The end of a single phase is grounded		A 3-phase connection without grounding	

⚠ Danger

- Do not activate the EMC filter if the inverter uses a power source with an asymmetrical grounding structure, for example a grounded delta connection. Personal injury or death by electric shock may result.
- Wait at least 10 minutes before opening the covers and exposing the terminal connections. Before starting work on the inverter, test the connections to ensure all DC voltage has been fully discharged. Personal injury or death by electric shock may result.

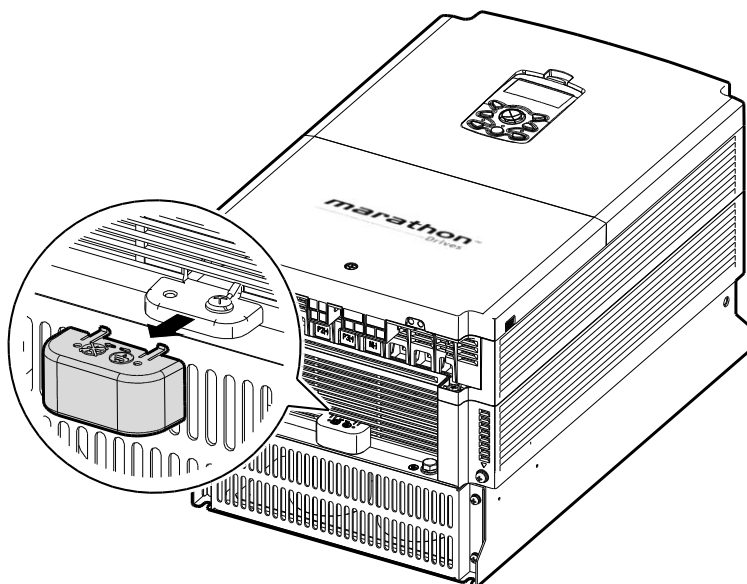
Before using the inverter, confirm the power supply's grounding system. Disable the EMC filter if the power source has an asymmetrical grounding connection.

Disabling the Built-in EMC Filter

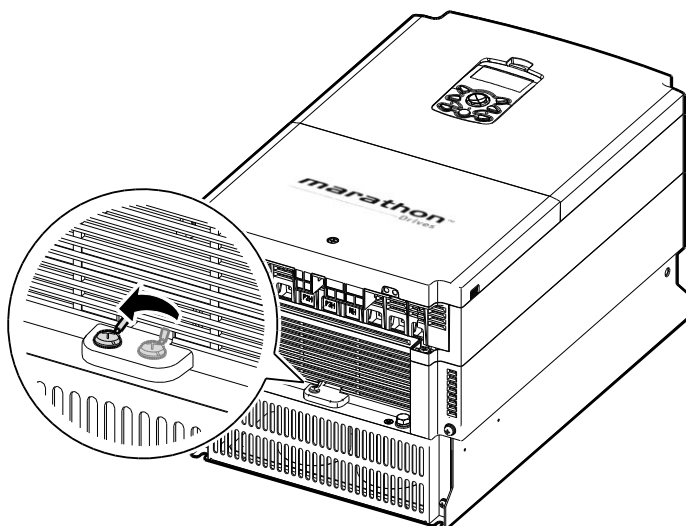
Refer to the figures below to locate the EMC filter on/off terminal and replace the metal bolt with the plastic bolt. If the EMC filter is required in the future, reverse the steps and replace the plastic bolt with the metal bolt to reconnect the EMC filter.

Follow the instructions listed below to disable the EMC filters.

- 1 Remove the EMC ground cover located at the bottom of the inverter.



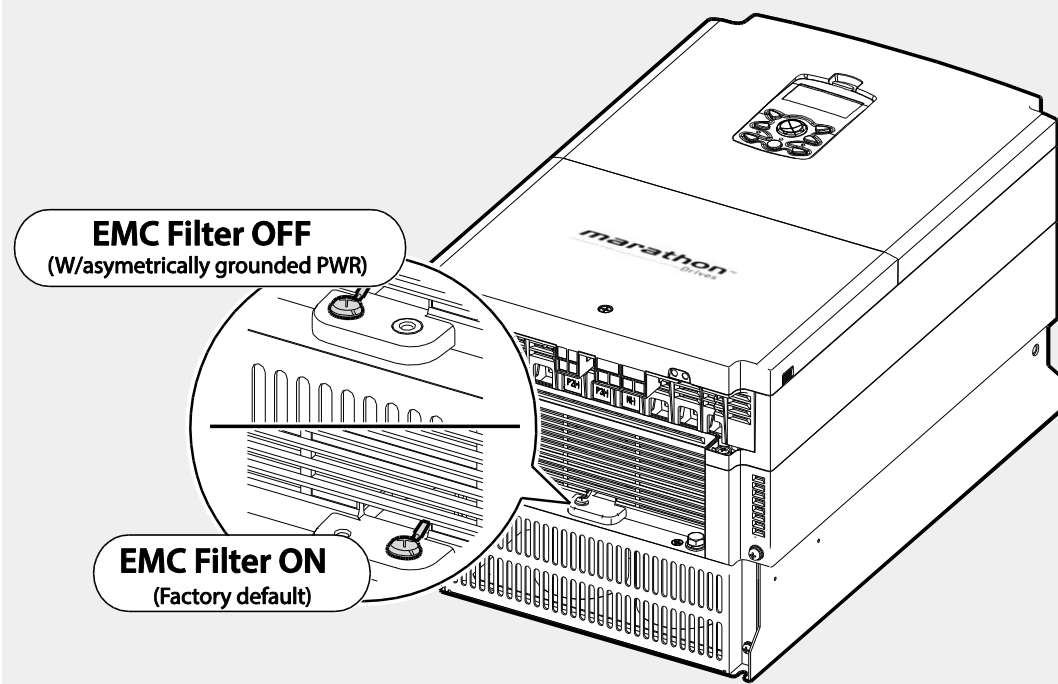
- 2 Remove the EMC ground cable from the right terminal (EMC filter-ON / factory default), and connect it to the left terminal (EMC filter-OFF / for power sources with asymmetrical grounding).



If the EMC filter is required in the future, reverse the steps and connect the EMC ground cable to the right terminal to enable the EMC filter.

Note

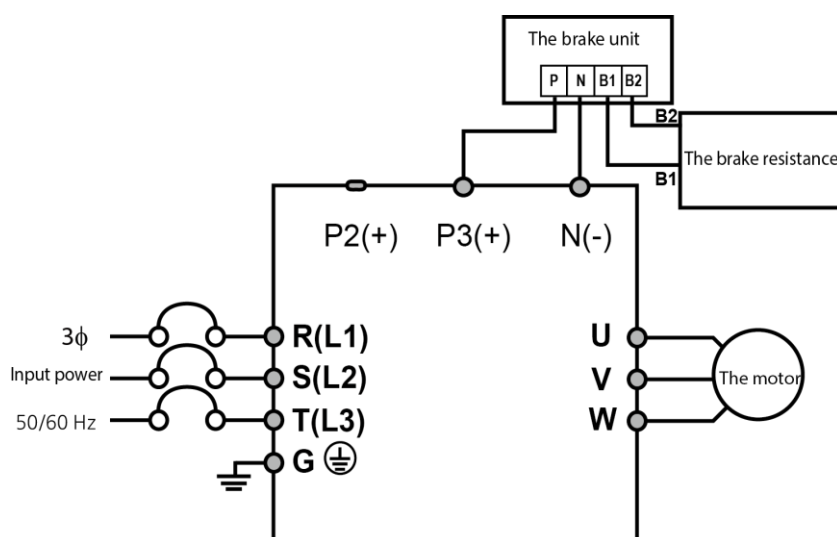
The terminal on the right is used to ENABLE the EMC filter (factory default). The terminal on the left is used to DISABLE the EMC filter (for power sources with asymmetrical grounding).



Step 7 Selecting the brake unit

Select the brake unit as following:

UL type	Applicable motor capacity	Brake unit
Non-UL Type	30-37 kW	SV037DBH-4
	45-55 kW	SV075DBH-4
	75 kW	
UL Type	30-37 kW	SV370DBU-4U
	45-55 kW	SV550DBU-4U
	75 kW	SV750DBU-4U



Step 8 Re-assembling the Covers and Routing Bracket

Re-assemble the cable routing bracket and the covers after completing the wiring and basic configurations. Note that the assembly procedure may vary according to the product group or frame size of the product.

2.3 Post-Installation Checklist

After completing the installation, check the items in the following table to make sure that the inverter has been safely and correctly installed.

Items	Check Point	Ref.	Result
Installation Location/Power I/O Verification	Is the installation location appropriate?	<u>p.4</u>	
	Does the environment meet the inverter's operating conditions?	<u>p.5</u>	
	Does the power source match the inverter's rated input?	<u>p.254</u>	
	Is the inverter's rated output sufficient to supply the equipment? (Degraded performance will result in certain circumstances. Refer to <i>9.8 Continuous Rated Current Derating</i> on page 262 for details.)	<u>p.254</u>	
Power Terminal Wiring	Is a circuit breaker installed on the input side of the inverter?	<u>p.12</u>	
	Is the circuit breaker correctly rated?	<u>p.254</u>	
	Are the power source cables correctly connected to the R/S/T terminals of the inverter? (Caution: connecting the power source to the U/V/W terminals may damage the inverter.)	<u>p.19</u>	
	Are the motor output cables connected in the correct phase rotation (U/V/W)? (Caution: motors will rotate in reverse direction if three phase cables are not wired in the correct rotation.)	<u>p.19</u>	
	Are the cables used in the power terminal connections correctly rated?	<u>p.8</u>	
	Is the inverter grounded correctly?	<u>p.18</u>	
	Are the power terminal screws and the ground terminal screws tightened to their specified torques?	<u>p.19</u>	
	Are the overload protection circuits installed correctly on the motors (if multiple motors are run using one inverter)?	-	
	Is the inverter separated from the power source by a magnetic contactor (if a braking resistor is in use)?	<u>p.12</u>	
	Are advanced-phase capacitors, surge protection and electromagnetic interference filters installed correctly? (These devices MUST not be installed on the output side of the inverter.)	<u>p.19</u>	
Control Terminal Wiring	Are STP (shielded twisted pair) cables used for control terminal wiring?	-	
	Is the shielding of the STP wiring properly grounded?	-	
	If 3-wire operation is required, are the multi-function input terminals defined prior to the installation of the control wiring connections?	<u>p.22</u>	
	Are the control cables properly wired?	<u>p.22</u>	

Items	Check Point	Ref.	Result
	Are the control terminal screws tightened to their specified torques?	<u>p.16</u>	
	Is the total cable length of all control wiring < 165ft (100m)?	<u>p.28</u>	
	Is the total length of safety wiring < 100ft (30m)?	<u>p.28</u>	
Miscellaneous	Are optional cards connected correctly?	-	
	Is there any debris left inside the inverter?	<u>p.16</u>	
	Are any cables contacting adjacent terminals, creating a potential short circuit risk?	-	
	Are the control terminal connections separated from the power terminal connections?	-	
	If capacitors have been in use for more than two years, have they been replaced?	-	
	Has a fuse been installed for the power source?	<u>p.260</u>	
	Are the connections to the motor separated from other connections?	-	
	If the fans have been in operation for more than three years, have they been replaced?	<u>p.251</u>	

Note

STP (Shielded Twisted Pair) cable has a highly conductive, shielded screen around twisted cable pairs. STP cables protect conductors from electromagnetic interference.

2.4 Test Run

After the post-installation checklist has been completed, follow the instructions below to test the inverter.

- 1** Before starting a test drive, check the wiring conditions.
- 2** Turn on the power supply to the inverter. Ensure that the keypad display light is on.
- 3** Select the command source (Set the DRV code).
- 4** Set a frequency reference, and then check the following:
 - If V1 is selected as the frequency reference source, does the reference change according to the input voltage at VR?
 - If V2 is selected as the frequency reference source, is the voltage/current selector switch (SW2) set to voltage, and does the reference change according to the input voltage?
 - If I2 is selected as the frequency reference source, is the voltage/current selector switch (SW2) set to current, and does the reference change according to the input current?
- 5** Set the acceleration (ACC) time and deceleration (Dec) time.
- 6** Start the motor and check the following:
 - Ensure that the motor rotates in the correct direction (refer to the note below).
 - Ensure that the motor accelerates and decelerates according to the set times, and that the motor speed reaches the frequency reference.

Note

If the forward command (Fx) is on, the motor should rotate counterclockwise when viewed from the load side of the motor. If the motor rotates in the reverse direction, switch the cables at the U and V terminals.

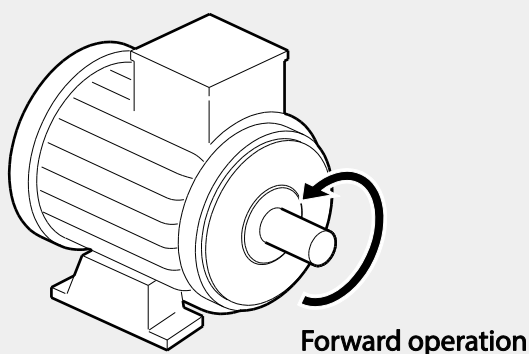
Remarque

Si la commande avant (Fx) est activée, le moteur doit tourner dans le sens anti-horaire si on le regarde côté charge du moteur. Si le moteur tourne dans le sens inverse, inverser les câbles aux bornes U et V.

Verifying the Motor Rotation

- 1 On the keypad, set the DRV-06 (Frequency reference source) code to 0(Keypad).
- 2 Set a frequency reference.
- 3 Press the [RUN] key. Motor starts forward operation.
- 4 Observe the motor's rotation from the load side and ensure that the motor rotates counterclockwise (forward).

If the motor rotates in the reverse direction, two of the U/V/W terminals need to be switched.



⚠ Caution

- Check the parameter settings before running the inverter. Parameter settings may have to be adjusted depending on the load.
- To avoid damaging the inverter, do not supply the inverter with an input voltage that exceeds the rated voltage for the equipment.
- Before running the motor at maximum speed, confirm the motor's rated capacity. As inverters can be used to easily increase motor speed, use caution to ensure that motor speeds do not accidentally exceed the motor's rated capacity.

3 Learning to Perform Basic Operations

This chapter describes the keypad layout and functions. It also introduces parameter groups and codes required to perform basic operations. The chapter also outlines the correct operation of the inverter before advancing to more complex applications. Examples are provided to demonstrate how the inverter actually operates.









3.1 About the Keypad

The keypad is composed of two main components – the display and the operation (input) keys. Refer to the following illustration to identify part names and functions.

3.1.1 Operation Keys

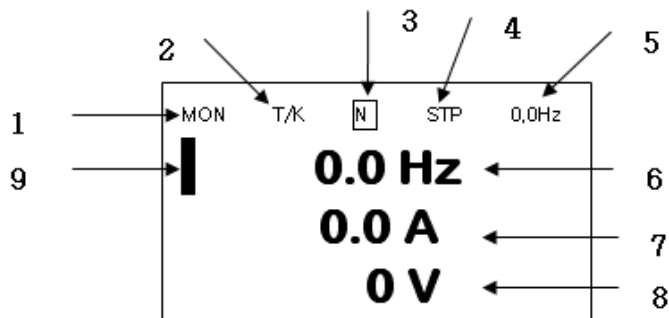
The following table lists the names and functions of the keypad's operation keys.



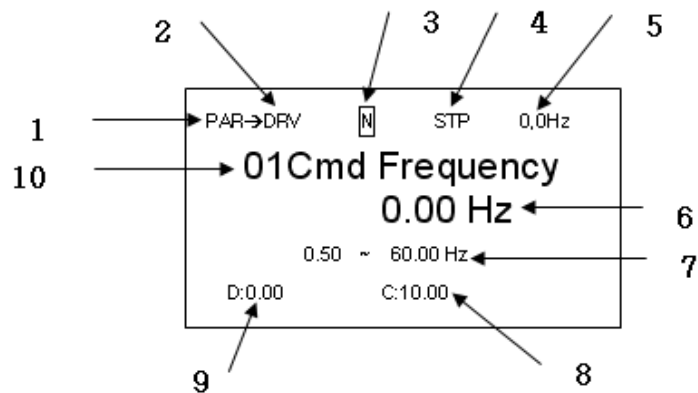
Key	Name	Description
	[MODE] Key	Used to switch between modes.
	[PROG / Ent] Key	Used to select, confirm, or save a parameter value.
	[UP] key [DOWN] key	Switch between codes or increase or decrease parameter values.
	[LEFT] key [RIGHT] key	Switch between groups or move the cursor during parameter setup or modification.
	[MULTI] Key	Used to perform special functions, such as user code registration.
	[ESC] Key	<p>Used to cancel an input during parameter setup.</p> <ul style="list-style-type: none"> Pressing the [ESC] key before pressing the [PROG / ENT] key reverts the parameter value to the previously set value. Pressing the [ESC] key while editing the codes in any function group makes the keypad display the first code of the function group. Pressing the [ESC] key while moving through the modes makes the keypad display Monitor mode.
	[FWD] Key	Used to operate the motor in the forward direction.
	[REV] Key	Used to operate the motor in the reversed direction.
	[STOP/RESET] Key	<p>Used to stop motor operation.</p> <p>Used to reset the inverter following fault or failure condition.</p>

3.1.2 About the Display

Monitor mode display



Parameter settings display



Names displayed in monitor mode and parameter settings

No.	Names displayed in monitor mode	No.	Names displayed in parameter settings
1	Mode	1	Mode
2	Operating/frequency command	2	Group
3	Multi-functional key settings	3	Multi-functional key settings
4	Inverter operation status	4	Inverter operation status
5	Items displayed in the status window	5	Items displayed in the status window
6	Monitor mode display 1	6	Display parameters
7	Monitor mode display 2	7	Available settings range
8	Monitor mode display 3	8	Existing setting values
9	Monitor mode cursor	9	Factory default values
		10	Code numbers and names

Display details

No.	Name	Display	Description
1	Mode	MON	Monitor Mode
		PAR	Parameter Mode
		TRP	Trip Mode
		CNF	Config Mode
2	Operation commands	K	Keypad operation command
		O	Field Bus communication option operation command
		A	Application option operation command
		R	Internal 485 operation command
		T	Terminal operation command
	Frequency commands	K	Keypad frequency command
		V	V1 input frequency command
		P	Pulse input frequency command
		U	Frequency command for UP operation (Up - Down operation)
		D	Frequency command for DOWN operation (Up - Down operation)
		S	Frequency command for STOP operation (Up - Down operation)
		O	FBus Option frequency command

No.	Name	Display	Description
		J	Jog frequency command
		R	Int 485 frequency command
		1 ~9, A~F	Multi-step frequency command
3	Multi-functional key settings	JOG Key	Keypad JOG operation mode
		Local/Remote	Able to select either local or remote operation
		UserGrpSelKey	Register or delete user group parameters in parameter mode
4	Inverter operation status	STP	Motor stopped
		FWD	Operating in forward direction
		REV	Operating in reverse direction
		DC	DC output
		WAN	Warning
		STL	Stall
		SPS	Speed Search
		OSS	S/W overcurrent protective function is on
		OSH	H/W overcurrent protective function is on
		TUN	Auto Tuning

3.1.3 Display Modes

The MD100G inverter uses 5 modes to monitor or configure different functions. The parameters in Parameter mode are divided into smaller groups of relevant functions. Press the [Mode] key to change to Parameter mode.

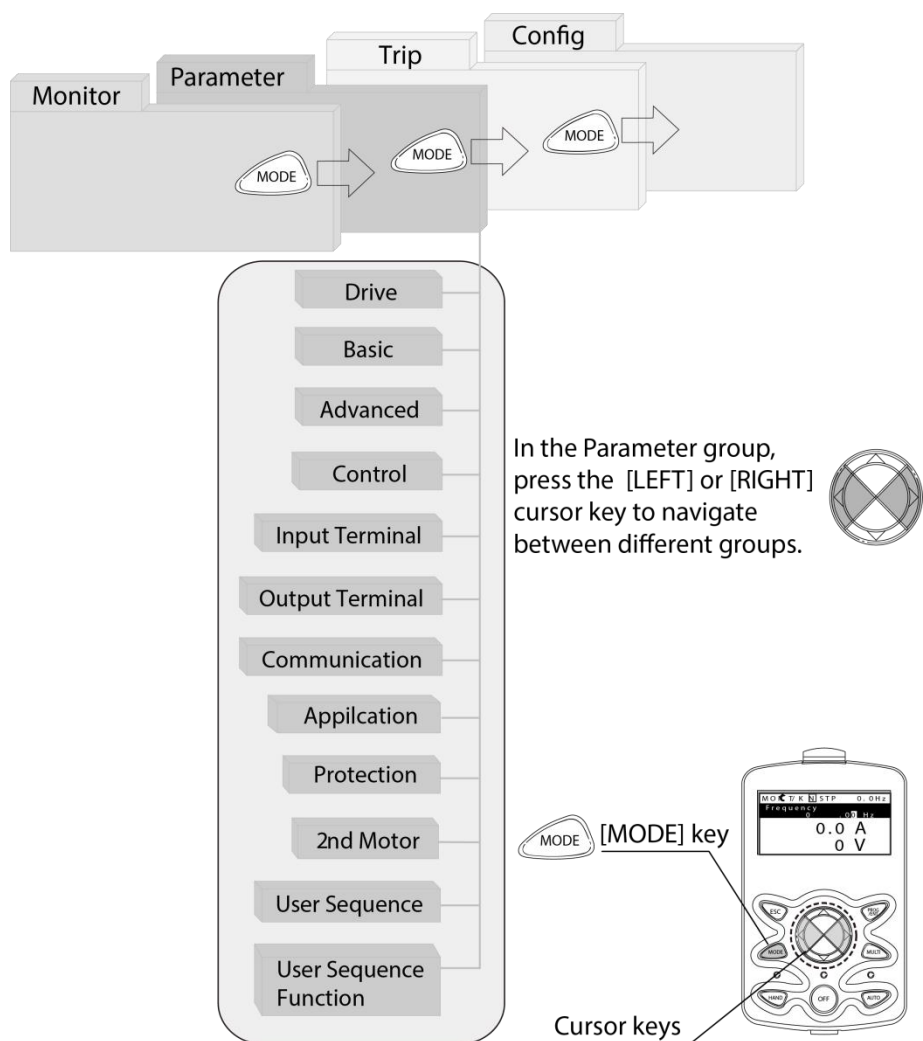


Table of Display Modes

The following table lists the 5 display modes used to control the inverter functions.

Mode Name	Keypad Display	Description
Monitor mode	MON	Displays the inverter's operation status information. In this mode, information including the inverter's frequency reference, operation frequency, output current, and voltage may be monitored.
Parameter mode	PAR	Used to configure the functions required to operate the inverter. These functions are divided into 14 groups based on purpose and complexity.
Trip mode	TRP	Used to monitor the inverter's fault trip information, including the previous fault trip history. When a fault trip occurs during inverter operation, the operation frequency, output current, and output voltage of the inverter at the time of the fault may be monitored. This mode is not displayed if the inverter is not at fault and fault trip history does not exist.
Config mode	CNF	Used to configure the inverter features that are not directly related to the operation of the inverter. The settings you can configure in the Config mode include keypad display language options, monitor mode environment settings, communication module display settings, and parameter duplication and initialization.

Parameter Setting Mode

The following table lists the functions groups under Parameter mode.

Function Group Name	Keypad Display	Description
Drive	DRV	Configures basic operation parameters. These include ACC/Dec time settings, operation command settings, and functions necessary for operation.
Basic	BAS	Configures basic operation parameters. These parameters include motor parameters and multi-step frequency parameters.
Advanced	ADV	Configures acceleration or deceleration patterns, frequency limits, energy saving features, and, regeneration prevention features.
Control	CON	Configures the features related to speed search and KEB (kinetic energy buffering).
Input Terminal	IN	Configures input terminal-related features, including digital multi-functional inputs and analog inputs.
Output Terminal	OUT	Configures output terminal-related features, including digital multi-functional outputs and analog outputs.
Communication	COM	Configures the USB-related features and communication features for the RS-485, Modbus-RTU, LS Bus, Metasys N2, and BACnet. Optional communication module related features may be configured as well, if one is installed.
Application	APP	Configures functions related to auto sequence operation and PID control.
Protection	PRT	Configures motor and inverter protection features.
Motor 2 (Secondary motor)	M2	Configures the secondary motor-related features.
User Sequence	USS	Used to implement simple sequences with various function blocks.
User Sequence Function	USF	

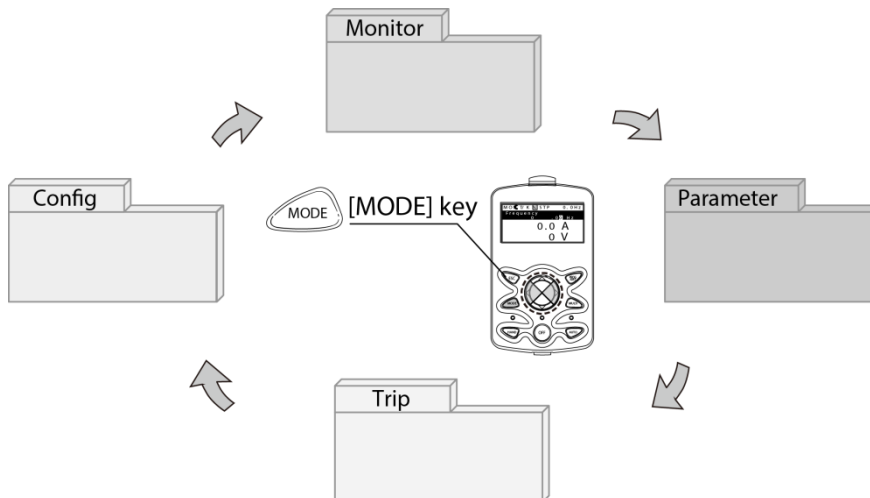
3.2 Learning to Use the Keypad

The keypad enables movement between groups and codes. It also enables users to select and configure functions. At code level, you can set parameter values to turn specific functions on or off or decide how the functions will be used. For detailed information on the codes in each function group, refer to 6. *Table of Functions* on page 161. Confirm the correct values (or the correct range of the values), then follow the examples below to configure the inverter with the keypad.

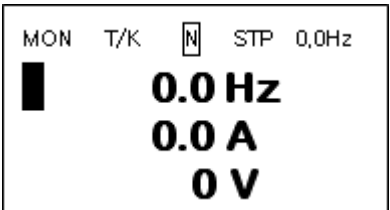
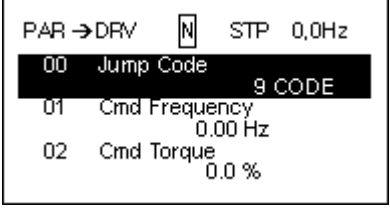

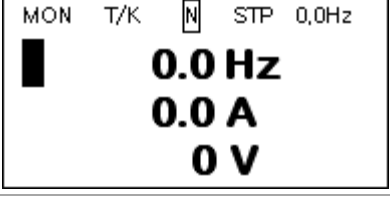
3.2.1 Display Mode Selection

The following figure illustrates how the display modes change when you press the [Mode] button on the keypad. You can continue to press the [Mode] key until you get to the desired mode.

User mode and Trip mode are not displayed when all the inverter settings are set to the factory default (User mode must be configured before it is displayed on the keypad, and Trip mode is displayed only when the inverter is at fault, or has previous trip fault history).

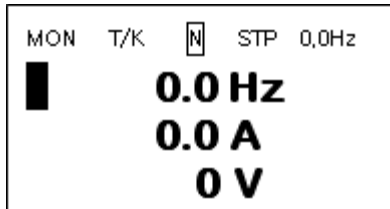


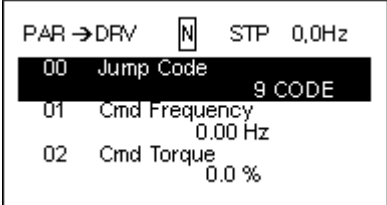
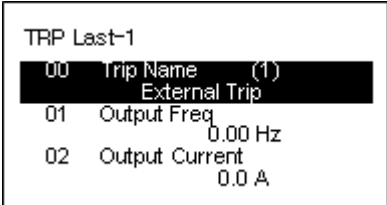
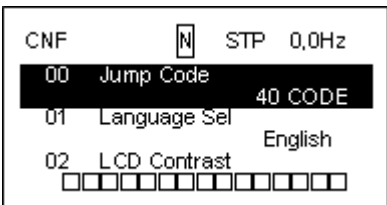
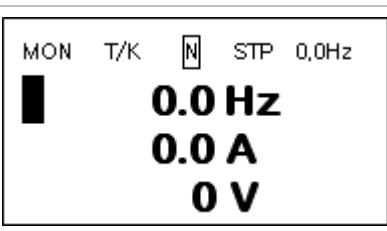
Mode selection in factory default condition

 <p>MON T/K [N] STP 0.0Hz 0.0 Hz 0.0 A 0 V</p>	<ul style="list-style-type: none"> When the power is turned on, Monitor mode is displayed. Press the [MODE] key.
 <p>PAR → DRV [N] STP 0.0Hz 00 Jump Code 9 CODE 01 Cmd Frequency 0.00 Hz 02 Cmd Torque 0.0 %</p>	<ul style="list-style-type: none"> Parameter mode Press the [MODE] key.
 <p>CNF [N] STP 0.0Hz 00 Jump Code 40 CODE 01 Language Sel English 02 LCD Contrast</p>	<ul style="list-style-type: none"> Config (CNF) mode Press the [MODE] key.
 <p>MON T/K [N] STP 0.0Hz 0.0 Hz 0.0 A 0 V</p>	<ul style="list-style-type: none"> Monitor mode is displayed again.

Switching between groups when Trip mode is added

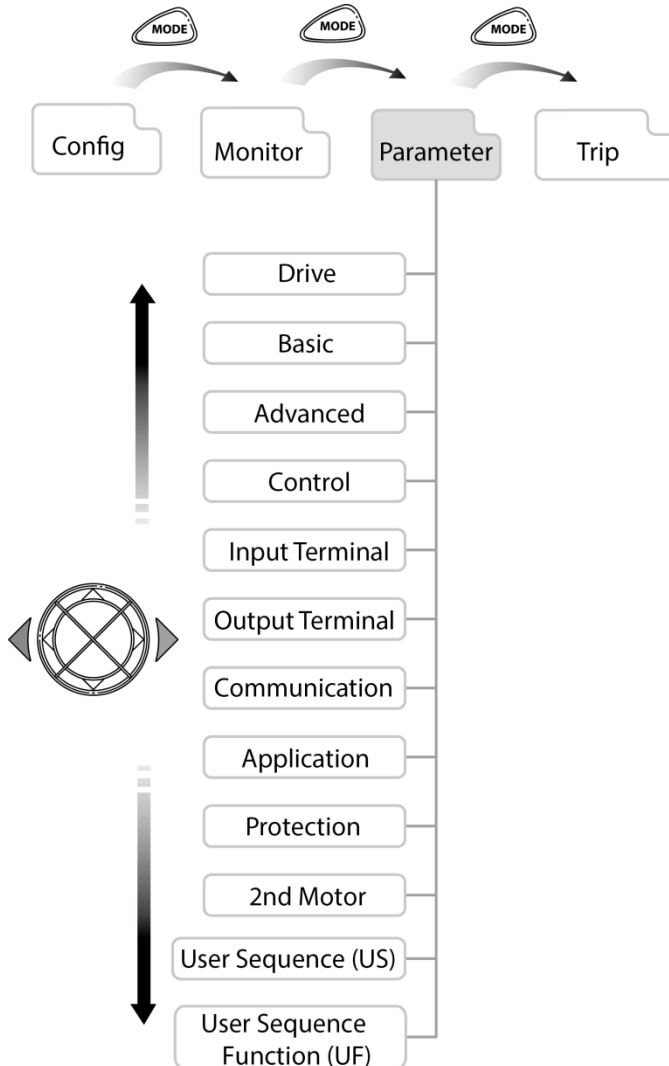
Trip mode is accessible only when the inverter has trip fault history. Refer to 4 [Learning Basic Features](#) on page 65 for information about monitoring faults.

 <p>MON T/K [N] STP 0.0Hz 0.0 Hz 0.0 A 0 V</p>	<ul style="list-style-type: none"> When the power is turned on, Monitor mode is displayed. Press the [MODE] key.
---	--

	<ul style="list-style-type: none"> Parameter mode Press the [MODE] key.
	<ul style="list-style-type: none"> Trip mode Press the [MODE] key.
	<ul style="list-style-type: none"> CNF mode Press the [MODE] key.
	<ul style="list-style-type: none"> Monitor mode is displayed again.

3.2.2 Switching Groups

Press the [MODE] key to display a specific mode. Modes displayed change in the following order:



Switching between Groups in Parameter Display Mode

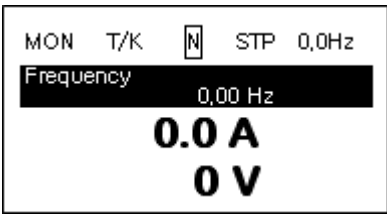
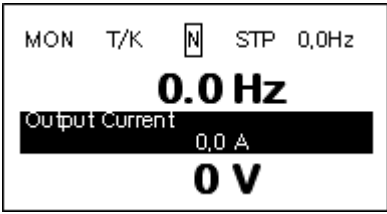
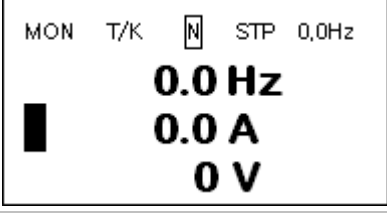
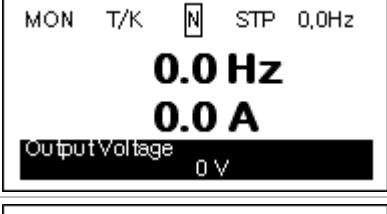
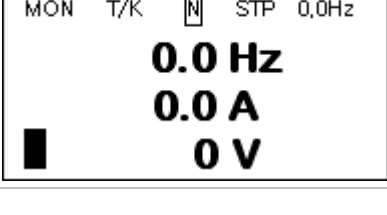
After entering Parameter mode from Monitor mode, press the [►] key to change the display as shown below. Press the [◄] key to return to the previous mode.

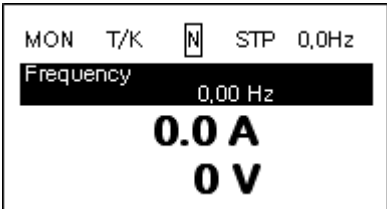
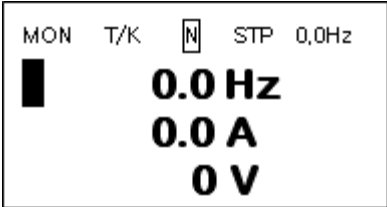
<p>MON T/K N STP 0.0Hz 0.0 Hz 0.0 A 0 V</p>	<ul style="list-style-type: none"> When the power is turned on, Monitor mode is displayed. Press the [MODE] key.
<p>PAR → DRV N STP 0.0Hz 00 Jump Code 9 CODE 01 Cmd Frequency 0.00 Hz 02 Cmd Torque 0.0 %</p>	<ul style="list-style-type: none"> Parameter mode Drive group is displayed. Press the [►] key.
<p>PAR → BAS N STP 0.0Hz 00 Jump Code 20 CODE 01 Aux Ref Src None 02 Cmd 2nd Src Fx/Rx-1</p>	<ul style="list-style-type: none"> Basic group (BAS) Press the [►] key.
<p>PAR → ADV N STP 0.0Hz 00 Jump Code 24 CODE 01 Acc Pattern Linear 02 Dec Pattern Linear</p>	<ul style="list-style-type: none"> Advanced group (ADV) Press the [►] key seven times.
<p>PAR → PRT N STP 0.0Hz 00 Jump Code 40 CODE 04 Load Duty Heavy Duty 05 Phase Loss Chk <input type="checkbox"/> <input type="checkbox"/></p>	<ul style="list-style-type: none"> Protection group (PRT) Press the [►] key.
<p>PAR → DRV N STP 0.0Hz 00 Jump Code 9 CODE 01 Cmd Frequency 0.00 Hz 02 Cmd Torque 0.0 %</p>	<ul style="list-style-type: none"> Parameter mode Drive group (DRV) is displayed again.

3.2.3 Navigating through the Codes (Functions)

Code Navigation in Monitor mode

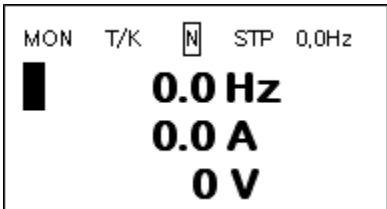
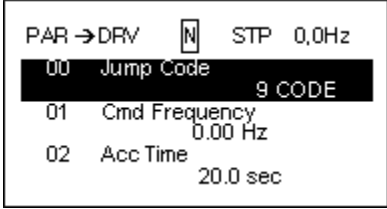
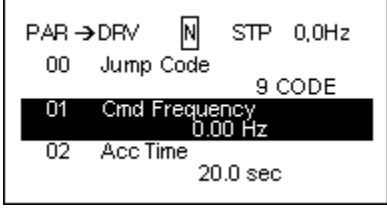
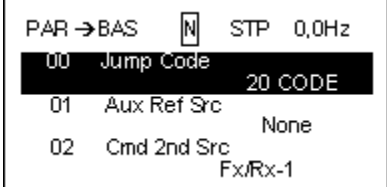
In monitor mode, press the [\blacktriangle] [\blacktriangledown] key to display frequency, the output current, or voltage according to the cursor position.

	<ul style="list-style-type: none"> When the power is turned on, Monitor mode is displayed. The cursor appears to the left of the frequency information. Press the [\blacktriangledown] key.
	<ul style="list-style-type: none"> Information about the second item in Monitor mode (Output Current) is displayed. Wait for 2 seconds until the information on the display disappears.
	<ul style="list-style-type: none"> Information about the second item in Monitor mode (Output Current) disappears and the cursor reappears to the left of the second item. Press the [\blacktriangledown] key.
	<ul style="list-style-type: none"> Information about the third item in Monitor mode (Output Voltage) is displayed. Wait for 2 seconds until the information on the display disappears.
	<ul style="list-style-type: none"> Information about the third item in Monitor mode (Output Voltage) disappears and the cursor appears to the left of the third item. Press the [\blacktriangledown] key twice.

 <p>MON T/K [N] STP 0,0Hz Frequency 0,00 Hz 0.0 A 0 V</p>	<ul style="list-style-type: none"> Information about the first item in Monitor mode (Frequency) is displayed.
 <p>MON T/K [N] STP 0,0Hz 0.0 Hz 0.0 A 0 V</p>	<ul style="list-style-type: none"> Information about the first item in Monitor mode (Frequency) disappears and the cursor appears to the left of the first item.

Code Navigation in Parameter mode

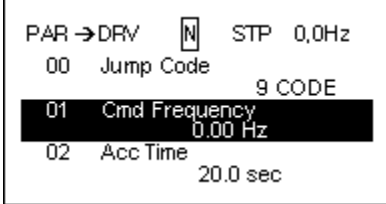
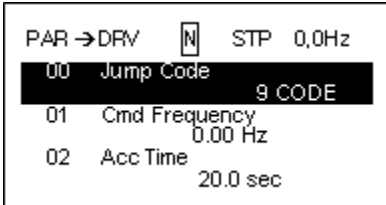

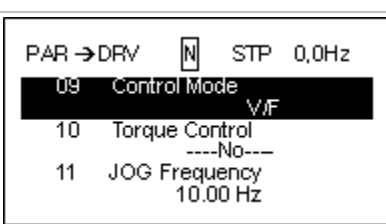
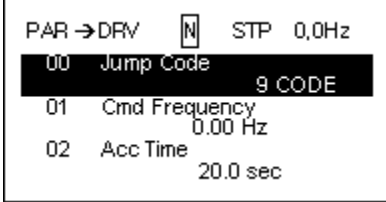
The following examples show you how to move through codes in different function groups (Drive group and Basic group) in Parameter mode. In parameter mode, press the [▲] or [▼] key to move to the desired functions.

 <p>MON T/K [N] STP 0,0Hz 0.0 Hz 0.0 A 0 V</p>	<ul style="list-style-type: none"> When the power is on, monitor mode is displayed. Press the [MODE] key.
 <p>PAR → DRV [N] STP 0,0Hz 00 Jump Code 9 CODE 01 Cmd Frequency 0.00 Hz 02 Acc Time 20.0 sec</p>	<ul style="list-style-type: none"> Drive group (DRV) in Parameter mode is displayed. If any other group is displayed, press the [MODE] key until the Drive group is displayed, or press the [ESC] key.
 <p>PAR → DRV [N] STP 0,0Hz 00 Jump Code 9 CODE 01 Cmd Frequency 0.00 Hz 02 Acc Time 20.0 sec</p>	<ul style="list-style-type: none"> Press the [▼] key to move to the second code (DRV-01) of Drive group. Press the [►] key
 <p>PAR → BAS [N] STP 0,0Hz 00 Jump Code 20 CODE 01 Aux Ref Src None 02 Cmd 2nd Src Fx/Rx-1</p>	<ul style="list-style-type: none"> Basic group is displayed. Press the [▲] or [▼] key to move to the desired codes and configure the inverter functions.

3.2.4 Navigating Directly to Different Codes

Parameter mode and Config mode allow direct jumps to specific codes. The code used for this feature is called the Jump Code. The Jump Code is the first code of each mode. The Jump Code feature is convenient when navigating for a code in a function group that has many codes.

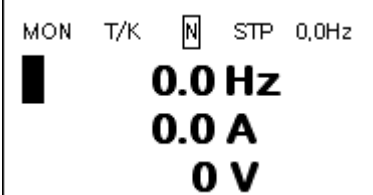
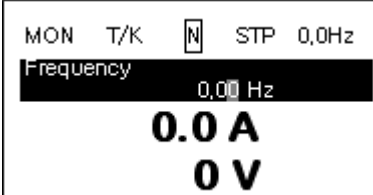
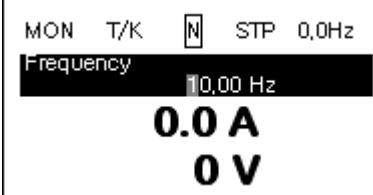

The following example shows how to navigate directly to code DRV-09 from the initial code (DRV-00 Jump Code) in the Drive group.

	<ul style="list-style-type: none"> • The Drive group (DRV) is displayed in Parameter mode. Make sure that the first code in the Drive group (DRV 00 Jump Code) is currently selected. • Press the [PROG/ENT] key.
	<ul style="list-style-type: none"> • The Code input screen is displayed and the cursor flashes. A flashing cursor indicates that it is waiting for user input.
	<ul style="list-style-type: none"> • Press the [▲] key to increase the number to 9, and then press the [PROG/ENT] key.
	<ul style="list-style-type: none"> • DRV-09 (Control Mode) is displayed.
	<ul style="list-style-type: none"> • Press the [ESC] key to go back to the initial code of the Drive group.

3.2.5 Parameter settings

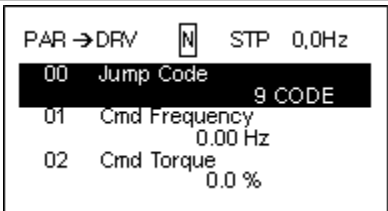
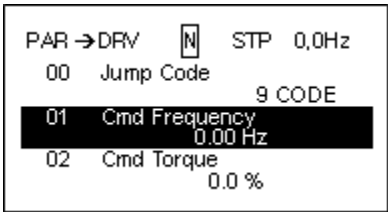
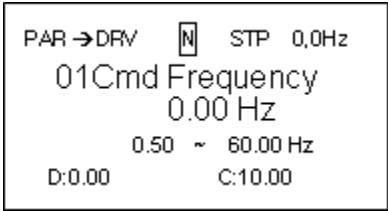
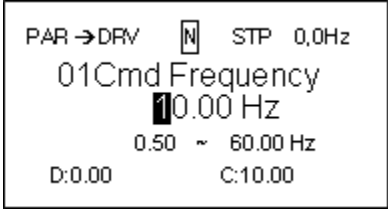
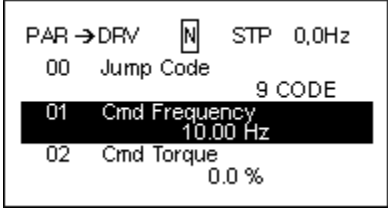
Parameter settings available in Monitor mode

The MD100G inverter allows basic parameters to be modified in Monitor mode. The following example shows how to set the frequency.

	<ul style="list-style-type: none"> • Make sure that the cursor is at the frequency reference item and that the frequency setting is set to 'Keypad' in DRV-09. • Press the [PROG/ENT] key.
	<ul style="list-style-type: none"> • When the cursor is on the frequency reference item, detailed information is displayed and the cursor flashes on the input line. • Press the shift key to go to the desired frequency.
	<ul style="list-style-type: none"> • Press the [▲] key to set the frequency to 10 Hz. • Press the [PROG/ENT] key.
	<ul style="list-style-type: none"> • The frequency is set to 10 Hz.

Parameter settings in other modes and groups

The following example shows how to change the frequency in the Drive group. This example can also be applied to other modes and groups.

	<ul style="list-style-type: none"> • This is the initial display for Parameter mode. • Press the [▼] key.
	<ul style="list-style-type: none"> • DRV-01 code is selected. • Press the [PROG/ENT] key.
	<ul style="list-style-type: none"> • The frequency can be changed at the flashing digit. • Press the [◀]/[▶] key to move the cursor to the desired digit.
	<ul style="list-style-type: none"> • Press the [▲] key to enter 10 Hz, and then press the [PROG/ENT] key.
	<ul style="list-style-type: none"> • The frequency is changed to 10 Hz.

3.2.6 Monitoring the Operation

How to use Monitor mode

There are 3 types of items that may be monitored in Monitor mode. Some items, including frequency, may be modified. Users can select the items to be displayed in Config mode (CNF).

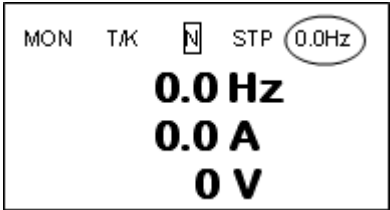
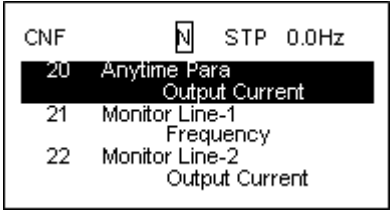
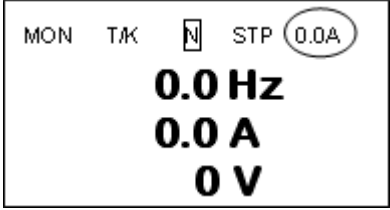
<p>MON T/K <input checked="" type="checkbox"/> STP 0.0Hz</p> <p>10.0 Hz</p> <p>0.0 A</p> <p>0 V</p>	<ul style="list-style-type: none"> • Monitor mode • Frequency, current, and voltage are set as the default monitored items. • The target frequency is displayed when the inverter is stopped. The operation frequency is displayed while operating.
<p>CNF <input checked="" type="checkbox"/> STP 0.0Hz</p> <p>21 Monitor Line-1 Frequency</p> <p>22 Monitor Line-2 Output Current</p> <p>23 Monitor Line-3 Output Voltage</p>	<ul style="list-style-type: none"> • Configure the items to be displayed in Config mode (CNF) 21~23. • Press the [▼] key to go to 23.
<p>CNF <input checked="" type="checkbox"/> STP 0.0Hz</p> <p>21 Monitor Line-1 Frequency</p> <p>22 Monitor Line-2 Output Current</p> <p>23 Monitor Line-3 Output Voltage</p>	<ul style="list-style-type: none"> • Press the[PROG/ENT] key to change 23 to output power.
<p>MON T/K <input checked="" type="checkbox"/> STP 0.0Hz</p> <p>0.0 Hz</p> <p>0.0 A</p> <p>0.0 kW</p>	<ul style="list-style-type: none"> • Press the[ESC] key to ensure that the third item in Monitor mode is changed to output power.

Items available for monitoring

Mode	Number	Display	Setting Range		Initial value
CNF	20	Anytime Para	0	Frequency	0: Frequency
	21	Monitor Line-1	1	Speed	0: Frequency
	22	Monitor Line-2	2	Output Current	2:Output Current
	23	Monitor Line-3	3	Output Voltage	3:Output Voltage
			4	Output Power	
			5	WHour Counter	
			6	DCLink Voltage	
			7	DI State	
			8	DO State	
			9	V1 Monitor[V]	
			10	V1 Monitor[%]	
			13	V2 Monitor[V]	
			14	V2 Monitor[%]	
			15	I2 Monitor[mA]	
			16	I2 Monitor[%]	
			17	PID Output	
			18	PID refValue	
			19	PID Fbk Value	
			20	Torque	
			21	Torque Limit	
			22	Trq Bias Ref	
			23	Speed Limit	

How to use the status bar


On the top-right corner of the display, there is a display item. This item is displayed as long as the inverter is on, regardless of the mode the inverter is operating in.

	<ul style="list-style-type: none"> • Monitor mode • In the top-right corner of the display, the frequency reference is displayed (factory default).
	<ul style="list-style-type: none"> • Enter Config mode and go to CNF-20 to select the item to display. • Press the [PROG/ENT] key to change the item to 'Output Current'. • On the top-right corner of the display, the unit changes from 'Frequency' to 'Current'.
	<ul style="list-style-type: none"> • In monitor mode, the status bar item is changes to 'Current'.

3.3 Fault Monitoring

3.3.1 Monitoring Faults during Inverter Operation

The following example shows how to monitor faults that occurred during inverter operation.

<p>TRP current</p> <p>Over Voltage (01)</p> <p>01 Output Freq 48.30 Hz</p> <p>02 Output Current 33.3 A</p>	<ul style="list-style-type: none"> If a fault trip occurs during inverter operation, the inverter enters Trip mode automatically and displays the type of fault trip that occurred.
<p>TRP Last-1</p> <p>01 Output Freq 48.30 Hz</p> <p>02 Output Current 33.3 A</p> <p>03 Inverter State Stop</p>	<ul style="list-style-type: none"> Press the [▼] key to view the information on the inverter at the time of fault, including the output frequency, output current, and operation type.
<p>MON T/K  STP 0.0A</p> <p>0.0 Hz</p> <p>0.0 A</p> <p>0 V</p>	<ul style="list-style-type: none"> When the inverter is reset and the fault trip is released, the keypad display returns to the screen it was at when the fault trip occurred.


3.3.2 Monitoring Multiple Fault Trips

The following example shows how to monitor multiple faults that occur at the same time.

<p>TRIP current</p> <p>Over Voltage (02)</p> <p>01 Output Freq 48.30 Hz</p> <p>02 Output Current 33.3 A</p>	<ul style="list-style-type: none"> • If multiple fault trips occur at the same time, the number of fault trips occurred is displayed on the right side of the fault trip type. • Press the [PROG/ENT] key.
<p>TRIP current</p> <p>00 Trip Name (02)</p> <p>0 Over Voltage</p> <p>1 External Trip</p>	<ul style="list-style-type: none"> • The types of fault trips that occurred are displayed. • Press the [PROG/ENT] key.
<p>TRIP current</p> <p>Over Voltage (02)</p> <p>01 Output Freq 48.30 Hz</p> <p>02 Output Current 33.3 A</p>	<ul style="list-style-type: none"> • The display returns to the screen it was at when the fault trip occurred.

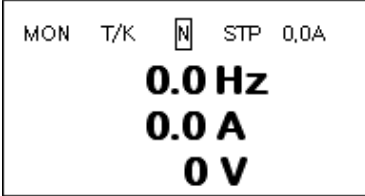
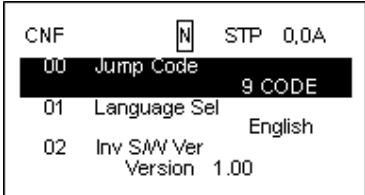
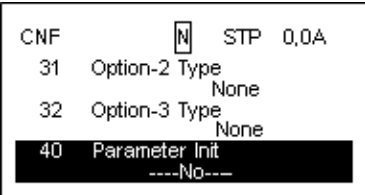
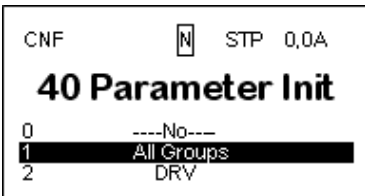
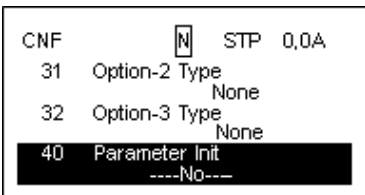
Fault trip history saving and monitoring

When fault trips occur, the trip mode saves the content. Up to five fault trips are saved in the history. Trip mode saves when the inverter is reset, and when a Low Voltage fault trip occurs due to power outages. If a trip occurs more than five times, the information for the five previous trips are automatically deleted.

<p>TRIP current</p> <p>Over Voltage (02)</p> <p>01 Output Freq 48.30 Hz</p> <p>02 Output Current 33.3 A</p>	<ul style="list-style-type: none"> If a fault trip occurs during inverter operation, the inverter enters Trip mode automatically and displays the type of fault trip that occurred.
<p>MON T/K  STP 0.0A</p> <p>0.0 Hz</p> <p>0.0 A</p> <p>0 V</p>	<ul style="list-style-type: none"> After the [RESET] key or terminal is pressed, the fault trip is saved automatically and returns to the screen it was on before the fault trip occurred. Press the [MODE] key to enter Trip mode.
<p>TRIP current</p> <p>00 Trip Name (02)</p> <p>Over Voltage</p> <p>01 Output Freq 48.30 Hz</p> <p>02 Output Current 33.3 A</p>	<ul style="list-style-type: none"> The most recent fault trip is saved in Last-1 code. Press the [▶] key.
<p>TRIP current</p> <p>00 Trip Name (01)</p> <p>External Trip</p> <p>01 Output Freq 48.30 Hz</p> <p>02 Output Current 33.3 A</p>	<ul style="list-style-type: none"> The fault trip changes position and is saved in Last-2 code. When a fault trip occurs again, the content in Last-2 is moved to Last-3.

3.4 Parameter Initialization

The following example demonstrates how to revert all the parameter settings back to the factory default (Parameter Initialization). Parameter initialization may be performed for separate groups in Parameter mode as well.

 <p>MON T/K N STP 0,0A 0.0 Hz 0.0 A 0 V</p>	<ul style="list-style-type: none"> • Monitor mode is displayed.
 <p>CNF N STP 0,0A 00 Jump Code 9 CODE 01 Language Sel English 02 Inv S/W Ver Version 1.00</p>	<ul style="list-style-type: none"> • Press the [MODE] key to move to the Config (CNF) mode.
 <p>CNF N STP 0,0A 31 Option-2 Type None 32 Option-3 Type None 40 Parameter Init ----No----</p>	<ul style="list-style-type: none"> • Press the [▼] key to go to CNF-40 (Parameter Init). • Press the [PROG/ENT] key.
 <p>CNF N STP 0,0A 40 Parameter Init 0 ----No---- 1 All Groups 2 DRV</p>	<ul style="list-style-type: none"> • In the list of options, select All Groups, and then press the [PROG/ENT] key.
 <p>CNF N STP 0,0A 31 Option-2 Type None 32 Option-3 Type None 40 Parameter Init ----No----</p>	<ul style="list-style-type: none"> • The parameter initialization option is displayed again when the initialization is complete.

4 Learning Basic Features

This chapter describes the basic features of the MD100G inverter. Check the reference page in the table to see the detailed description for each of the advanced features.

Basic Tasks	Description	Ref.
Frequency reference source configuration for the keypad	Configures the inverter to allow you to setup or modify frequency reference using the Keypad.	p.68
Frequency reference source configuration for the terminal block (input voltage)	Configures the inverter to allow input voltages at the terminal block (V1, V2) and to setup or modify a frequency reference.	p.69 p.77
Frequency reference source configuration for the terminal block (input current)	Configures the inverter to allow input currents at the terminal block (I2) and to setup or modify a frequency reference.	p.76
Frequency reference source configuration for the terminal block (input pulse)	Configures the inverter to allow input pulse at the terminal block (TI) and to setup or modify a frequency reference.	p.78
Frequency reference source configuration for RS-485 communication	Configures the inverter to allow communication signals from upper level controllers, such as PLCs or PCs, and to setup or modify a frequency reference.	p.79
Frequency control using analog inputs	Enables the user to hold a frequency using analog inputs at terminals.	p.80
Motor operation display options	Configures the display of motor operation values. Motor operation is displayed either in frequency (Hz) or speed (rpm).	p.80
Multi-step speed (frequency) configuration	Configures multi-step frequency operations by receiving an input at the terminals defined for each step frequency.	p.81
Command source configuration for keypad buttons	Configures the inverter to allow the manual operation of the [FWD], [REV] and [Stop] keys.	p.83
Command source configuration for terminal block inputs	Configures the inverter to accept inputs at the FX/RX terminals.	p.83
Command source configuration for RS-485 communication	Configures the inverter to accept communication signals from upper level controllers, such as PLCs or PCs.	p.85
Local/remote switching via the [ESC] key	Configures the inverter to switch between local and remote operation modes when the [ESC] key is pressed. When the inverter is operated using remote inputs (any input other than one from the keypad), this configuration can be used to perform maintenance on the inverter, without losing or altering saved parameter settings. It can also be used to override remotes and use the keypad immediately in emergencies.	p.86

Basic Tasks	Description	Ref.
Motor rotation control	Configures the inverter to limit a motor's rotation direction.	p.88
Automatic start-up at power-on	Configures the inverter to start operating at power-on. With this configuration, the inverter begins to run and the motor accelerates as soon as power is supplied to the inverter. To use automatic start-up configuration, the operation command terminals at the terminal block must be turned on.	p.89
Automatic restart after reset of a fault trip condition	Configures the inverter to start operating when the inverter is reset following a fault trip. In this configuration, the inverter starts to run and the motor accelerates as soon as the inverter is reset following a fault trip condition. For automatic start-up configuration to work, the operation command terminals at the terminal block must be turned on.	p.90
Acc/Dec time configuration based on the Max. Frequency	Configures the acceleration and deceleration times for a motor based on a defined maximum frequency.	p.91
Acc/Dec time configuration based on the frequency reference	Configures acceleration and deceleration times for a motor based on a defined frequency reference.	p.92
Multi-stage Acc/Dec time configuration using the multi-function terminal	Configures multi-stage acceleration and deceleration times for a motor based on defined parameters for the multi-function terminals.	p.93
Acc/Dec time transition speed (frequency) configuration	Enables modification of acceleration and deceleration gradients without configuring the multi-functional terminals.	p.95
Acc/Dec pattern configuration	Enables modification of the acceleration and deceleration gradient patterns. Basic patterns to choose from include linear and S-curve patterns.	p.97
Acc/Dec stop command	Stops the current acceleration or deceleration and controls motor operation at a constant speed. Multi-function terminals must be configured for this command.	p.99
Linear V/F pattern operation	Configures the inverter to run a motor at a constant torque. To maintain the required torque, the operating frequency may vary during operation.	p.100
Square reduction V/F pattern operation	Configures the inverter to run the motor at a square reduction V/F pattern. Fans and pumps are appropriate loads for square reduction V/F operation.	p.101
User V/F pattern configuration	Enables the user to configure a V/F pattern to match the characteristics of a motor. This configuration is for special-purpose motor applications to achieve optimal performance.	p.102
Manual torque boost	Manual configuration of the inverter to produce a momentary torque boost. This configuration is for loads that require a large amount of starting torque, such as elevators or lifts.	p.104
Automatic torque boost	Automatic configuration of the inverter that provides "auto tuning" that produces a momentary torque boost. This	p.105

Basic Tasks	Description	Ref.
	configuration is for loads that require a large amount of starting torque, such as elevators or lifts.	
Output voltage adjustment	Adjusts the output voltage to the motor when the power supply to the inverter differs from the motor's rated input voltage.	p.105
Accelerating start	Accelerating start is the general way to start motor operation. The typical application configures the motor to accelerate to a target frequency in response to a run command, however there may be other start or acceleration conditions defined.	p.106
Start after DC braking	Configures the inverter to perform DC braking before the motor starts rotating again. This configuration is used when the motor will be rotating before the voltage is supplied from the inverter.	p.106
Deceleration stop	Deceleration stop is the typical method used to stop a motor. The motor decelerates to 0 Hz and stops on a stop command, however there may be other stop or deceleration conditions defined.	p.107
Stopping by DC braking	Configures the inverter to apply DC braking during motor deceleration. The frequency at which DC braking occurs must be defined and during deceleration, when the motor reaches the defined frequency, DC braking is applied.	p.107
Free-run stop	Configures the inverter to stop output to the motor using a stop command. The motor will free-run until it slows down and stops.	p.109
Power braking	Configures the inverter to provide optimal, motor deceleration, without tripping over-voltage protection.	p.110
Start/maximum frequency configuration	Configures the frequency reference limits by defining a start frequency and a maximum frequency.	p.111
Upper/lower frequency limit configuration	Configures the frequency reference limits by defining an upper limit and a lower limit.	p.111
Frequency jump	Configures the inverter to avoid running a motor in mechanically resonating frequencies.	p.113
2 nd Operation Configuration	Used to configure the 2 nd operation mode and switch between the operation modes according to your requirements.	p.114
Multi-function input terminal control configuration	Enables the user to improve the responsiveness of the multi-function input terminals.	p.115
P2P communication configuration	Configures the inverter to share input and output devices with other inverters.	p.116
Multi-keypad configuration	Enables the user to monitor multiple inverters with one monitoring device.	p.116
User sequence configuration	Enables the user to implement simple sequences using various function blocks.	p.118

4.1 Setting Frequency Reference

The MD100G inverter provides several methods to setup and modify a frequency reference for an operation. The keypad, analog inputs [for example voltage (V1, V2) and current (I2) signals], or RS-485 (digital signals from higher-level controllers, such as PC or PLC) can be used.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	07	Frequency reference source	Ref Freq Src	0	KeyPad-1	0–12	-
				1	KeyPad-2		
				2	V1		
				4	V2		
				5	I2		
				6	Int 485		
				8	Field Bus		
				12	Pulse		

4.1.1 Keypad as the Source (KeyPad-1 setting)

You can modify frequency reference by using the keypad and apply changes by pressing the [ENT] key. To use the keypad as a frequency reference input source, go to 07 (Frequency reference source) code in the DRV group and change the parameter value to 0 (Keypad-1). Input the frequency reference for an operation.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	07	Frequency reference source	Freq Ref Src	0	KeyPad-1	0–12	

* You cannot set a frequency reference that exceeds the Max. Frequency, as configured with DRV-20.

4.1.2 Keypad as the Source (KeyPad-2 setting)

You can use the [▲] and [▼] keys to modify a frequency reference. To use this as a second option, set the keypad as the source of the frequency reference, by going to 07 (Frequency reference source) code in the DRV group and change the parameter value to 1 (KeyPad-2). This allows frequency reference values to be increased or decreased by pressing the [▲] and [▼] keys.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	07	Frequency reference source	Freq Ref Src	1	KeyPad-2	0–12	-

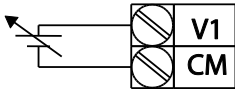
* You cannot set a frequency reference that exceeds the Max. Frequency, as configured with DRV-20.

4.1.3 V1 Terminal as the Source

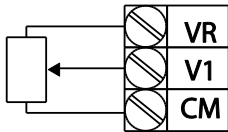
You can set and modify a frequency reference by setting voltage inputs when using the V1 terminal. Use voltage inputs ranging from 0 to 10 V (unipolar) for forward only operation. Use voltage inputs ranging from -10 to +10 V (bipolar) for both directions, where negative voltage inputs are used reverse operations.

4.1.3.1 Setting a Frequency Reference for 0–10 V Input

Set code 06 (V1 Polarity) to 0 (unipolar) in the Input Terminal group (IN). Use a voltage output from an external source or use the voltage output from the VR terminal to provide inputs to V1. Refer to the diagrams below for the wiring required for each application.



[External source application]


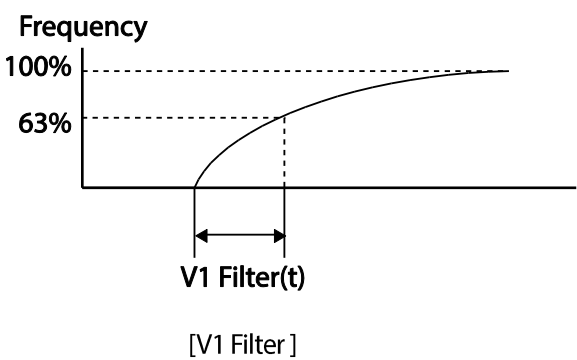


[Internal source (VR) application]

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	07	Frequency reference source	Freq Ref Src	2	V1	0–12	-
In	01	Frequency at maximum analog input	Freq at 100%	Maximum frequency		0.00–Max. Frequency	Hz
	05	V1 input monitor	V1 Monitor [V]	0.00		0.00–12.00	V
	06	V1 polarity options	V1 Polarity	0	Unipolar	0–1	-
	07	V1 input filter time constant	V1 Filter	10		0–10000	ms
	08	V1 minimum input voltage	V1 volt x1	0.00		0.00–10.00	V
	09	V1 output at minimum voltage (%)	V1 Perc y1	0.00		0.00–100.00	%
	10	V1 maximum input voltage	V1 Volt x2	10.00		0.00– 12.00	V
	11	V1 output at maximum voltage (%)	V1 Perc y2	100.00		0–100	%
	16	Rotation direction options	V1 Inverting	0	No	0–1	-
	17	V1 Quantizing level	V1 Quantizing	0.04		0.00*, 0.04–10.00	%

* Quantizing is disabled if '0' is selected.

0–10 V Input Voltage Setting Details

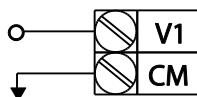
Code	Description
IN-01 Freq at 100%	<p>Configures the frequency reference at the maximum input voltage when a potentiometer is connected to the control terminal block. A frequency set with code IN-01 becomes the maximum frequency only if the value set in code IN-11 (or IN-15) is 100(%).</p> <ul style="list-style-type: none"> Set code IN-01 to 40.00 and use default values for codes IN-02–IN-16. Motor will run at 40.00 Hz when a 10 V input is provided at V1. Set code IN-11 to 50.00 and use default values for codes IN-01–IN-16. Motor will run at 25.00 Hz (50% of the default maximum frequency–50 Hz) when a 10 V input is provided at V1.
IN-05 V1 Monitor[V]	Configures the inverter to monitor the input voltage at V1.
IN-07 V1 Filter	<p>V1 Filter may be used when there are large variations between reference frequencies. Variations can be mitigated by increasing the time constant, but this will require an increased response time.</p> <p>The value t (time) indicates the time required for the frequency to reach 63% of the reference, when external input voltages are provided in multiple steps.</p> <div style="text-align: center;"> <p>V1 input from external source </p>  <p>Frequency</p> <p>100%</p> <p>63%</p> <p>V1 Filter(t)</p> <p>[V1 Filter]</p> </div>
IN-08 V1 Volt x1– IN-11 V1 Perc y2	These parameters are used to configure the gradient level and offset values of the Output Frequency, based on the Input Voltage.

Code	Description
	<p>Frequency reference</p> <p>[Volt x1-IN-11 V1 Perc y2]</p>
IN-16 V1 Inverting	<p>Inverts the direction of rotation. Set this code to 1 (Yes) if you need the motor to run in the opposite direction from the current rotation.</p>
IN-17 V1 Quantizing	<p>Quantizing may be used when the noise level is high in the analog input (V1 terminal) signal. Quantizing is useful when you are operating a noise-sensitive system, because it suppresses any signal noise. However, quantizing will diminish system sensitivity (resultant power of the output frequency will decrease based on the analog input).</p> <p>You can also turn on the low-pass filter using code IN-07 to reduce the noise, but increasing the value will reduce responsiveness and may cause pulsations (ripples) in the output frequency.</p> <p>Parameter values for quantizing refer to a percentage based on the maximum input. Therefore, if the value is set to 1% of the analog maximum input (50 Hz), the output frequency will increase or decrease by 0.5 Hz per 0.1V difference.</p> <p>When the analog input is increased, an increase to the input equal to 75% of the set value will change the output frequency, and then the frequency will increase according to the set value. Likewise, when the analog input decreases, a decrease in the input equal to 75% of the set value will make an initial change to the output frequency.</p> <p>As a result, the output frequency will be different at acceleration and deceleration, mitigating the effect of analog input changes over the output frequency.</p>

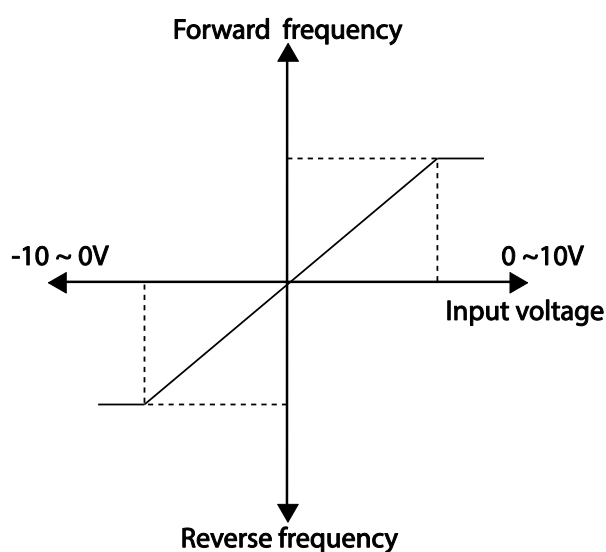
Code	Description																		
	<p>Output frequency (Hz)</p> <p>Analog input (V)</p> <p>[V1 Quantizing]</p> <table border="1"><caption>Data points from the quantization graph</caption><thead><tr><th>Analog input (V)</th><th>Output frequency (Hz)</th></tr></thead><tbody><tr><td>0.025</td><td>0.6</td></tr><tr><td>0.075</td><td>0.6</td></tr><tr><td>0.1</td><td>1.2</td></tr><tr><td>0.175</td><td>1.2</td></tr><tr><td>0.2</td><td>59.4</td></tr><tr><td>9.925</td><td>59.4</td></tr><tr><td>9.975</td><td>60.00</td></tr><tr><td>10</td><td>60.00</td></tr></tbody></table>	Analog input (V)	Output frequency (Hz)	0.025	0.6	0.075	0.6	0.1	1.2	0.175	1.2	0.2	59.4	9.925	59.4	9.975	60.00	10	60.00
Analog input (V)	Output frequency (Hz)																		
0.025	0.6																		
0.075	0.6																		
0.1	1.2																		
0.175	1.2																		
0.2	59.4																		
9.925	59.4																		
9.975	60.00																		
10	60.00																		

4.1.3.2 Setting a Frequency Reference for -10~10 V Input

Set the 07 (Frequency reference source) code in the DRV group to 2 (V1), and then set code 06 (V1 Polarity) to 1 (bipolar) in the Input Terminal group (IN). Use the output voltage from an external source to provide input to V1.



[V1 terminal wiring]



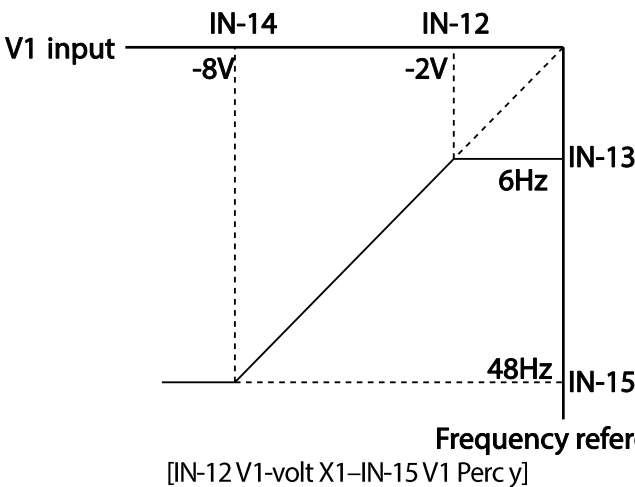
[Bipolar input voltage and output frequency]

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	07	Frequency reference source	Freq Ref Src	2	V1	0-12	-
In	01	Frequency at maximum analog input	Freq at 100%	50.00		0- Max Frequency	Hz
	05	V1 input monitor	V1 Monitor	0.00		0.00-12.00 V	V
	06	V1 polarity options	V1 Polarity	1	Bipolar	0-1	-
	12	V1 minimum input voltage	V1- volt x1	0.00		10.00-0.00 V	V
	13	V1 output at minimum voltage (%)	V1- Perc y1	0.00		-100.00-0.00%	%
	14	V1maximum input voltage	V1-Volt x2	-10.00		-12.00-0.00 V	V
	15	V1 output at maximum voltage (%)	V1- Perc y2	-100.00		-100.00-0.00%	%

Rotational Directions for Different Voltage Inputs

Command / Voltage Input	Input voltage	
	0–10 V	-10–0 V
FWD	Forward	Reverse
REV	Reverse	Forward

-10–10 V Voltage Input Setting Details

Code	Description
IN-12 V1-volt x1– IN-15 V1- Perc y2	<p>Sets the gradient level and off-set value of the output frequency in relation to the input voltage. These codes are displayed only when IN-06 is set to 1 (bipolar). As an example, if the minimum input voltage (at V1) is set to -2 (V) with 10% output ratio, and the maximum voltage is set to -8 (V) with 80% output ratio respectively, the output frequency will vary within the range of 6 - 48 Hz.</p>  <p>For details about the 0–+10 V analog inputs, refer to the code descriptions IN-08 V1 volt x1–IN-11 V1 Perc y2 on page 71.</p>

4.1.3.3 Setting a Reference Frequency using Input Current (I2)

You can set and modify a frequency reference using input current at the I2 terminal after selecting current input at SW 2. Set the 07 (Frequency reference source) code in the DRV group to 5 (I2) and apply 4–20 mA input current to I2.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	07	Frequency reference source	Freq Ref Src	5	I2	0–12	-
IN	01	Frequency at maximum analog input	Freq at 100%	50.00		0– Maximum Frequency	Hz
	50	I2 input monitor	I2 Monitor	0.00		0.00–24.00	mA
	52	I2 input filter time constant	I2 Filter	10		0–10000	ms
	53	I2 minimum input current	I2 Curr x1	4.00		0.00–20.00	mA
	54	I2 output at minimum current (%)	I2 Perc y1	0.00		0–100	%
	55	I2 maximum input current	I2 Curr x2	20.00		0.00–24.00	mA
	56	I2 output at maximum current (%)	I2 Perc y2	100.00		0.00–100.00	%
	61	I2 rotation direction options	I2 Inverting	0	No	0–1	-
	62	I2 Quantizing level	I2 Quantizing	0.04		0*, 0.04–10.00	%

* Quantizing is disabled if '0' is selected.

Input Current (I2) Setting Details

Code	Description
IN-01 Freq at 100%	Configures the frequency reference for operation at the maximum current (when IN-56 is set to 100%). <ul style="list-style-type: none"> If IN-01 is set to 40.00 Hz, and default settings are used for IN-53–56, 20 mA input current (max) to I2 will produce a frequency reference of 40.00 Hz. If IN-56 is set to 50.00 (%), and default settings are used for IN-01 (50 Hz) and IN-53–55, 20 mA input current (max) to I2 will produce a frequency reference of 25.00 Hz (50% of 50 Hz).
IN-50 I2 Monitor	Used to monitor input current at I2.
IN-52 I2 Filter	Configures the time for the operation frequency to reach 63% of target frequency based on the input current at I2.
IN-53 I2 Curr x1–IN-56 I2 Perc y2	Configures the gradient level and off-set value of the output frequency.

Code	Description
	<p>Frequency Reference</p> <p>[Gradient and off-set configuration based on output frequency]</p>

4.1.4 Setting a Frequency Reference with Input Voltage (Terminal I2)

Set and modify a frequency reference using input voltage at I2 (V2) terminal by setting SW2 to V2. Set the Frq (Frequency reference source) code in the DRV group to 4 (V2) and apply 0–12V input voltage to I2 (=V2, Analog current/voltage input terminal). Codes IN-35–47 will not be displayed when I2 is set to receive current input (07 code parameter is set to 5).

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	07	Frequency reference source	Freq Ref Src	4	V2	0–12	-
IN	35	V2 input display	V2 Monitor	0.00		0.00–12.00	V
	37	V2 input filter time constant	V2 Filter	10		0–10000	ms
	38	Minimum V2 input voltage	V2 Volt x1	0.00		0.00–10.00	V
	39	Output% at minimum V2 voltage	V2 Perc y1	0.00		0.00–100.00	%
	40	Maximum V2 input voltage	V2 Volt x2	10.00		0.00–10.00	V
	41	Output% at maximum V2 voltage	V2 Perc y2	100.00		0.00–100.00	%
	46	Invert V2 rotational direction	V2 Inverting	0	No	0–1	-
	47	V2 quantizing level	V2 Quantizing	0.04		0.00*, 0.04–10.00	%

* Quantizing is disabled if '0' is selected.

4.1.5 Setting a Frequency with TI Pulse Input

Set a frequency reference by setting the 07 (Frequency reference source) code in the DRV group to 12 (Pulse) and providing 0–32.00 kHz pulse frequency to TI.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	07	Frequency reference source	Freq Ref Src	12	Pulse	0–12	-
IN	01	Frequency at maximum analog input	Freq at 100%	50.00		0.00–Maximum frequency	Hz
	91	Pulse input display	Pulse Monitor	0.00		0.00–50.00	kHz
	92	TI input filter time constant	TI Filter	10		0–9999	ms
	93	TI input minimum pulse	TI Pls x1	0.00		0.00–32.00	kHz
	94	Output% at TI minimum pulse	TI Perc y1	0.00		0.00–100.00	%
	95	TI Input maximum pulse	TI Pls x2	32.00		0.00–32.00	kHz
	96	Output% at TI maximum pulse	TI Perc y2	100.00		0.00–100.00	%
	97	Invert TI direction of rotation	TI Inverting	0	No	0–1	-
	98	TI quantizing level	TI Quantizing	0.04		0.00*, 0.04–10.00	%

*Quantizing is disabled if '0' is selected.

TI Pulse Input Setting Details

Code	Description
IN-01 Freq at 100%	Configures the frequency reference at the maximum pulse input. The frequency reference is based on 100% of the value set with IN-96. <ul style="list-style-type: none"> If IN-01 is set to 40.00 and codes IN-93–96 are set at default, 32 kHz input to TI yields a frequency reference of 40.00 Hz. If IN-96 is set to 50.00 and codes IN-01, IN-93–95 are set at default, 32 kHz input to the TI terminal yields a frequency reference of 30.00 Hz.
IN-91 Pulse Monitor	Displays the pulse frequency supplied at TI.
IN-92 TI Filter	Sets the time for the pulse input at TI to reach 63% of its nominal frequency (when the pulse frequency is supplied in multiple steps).
IN-93 TI Pls x1–IN-96 TI Perc y2	Configures the gradient level and offset values for the output frequency.

Code	Description
	<p>Frequency reference</p>
IN-97 TI Inverting– IN-98 TI Quantizing	Identical to IN-16–17 (refer to IN-16 V1 Inverting/IN-17. V1 Quantizing on page 71).

4.1.6 Setting a Frequency Reference via RS-485 Communication

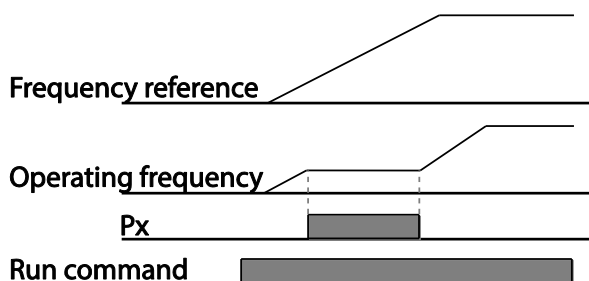
Control the inverter with upper-level controllers, such as PCs or PLCs, via RS-485 communication. Set the 07 (Frequency reference source) code in the DRV group to 6 (Int 485) and use the RS-485 signal input terminals (S+/S-/SG) for communication. Refer to [5 RS-485 Communication Features](#) on page [129](#).

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	07	Frequency reference source	Freq Ref Src	6	Int 485	0–12	-
COM	01	Integrated RS-485 communication inverter ID	Int485 St ID	-	1	1–250	-
	02	Integrated communication protocol	Int485 Proto	0	ModBus RTU	0–2	-
				1	Reserved		
				2	LS Inv 485		
	03	Integrated communication speed	Int485 BaudR	3	9600 bps	0–7	-
	04	Integrated communication frame configuration	Int485 Mode	0	D8/PN/S1	0–3	-
				1	D8/PN/S2		
				2	D8/PE/S1		
				3	D8/PO/S1		

4.2 Frequency Hold by Analog Input

If you set a frequency reference via analog input at the control terminal block, you can hold the operation frequency of the inverter by assigning a multi-function input as the analog frequency hold terminal. The operation frequency will be fixed upon an analog input signal.

group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	07	Frequency reference source	Freq Ref Src	0	Keypad-1	0-12	-
				1	Keypad-2		
				2	V1		
				4	V2		
				5	I2		
				6	Int 485		
				8	Field Bus		
				12	Pulse		
IN	65-71	Px terminal configuration	Px Define(Px: P1-P7)	21	Analog Hold	0-54	-



4.3 Changing the Displayed Units (Hz↔Rpm)

You can change the units used to display the operational speed of the inverter by setting Dr. 21 (Speed unit selection) to 0 (Hz) or 1 (Rpm). This function is available only with the LCD keypad.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	21	Speed unit selection	Hz/Rpm Sel	0	Hz Display	0-1	-
				1	Rpm Display		

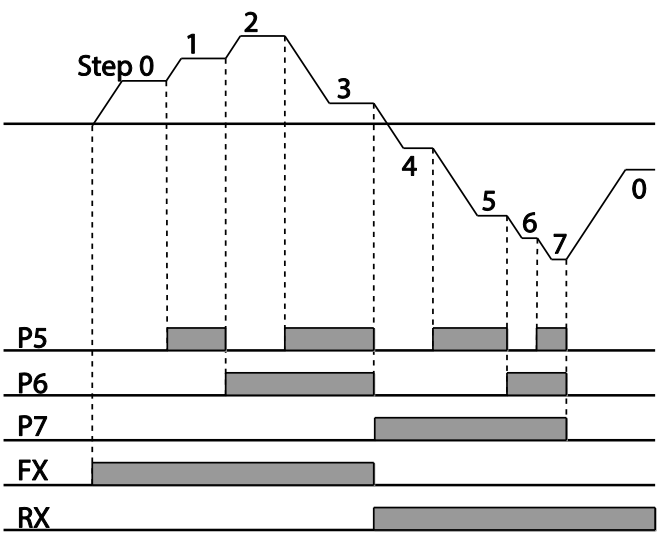
4.4 Setting Multi-step Frequency

Multi-step operations can be carried out by assigning different speeds (or frequencies) to the Px terminals. Step 0 uses the frequency reference source set with the 07 code in the DRV group. Px terminal parameter values 7 (Speed-L), 8 (Speed-M) and 9 (Speed-H) are recognized as binary commands and work in combination with Fx or Rx run commands. Select the frequency set in the BAS-50-BAS-60 (Multi-step frequency 1-7) code to operate the system.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
BAS	50–56	Multi-step frequency 1–7	Step Freq - 1–7	-		0–Maximum frequency	Hz
IN	65–71	Px terminal configuration	Px Define (Px: P1–P7)	7	Speed-L	0–54	-
				8	Speed-M		-
				9	Speed-H		-
	89	Multi-step command delay time	InCheck Time	1		1–5000	ms

Multi-step Frequency Setting Details

Code	Description
BAS-50–56 Step Freq - 1–7	Configure multi-step frequency 1–7.
IN-65–71 Px Define	<p>Choose the terminals to setup as multi-step inputs, and then set the relevant codes (IN-65–71) to 7(Speed-L), 8(Speed-M), or 9(Speed-H).</p> <p>Provided that terminals P3, P4 and P5 have been set to Speed-L, Speed-M and Speed-H respectively, the following multi-step operation will be available.</p>

Code	Description																																													
	<div><p>[An example of a multi-step operation]</p><table><tr><th>Speed</th><th>Fx/Rx</th><th>P7</th><th>P6</th><th>P5</th></tr><tr><td>0</td><td>✓</td><td>-</td><td>-</td><td>-</td></tr><tr><td>1</td><td>✓</td><td>-</td><td>-</td><td>✓</td></tr><tr><td>2</td><td>✓</td><td>-</td><td>✓</td><td>-</td></tr><tr><td>3</td><td>✓</td><td>-</td><td>✓</td><td>✓</td></tr><tr><td>4</td><td>✓</td><td>✓</td><td>-</td><td>-</td></tr><tr><td>5</td><td>✓</td><td>✓</td><td>-</td><td>✓</td></tr><tr><td>6</td><td>✓</td><td>✓</td><td>✓</td><td>-</td></tr><tr><td>7</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr></table></div>	Speed	Fx/Rx	P7	P6	P5	0	✓	-	-	-	1	✓	-	-	✓	2	✓	-	✓	-	3	✓	-	✓	✓	4	✓	✓	-	-	5	✓	✓	-	✓	6	✓	✓	✓	-	7	✓	✓	✓	✓
Speed	Fx/Rx	P7	P6	P5																																										
0	✓	-	-	-																																										
1	✓	-	-	✓																																										
2	✓	-	✓	-																																										
3	✓	-	✓	✓																																										
4	✓	✓	-	-																																										
5	✓	✓	-	✓																																										
6	✓	✓	✓	-																																										
7	✓	✓	✓	✓																																										
IN-89 InCheck Time	<p>Set a time interval for the inverter to check for additional terminal block inputs after receiving an input signal.</p> <p>After adjusting IN-89 to 100ms and an input signal is received at P6, the inverter will search for inputs at other terminals for 100ms, before proceeding to accelerate or decelerate based on P6's configuration.</p>																																													

4.5 Command Source Configuration

Various devices can be selected as command input devices for the MD100G inverter. Input devices available to select include keypad, multi-function input terminal, RS-485 communication and field bus adapter.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	06	Command Source	Cmd Source*	0	Keypad	0–4	-
				1	Fx/Rx-1		
				2	Fx/Rx-2		
				3	Int 485		
				4	Field Bus		

4.5.1 The Keypad as a Command Input Device

The keypad can be selected as a command input device to send command signals to the inverter. This is configured by setting the drv (command source) code to 0 (Keypad). Press the [RUN] key on the keypad to start an operation, and the [STOP/RESET] key to end it.

group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	06	Command source	Cmd Source*	0	KeyPad	0–4	-

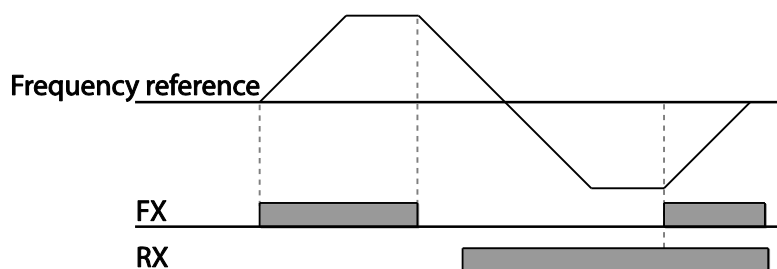
4.5.2 Terminal Block as a Command Input Device (Fwd/Rev Run Commands)

Multi-function terminals can be selected as a command input device. This is configured by setting the 06 (command source) code in the DRV group to 1 (Fx/Rx). Select 2 terminals for the forward and reverse operations, and then set the relevant codes (2 of the 7 multi-function terminal codes, IN-65–71 for P1–P7) to 1 (Fx) and 2 (Rx) respectively. This application enables both terminals to be turned on or off at the same time, constituting a stop command that will cause the inverter to stop operation.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	06	Command source	Cmd Source*	1	Fx/Rx-1	0–4	-
IN	65–71	Px terminal configuration	Px Define(Px: P1–P7)	1	Fx	0–54	-
				2	Rx		

Fwd/Rev Command by Multi-function Terminal – Setting Details

Code	Description
DRV-06 Cmd Source	Set to 1(Fx/Rx-1).
IN-65–71 Px Define	Assign a terminal for forward (Fx) operation. Assign a terminal for reverse (Rx) operation.



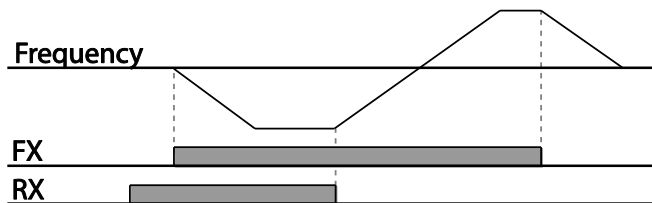
4.5.3 Terminal Block as a Command Input Device (Run and Rotation Direction Commands)

Multi-function terminals can be selected as a command input device. This is configured by setting the 06 (command source) code in the DRV group to 2 (Fx/Rx-2). Select 2 terminals for run and rotation direction commands, and then select the relevant codes (2 of the 7 multi-function terminal codes, IN-65–71 for P1–P7) to 1 (Fx) and 2 (Rx) respectively. This application uses an Fx input as a run command, and an Rx input to change a motor's rotation direction (On-Rx, Off-Fx).

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	06	Command source	Cmd Source*	2	Fx/Rx-2	0–4	-
IN	65–71	Px terminal configuration	Px Define (Px: P1 – P7)	1	Fx	0–54	-
				2	Rx		

Run Command and Fwd/ Rev Change Command Using Multi-function Terminal – Setting Details

Code	Description
DRV-06 Cmd Source	Set to 2 (Fx/Rx-2).
IN-65–71 Px Define	Assign a terminal for run command (Fx). Assign a terminal for changing rotation direction (Rx).



4.5.4 RS-485 Communication as a Command Input Device

Internal RS-485 communication can be selected as a command input device by setting the 06 (command source) code in the DRV group to 3(Int 485). This configuration uses upper level controllers such as PCs or PLCs to control the inverter by transmitting and receiving signals via the S+, S-, and Sg terminals at the terminal block. For more details, refer to [5 RS-485 Communication Features](#) on page [129](#).

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	06	Command source	Cmd Source*	3	Int 485	0–4	-
COM	01	Integrated communication inverter ID	Int485 St ID	1		1–250	-
	02	Integrated communication protocol	Int485 Proto	0	ModBus RTU	0–2	-
	03	Integrated communication speed	Int485 BaudR	3	9600 bps	0–7	-
	04	Integrated communication frame setup	Int485 Mode	0	D8 / PN / S1	0–3	-

4.6 Local/Remote Mode Switching

Local/remote switching is useful for checking the operation of an inverter or to perform an inspection while retaining all parameter values. Also, in an emergency, it can also be used to override control and operate the system manually using the keypad.

The [ESC] key is a programmable key that can be configured to carry out multiple functions.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	90	[ESC] key functions	-	2	Local/Remote	0–2	-
DRV	06	Command source	Cmd Source*	1	Fx/Rx-1	0–4	-

Local/Remote Mode Switching Setting Details

Code	Description
DRV-90 [ESC] key functions	Set DRV-90 to 2(Local/Remote) to perform local/remote switching using the [ESC] key. Once the value is set, the inverter will automatically begin operating in remote mode. Changing from local to remote will not alter any previously configured parameter values and the operation of the inverter will not change. Press the [ESC] key to switch the operation mode back to “local.” The SET light will flash, and the inverter will operate using the [RUN] key on the keypad. Press the [ESC] key again to switch the operation mode back to “remote.” The SET light will turn off and the inverter will operate according to the previous drv code configuration.

Note**Local/Remote Operation**

- Full control of the inverter is available with the keypad during local operation (local operation).
- During local operation, jog commands will only work if one of the P1–P7 multi-function terminals (codes IN-65–71) is set to 13 (RUN Enable) and the relevant terminal is turned on.
- During remote operation (remote operation), the inverter will operate according to the previously set frequency reference source and the command received from the input device.
- If ADV-10 (power-on run) is set to 0 (No), the inverter will NOT operate on power-on even when the following terminals are turned on:
 - Fwd/Rev run (Fx/Rx) terminal
 - Fwd/Rev jog terminal (Fwd jog/Rev Jog)
 - Pre-Excitation terminal

To operate the inverter manually with the keypad, switch to local mode. Use caution when switching back to remote operation mode as the inverter will stop operating. If ADV-10 (power-on run) is set to 0 (No), a command through the input terminals will work ONLY AFTER all the terminals listed above have been turned off and then turned on again.

- If the inverter has been reset to clear a fault trip during an operation, the inverter will switch to local operation mode at power-on, and full control of the inverter will be with the keypad. The inverter will stop operating when operation mode is switched from “local” to “remote”. In this case, a run command through an input terminal will work ONLY AFTER all the input terminals have been turned off.

Inverter Operation During Local/Remote Switching

Switching operation mode from “remote” to “local” while the inverter is running will cause the inverter to stop operating. Switching operation mode from “local” to “remote” however, will cause the inverter to operate based on the command source:

- Analog commands via terminal input: the inverter will continue to run without interruption based on the command at the terminal block. If a reverse operation (Rx) signal is ON at the terminal block at startup, the inverter will operate in the reverse direction even if it was running in the forward direction in local operation mode before the reset.
- Digital source commands: all command sources except terminal block command sources (which are analog sources) are digital command sources that include the keypad, LCD keypad, and communication sources. The inverter stops operation when switching to remote operation mode, and then starts operation when the next command is given.

⚠ Caution

Use local/remote operation mode switching only when it is necessary. Improper mode switching may result in interruption of the inverter’s operation.

4.7 Forward or Reverse Run Prevention

The rotation direction of motors can be configured to prevent motors to only run in one direction. Pressing the [REV] key on the LCD keypad when direction prevention is configured, will cause the motor to decelerate to 0 Hz and stop. The inverter will remain on.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
ADV	09	Run prevention options	Run Prevent	0	None	0-2	-
				1	Forward Prev		
				2	Reverse Prev		

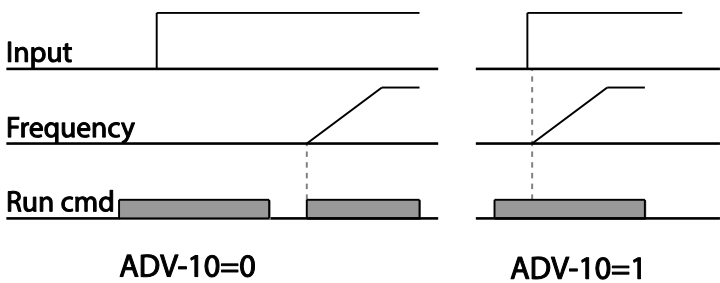
Forward/Reverse Run Prevention Setting Details

Code	Description		
ADV-09 Run Prevent	Choose a direction to prevent.		
	Setting		Description
	0	None	Do not set run prevention.
	1	Forward Prev	Set forward run prevention.
	2	Reverse Prev	Set reverse run prevention.

4.8 Power-on Run

A power-on command can be setup to start an inverter operation after powering up, based on terminal block operation commands (if they have been configured). To enable power-on run set the drv (command source) code to 1 (Fx/Rx-1) or 2 (Fx/Rx-2) in the DRV group.

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
DRV	06	Command source	Cmd Source*	1, 2	Fx/Rx-1 or Fx/Rx-2	0-4
ADV	10	Power-on run	Power-on Run	1	Yes	0-1



Note

- A fault trip may be triggered if the inverter starts operation while a motor's load (fan-type load) is in free-run state. To prevent this from happening, set bit4 to 1 in CON- 71 (speed search options) of the Control group. The inverter will perform a speed search at the beginning of the operation.
- If the speed search is not enabled, the inverter will begin its operation in a normal V/F pattern and accelerate the motor. If the inverter has been turned on without power-on run enabled, the terminal block command must first be turned off, and then turned on again to begin the inverter's operation.

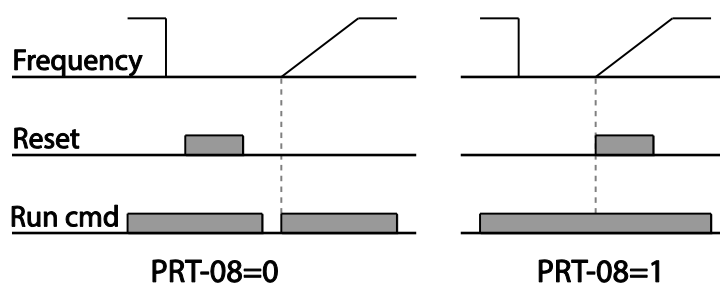
⚠ Caution

Use caution when operating the inverter with Power-on Run enabled as the motor will begin rotating when the inverter starts up.

4.9 Reset and Restart

Reset and restart operations can be setup for inverter operation following a fault trip, based on the terminal block operation command (if it is configured). When a fault trip occurs, the inverter cuts off the output and the motor will free-run. Another fault trip may be triggered if the inverter begins its operation while motor load is in a free-run state.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	06	Command source	Cmd Source*	1 2	Fx/Rx-1 or Fx/Rx-2	0–4	-
PRT	08	Reset restart setup	RST Restart	1	Yes	0–1	
	09	No. of auto restart	Retry Number	0		0–10	
	10	Auto restart delay time	Retry Delay	1.0		0–60	sec



Note

- To prevent a repeat fault trip from occurring, set CON-71 (speed search options) bit 2 equal to 1. The inverter will perform a speed search at the beginning of the operation.
- If the speed search is not enabled, the inverter will start its operation in a normal V/F pattern and accelerate the motor. If the inverter has been turned on without 'reset and restart' enabled, the terminal block command must be first turned off, and then turned on again to begin the inverter's operation.

⚠ Caution

Use caution when operating the inverter with Power-on Run enabled as the motor will begin rotating when the inverter starts up.

4.10 Setting Acceleration and Deceleration Times

4.10.1 Acc/Dec Time Based on Maximum Frequency

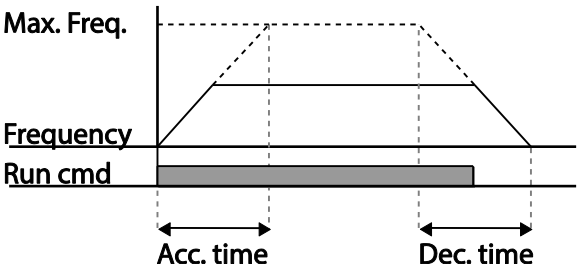
Acc/Dec time values can be set based on maximum frequency, not on inverter operation frequency. To set Acc/Dec time values based on maximum frequency, set BAS- 08 (Acc/Dec reference) in the Basic group to 0 (Max Freq).

Acceleration time set at the ACC (Acceleration time) code in the DRV group (DRV-03 in an LCD keypad) refers to the time required for the inverter to reach the maximum frequency from a stopped (0 Hz) state. Likewise, the value set at the Dec (deceleration time) code in the DRV group (DRV-04 in an LCD keypad) refers to the time required to return to a stopped state (0 Hz) from the maximum frequency.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	03	Acceleration time	Acc Time	20.0		0.0–600.0	sec
	04	Deceleration time	Dec Time	30.0		0.0–600.0	sec
	20	Maximum frequency	Max Freq	50.00		40.00–400.00	Hz
BAS	08	Acc/Dec reference frequency	Ramp T Mode	0	Max Freq	0–1	-
	09	Time scale	Time scale	1	0.1sec	0–2	-

Acc/Dec Time Based on Maximum Frequency – Setting Details

Code	Description		
BAS-08 Ramp T Mode	Set the parameter value to 0 (Max Freq) to setup Acc/Dec time based on maximum frequency.		
	Configuration		Description
	0	Max Freq	Set the Acc/Dec time based on maximum frequency.
	1	Delta Freq	Set the Acc/Dec time based on operating frequency.
	If, for example, maximum frequency is 50.00 Hz, the Acc/Dec times are set to 5 seconds, and the frequency reference for operation is set at 30 Hz (half of 50 Hz), the time required to reach 30 Hz therefore is 2.5 seconds (half of 5 seconds).		

Code	Description								
									
BAS-09 Time scale	<p>Use the time scale for all time-related values. It is particularly useful when a more accurate Acc/Dec times are required because of load characteristics, or when the maximum time range needs to be extended.</p> <table border="1"> <thead> <tr> <th>Configuration</th><th>Description</th></tr> </thead> <tbody> <tr> <td>0</td><td>0.01sec</td></tr> <tr> <td>1</td><td>0.1sec</td></tr> <tr> <td>2</td><td>1sec</td></tr> </tbody> </table>	Configuration	Description	0	0.01sec	1	0.1sec	2	1sec
Configuration	Description								
0	0.01sec								
1	0.1sec								
2	1sec								

⚠ Caution

Note that the range of maximum time values may change automatically when the units are changed. If for example, the acceleration time is set at 6000 seconds, a time scale change from 1 second to 0.01 second will result in a modified acceleration time of 60.00 seconds.

4.10.2 Acc/Dec Time Based on Operation Frequency

Acc/Dec times can be set based on the time required to reach the next step frequency from the existing operation frequency. To set the Acc/Dec time values based on the existing operation frequency, set BAS- 08 (acc/dec reference) in the Basic group to 1 (Delta Freq).

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
DRV	03	Acceleration time	Acc Time	20.0	0.0–600.0	sec
	04	Deceleration time	Dec Time	30.0	0.0–600.0	sec
BAS	08	Acc/Dec reference	Ramp T Mode	1 Delta Freq	0–1	-

Acc/Dec Time Based on Operation Frequency – Setting Details

Code	Description									
BAS-08 Ramp T Mode	Set the parameter value to 1 (Delta Freq) to set Acc/Dec times based on Maximum frequency.									
	<table><tr><th colspan="2">Configuration</th><th>Description</th></tr><tr><td>0</td><td>Max Freq</td><td>Set the Acc/Dec time based on Maximum frequency.</td></tr><tr><td>1</td><td>Delta Freq</td><td>Set the Acc/Dec time based on Operation frequency.</td></tr></table>	Configuration		Description	0	Max Freq	Set the Acc/Dec time based on Maximum frequency.	1	Delta Freq	Set the Acc/Dec time based on Operation frequency.
	Configuration		Description							
	0	Max Freq	Set the Acc/Dec time based on Maximum frequency.							
	1	Delta Freq	Set the Acc/Dec time based on Operation frequency.							
If Acc/Dec times are set to 5 seconds, and multiple frequency references are used in the operation in 2 steps, at 10 Hz and 30 Hz, each acceleration stage will take 5 seconds (refer to the graph below).										
<p>The graph illustrates the frequency profile over time for a two-stage acceleration process. The vertical axis is labeled 'Frequency' and the horizontal axis is labeled 'time'. A 'Run cmd' bar is shown at the bottom, indicating the duration of the command. The frequency starts at a baseline, rises linearly to 10Hz at 5 seconds, then continues to rise linearly to 30Hz at 12 seconds. The time intervals for each acceleration stage are marked as 5 seconds.</p>										

4.10.3 Multi-step Acc/Dec Time Configuration

Acc/Dec times can be configured via a multi-function terminal by setting the DRV-03 (Acceleration time) and DRV-04 (Deceleration time) codes in the DRV group.

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
DRV	03	Acceleration time	Acc Time	20.0	0.0–600.0	sec
	04	Deceleration time	Dec Time	30.0	0.0–600.0	sec
BAS	70–82	Multi-step acceleration time1–7	Acc Time 1–7	x.xx	0.0–600.0	sec
	71–83	Multi-step deceleration time1–7	Dec Time 1–7	x.xx	0.0–600.0	sec
IN	65–71	Px terminal configuration	Px Define (Px: P1–P7)	11	XCEL-L	0–54
				12	XCEL-M	
				49	XCEL-H	
	89	Multi-step command delay time	In Check Time	1	1–5000	ms

Acc/Dec Time Setup via Multi-function Terminals – Setting Details

Code	Description															
BAS-70–82 Acc Time 1–7	Set multi-step acceleration time1–7.															
BAS-71–83 Dec Time 1–7	Set multi-step deceleration time1–7.															
IN-65–71 Px Define (P1–P7)	Choose and configure the terminals to use for multi-step Acc/Dec time inputs.															
	<table><tr><th colspan="2">Configuration</th><th>Description</th></tr><tr><td>11</td><td>XCEL-L</td><td>Acc/Dec command-L</td></tr><tr><td>12</td><td>XCEL-M</td><td>Acc/Dec command-M</td></tr><tr><td>49</td><td>XCEL-H</td><td>Acc/Dec command-H</td></tr></table>	Configuration		Description	11	XCEL-L	Acc/Dec command-L	12	XCEL-M	Acc/Dec command-M	49	XCEL-H	Acc/Dec command-H			
	Configuration		Description													
	11	XCEL-L	Acc/Dec command-L													
	12	XCEL-M	Acc/Dec command-M													
	49	XCEL-H	Acc/Dec command-H													
	Acc/Dec commands are recognized as binary code inputs and will control the acceleration and deceleration based on parameter values set with BAS-70–82 and BAS-71–83.															
	If, for example, the P6 and P7 terminals are set as XCEL-L and XCEL respectively, the following operation will be available.															
	<table><tr><th>Acc/Dec time</th><th>P7</th><th>P6</th></tr><tr><td>0</td><td>-</td><td>-</td></tr><tr><td>1</td><td>-</td><td>✓</td></tr><tr><td>2</td><td>✓</td><td>-</td></tr><tr><td>3</td><td>✓</td><td>✓</td></tr></table>		Acc/Dec time	P7	P6	0	-	-	1	-	✓	2	✓	-	3	✓
Acc/Dec time	P7	P6														
0	-	-														
1	-	✓														
2	✓	-														
3	✓	✓														
IN-89 In Check Time	Set the time for the inverter to check for other terminal block inputs. If IN-89 is set to 100ms and a signal is supplied to the P6 terminal, the inverter searches															

Code	Description
	for other inputs over the next 100ms. When the time expires, the Acc/Dec time will be set based on the input received at P6.

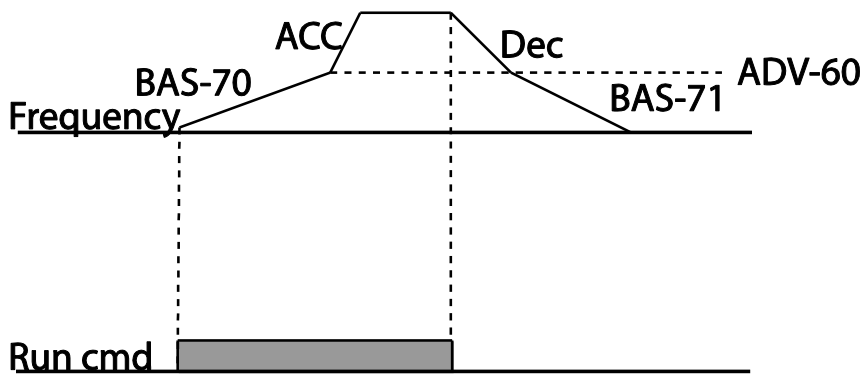
4.10.4 Configuring Acc/Dec Time Switch Frequency

You can switch between two different sets of Acc/Dec times (Acc/Dec gradients) by configuring the switch frequency without configuring the multi-function terminals.

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
DRV	03	Acceleration time	Acc Time	10.0	0.0–600.0	sec
	04	Deceleration time	Dec Time	10.0	0.0–600.0	sec
BAS	70	Multi-step acceleration time1	AccTime-1	20.0	0.0–600.0	sec
	71	Multi-step deceleration time1	DecTime-1	20.0	0.0–600.0	sec
ADV	60	Acc/Dec time switch frequency	Xcel Change Frq	30.00	0–Maximum frequency	Hz

Acc/Dec Time Switch Frequency Setting Details

Code	Description
ADV-60 Xcel Change Fr	<p>After the Acc/Dec switch frequency has been set, Acc/Dec gradients configured at BAS-70 and 71 will be used when the inverter's operation frequency is at or below the switch frequency. If the operation frequency exceeds the switch frequency, the configured gradient level, configured for the ACC and Dec codes, will be used.</p> <p>If you configure the P1–P7 multi-function input terminals for multi-step Acc/Dec gradients (XCEL-L, XCEL-M, XCEL-H), the inverter will operate based on the Acc/Dec inputs at the terminals instead of the Acc/Dec switch frequency configurations.</p>



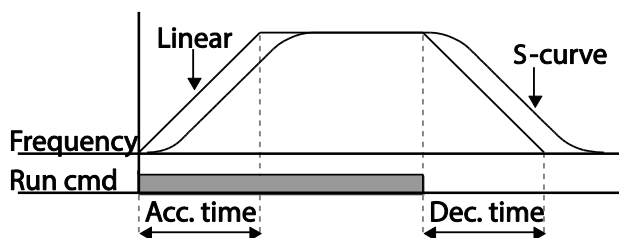
4.11 Acc/Dec Pattern Configuration

Acc/Dec gradient level patterns can be configured to enhance and smooth the inverter's acceleration and deceleration curves. Linear pattern features a linear increase or decrease to the output frequency, at a fixed rate. For an S-curve pattern a smoother and more gradual increase or decrease of output frequency, ideal for lift-type loads or elevator doors, etc. S-curve gradient level can be adjusted using codes ADV- 03–06 in the Advanced group.

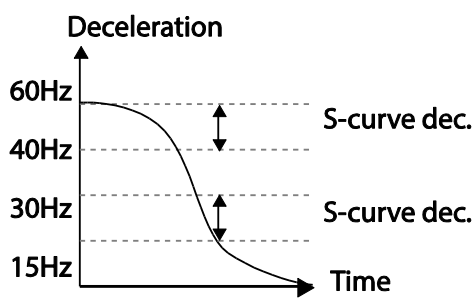
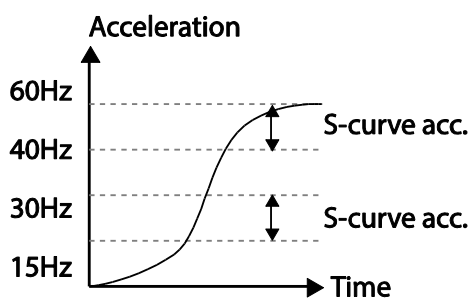
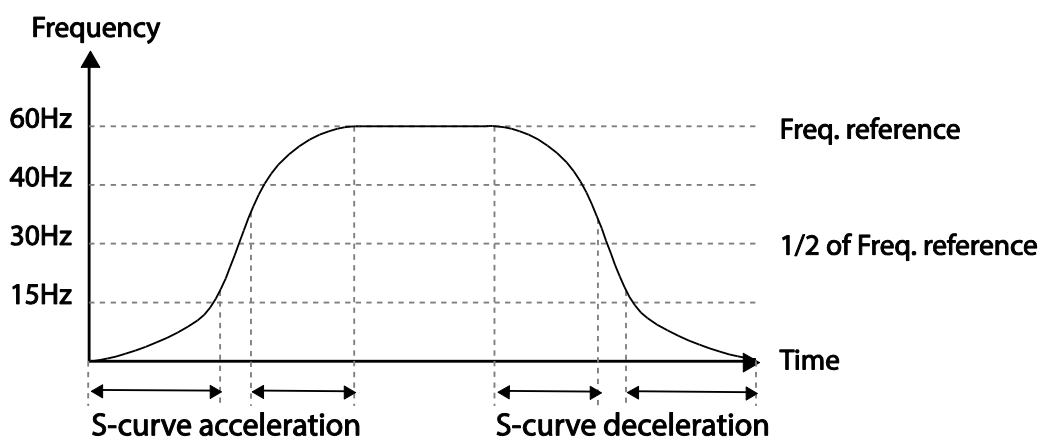
Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
BAS	08	Acc/Dec reference	Ramp T mode	0	Max Freq	0–1	-
ADV	01	Acceleration pattern	Acc Pattern	0	Linear	0–1	-
	02	Deceleration pattern	Dec Pattern	1	S-curve		-
	03	S-curve Acc start gradient	Acc S Start	40		1–100	%
	04	S-curve Acc end gradient	Acc S End	40		1–100	%
	05	S-curve Dec start gradient	Dec S Start	40		1–100	%
	06	S-curve Dec end gradient	Dec S End	40		1–100	%

Acc/Dec Pattern Setting Details

Code	Description
ADV-03 Acc S Start	<p>Sets the gradient level as acceleration starts when using an S-curve, Acc/Dec pattern. ADV- 03 defines S-curve gradient level as a percentage, up to half of total acceleration.</p> <p>If the frequency reference and maximum frequency are set at 50 Hz and ADV-03 is set to 50%, ADV- 03 configures acceleration up to 30 Hz (half of 50 Hz).The inverter will operate S-curve acceleration in the 0-15 Hz frequency range (50% of 30 Hz). Linear acceleration will be applied to the remaining acceleration within the 15–30 Hz frequency range.</p>
ADV-04 Acc S End	<p>Sets the gradient level as acceleration ends when using an S-curve Acc/Dec pattern. ADV- 03 defines S-curve gradient level as a percentage, above half of total acceleration.</p> <p>If the frequency reference and the maximum frequency are set at 50 Hz and ADV-04 is set to 50%, setting ADV- 04 configures acceleration to increase from 25 Hz (half of 50 Hz) to 50 Hz (end of acceleration). Linear acceleration will be applied within the 30-45 Hz frequency range. The inverter will perform an S-curve acceleration for the remaining acceleration in the 45–50 Hz frequency range.</p>
ADV-05 Dec S Start – ADV-06 Dec S End	<p>Sets the rate of S-curve deceleration. Configuration for codes ADV-05 and ADV-06 may be performed the same way as configuring codes ADV-03 and ADV-04.</p>



[Acceleration / deceleration pattern configuration]



[Acceleration / deceleration S-curve pattern configuration]

Note

The Actual Acc/Dec time during an S-curve application

Actual acceleration time = user-configured acceleration time + user-configured acceleration time x starting gradient level/2 + user-configured acceleration time x ending gradient level/2.

Actual deceleration time = user-configured deceleration time + user-configured deceleration time x starting gradient level/2 + user-configured deceleration time x ending gradient level/2.

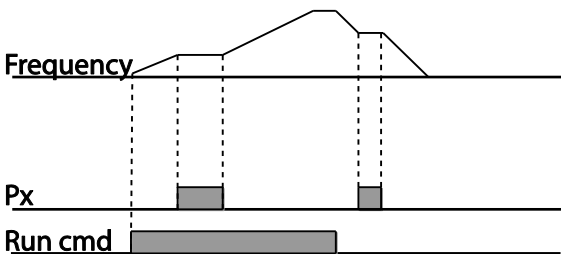
⚠ Caution

Note that actual Acc/Dec times become greater than user defined Acc/Dec times when S-curve Acc/Dec patterns are in use.

4.12 Stopping the Acc/Dec Operation

Configure the multi-function input terminals to stop acceleration or deceleration and operate the inverter at a fixed frequency.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
IN	65–71	Px terminal configuration	Px Define(Px: P1– P7)	25	XCEL Stop	0–54	-



4.13 V/F(Voltage/Frequency) Control

Configure the inverter's output voltages, gradient levels and output patterns to achieve a target output frequency with V/F control. The amount of torque boost used during low frequency operations can also be adjusted.

4.13.1 Linear V/F Pattern Operation

A linear V/F pattern configures the inverter to increase or decrease the output voltage at a fixed rate for different operation frequencies based on V/F characteristics. A linear V/F pattern is particularly useful when a constant torque load is applied.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	09	Control mode	Control Mode	0	V/F	0–4	-
	18	Base frequency	Base Freq	50.00		30.00–400.00	Hz
	19	Start frequency	Start Freq	0.50		0.01–10.00	Hz
BAS	07	V/F pattern	V/F Pattern	0	Linear	0–3	-

Linear V/F Pattern Setting Details

Code	Description
DRV-18 Base Freq	Sets the base frequency. A base frequency is the inverter's output frequency when running at its rated voltage. Refer to the motor's rating plate to set this parameter value.
DRV-19 Start Freq	<p>Sets the start frequency. A start frequency is a frequency at which the inverter starts voltage output. The inverter does not produce output voltage while the frequency reference is lower than the set frequency. However, if a deceleration stop is made while operating above the start frequency, output voltage will continue until the operation frequency reaches a full-stop (0 Hz).</p>

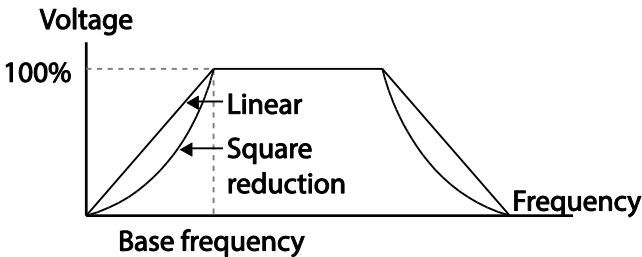
4.13.2 Square Reduction V/F pattern Operation

Square reduction V/F pattern is ideal for loads such as fans and pumps. It provides non-linear acceleration and deceleration patterns to sustain torque throughout the whole frequency range.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
BAS	07	V/F pattern	V/F Pattern	1	Square	0-3	-
				3	Square2		

Square Reduction V/F pattern Operation - Setting Details

Code	Description		
BAS-07 V/F Pattern	Sets the parameter value to 1(Square) or 3(Square2) according to the load's start characteristics.		
	Setting		Function
	1	Square	The inverter produces output voltage proportional to 1.5 square of the operation frequency.
	3	Square2	The inverter produces output voltage proportional to 2 square of the operation frequency. This setup is ideal for variable torque loads such as fans or pumps.



4.13.3 User V/F Pattern Operation

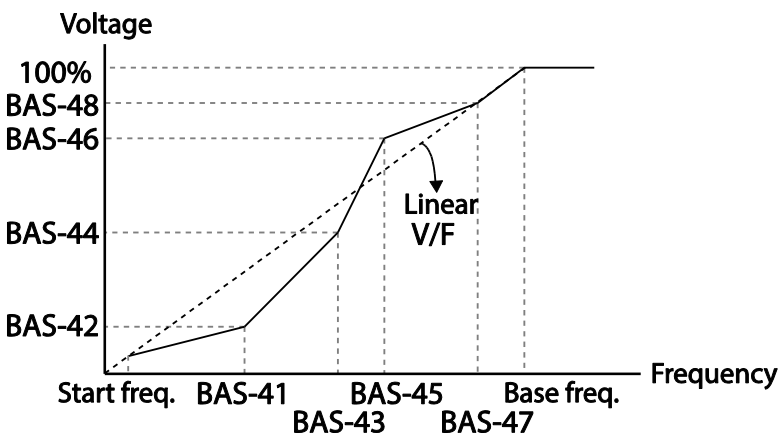
The MD100G inverter allows the configuration of user-defined V/F patterns to suit the load characteristics of special motors.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
BAS	07	V/F pattern	V/F Pattern	2	User V/F	0-3	-
	41	User Frequency1	User Freq 1	15.00		0-Maximum frequency	Hz
	42	User Voltage1	User Volt 1	25		0-100	%
	43	User Frequency2	User Freq 2	30.00		0-Maximum frequency	Hz
	44	User Voltage2	User Volt 2	50		0-100	%
	45	User Frequency3	User Freq 3	45.00		0-Maximum frequency	Hz
	46	User Voltage3	User Volt 3	75		0-100	%
	47	User Frequency4	User Freq 4	Maximum frequency		0-Maximum frequency	Hz
	48	User Voltage4	User Volt 4	100		0-100%	%

User V/F pattern Setting Details

Code	Description
BAS-41 User Freq 1– BAS-48 User Volt 4	Set the parameter values to assign arbitrary frequencies (User Freq 1–4) for start and maximum frequencies. Voltages can also be set to correspond with each frequency, and for each user voltage (User Volt 1–4).

The 100% output voltage in the figure below is based on the parameter settings of BAS-15 (motor rated voltage). If BAS-15 is set to 0 it will be based on the input voltage.



⚠ Caution

- When a normal induction motor is in use, care must be taken not to configure the output pattern away from a linear V/F pattern. Non-linear V/F patterns may cause insufficient motor torque or motor overheating due to over-excitation.
- When a user V/F pattern is in use, forward torque boost (DRV-16) and reverse torque boost (DRV-17) do not operate.

4.14 Torque Boost

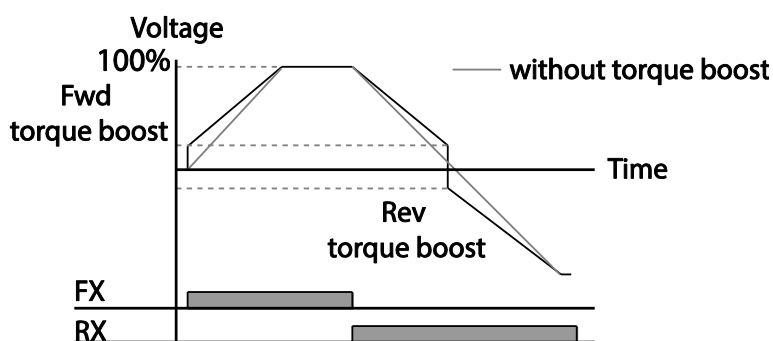
4.14.1 Manual Torque Boost

Manual torque boost enables users to adjust output voltage during low speed operation or motor start. Increase low speed torque or improve motor starting properties by manually increasing output voltage. Configure manual torque boost while running loads that require high starting torque, such as lift-type loads.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	15	Torque boost options	Torque Boost	0	Manual	0–1	-
	16	Forward torque boost	Fwd Boost	2.0		0.0–15.0	%
	17	Reverse torque boost	Rev Boost	2.0		0.0–15.0	%

Manual Torque Boost Setting Details

Code	Description
DRV-16 Fwd Boost	Set torque boost for forward operation.
DRV-17 Rev Boost	Set torque boost for reverse operation.



ⓘ Caution

Excessive torque boost will result in over-excitation and motor overheating .

4.14.2 Auto Torque Boost

Auto torque boost enables the inverter to automatically calculate the amount of output voltage required for torque boost based on the entered motor parameters. Because auto torque boost requires motor-related parameters such as stator resistance, inductance, and no-load current, auto tuning (BAS-20) has to be performed before auto torque boost can be configured. Similarly to manual torque boost, configure auto torque boost while running a load that requires high starting torque, such as lift-type loads.

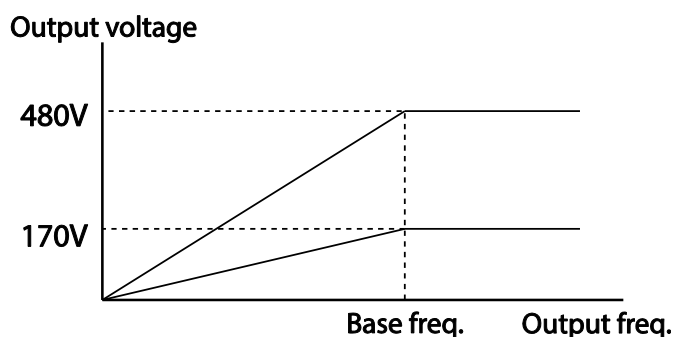
Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	15	torque boost mode	Torque Boost	1	Auto	0–1	-
BAS	20	auto tuning	Auto Tuning	3	Rs+Lsigma	0–6	-

4.15 Output Voltage Setting

Output voltage settings are required when a motor's rated voltage differs from the input voltage to the inverter. Set BAS-15 to configure the motor's rated operating voltage. The set voltage becomes the output voltage of the inverter's base frequency. When the inverter operates above the base frequency, and when the motor's voltage rating is lower than the input voltage at the inverter, the inverter adjusts the voltage and supplies the motor with the voltage set at BAS-15 (motor rated voltage). If the motor's rated voltage is higher than the input voltage at the inverter, the inverter will supply the inverter input voltage to the motor.

If BAS-15 (motor rated voltage) is set to 0, the inverter corrects the output voltage based on the input voltage in the stopped condition. If the frequency is higher than the base frequency, when the input voltage is lower than the parameter setting, the input voltage will be the inverter output voltage.

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
BAS	15	Motor rated voltage	Rated Volt	0	0, 170–480	V



4.16 Start Mode Setting

Select the start mode to use when the operation command is input with the motor in the stopped condition.

4.16.1 Acceleration Start

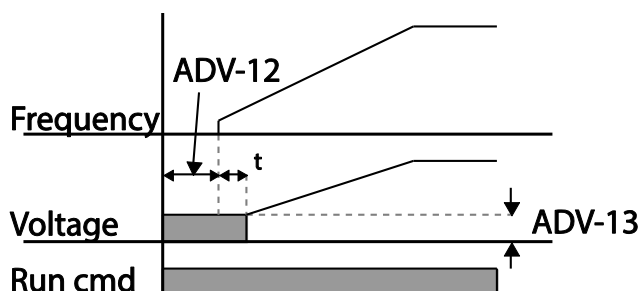
Acceleration start is a general acceleration mode. If there are no extra settings applied, the motor accelerates directly to the frequency reference when the command is input.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
ADV	07	Start mode	Start mode	0	Acc	0–1	-

4.16.2 Start After DC Braking

This start mode supplies a DC voltage for a set amount of time to provide DC braking before an inverter starts to accelerate a motor. If the motor continues to rotate due to its inertia, DC braking will stop the motor, allowing the motor to accelerate from a stopped condition. DC braking can also be used with a mechanical brake connected to a motor shaft when a constant torque load is applied, if a constant torque is required after the the mechanical brake is released.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
ADV	07	Start mode	Start Mode	1	DC-Start	0–1	-
	12	Start DC braking time	DC-Start Time	0.00		0.00–60.00	sec
	13	DC Injection Level	DC Inj Level	50		0–200	%



⚠ Caution

The amount of DC braking required is based on the motor's rated current. Do not use DC braking resistance values that can cause current draw to exceed the rated current of the inverter. If the DC braking resistance is too high or brake time is too long, the motor may overheat or be damaged.

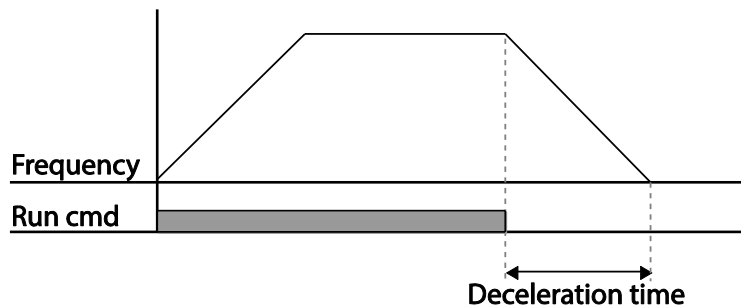
4.17 Stop Mode Setting

Select a stop mode to stop the inverter operation.

4.17.1 Deceleration Stop

Deceleration stop is a general stop mode. If there are no extra settings applied, the motor decelerates down to 0 Hz and stops, as shown in the figure below.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
ADV	08	Stop mode	Stop Mode	0	Dec	0–4	-



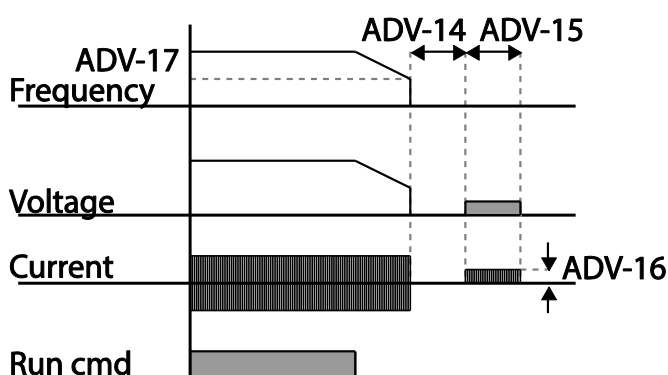
4.17.2 Stop After DC Braking

When the operation frequency reaches the set value during deceleration (DC braking frequency), the inverter stops the motor by supplying DC power to the motor. With a stop command input, the inverter begins decelerating the motor. When the frequency reaches the DC braking frequency set at ADV-17, the inverter supplies DC voltage to the motor and stops it.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
ADV	08	Stop mode	Stop Mode	0	Dec	0–4	-
	14	Output block time before braking	DC-Block Time	0.10		0.00–60.00	sec
	15	DC braking time	DC-Brake Time	1.00		0–60	sec
	16	DC braking amount	DC-Brake Level	50		0–200	%
	17	DC braking frequency	DC-Brake Freq	5.00		0.00–50.00	Hz

DC Braking After Stop Setting Details

Code	Description
ADV-14 DC-Block Time	Set the time to block the inverter output before DC braking. If the inertia of the load is great, or if DC braking frequency (ADV-17) is set too high, a fault trip may occur due to overcurrent conditions when the inverter supplies DC voltage to the motor. Prevent overcurrent fault trips by adjusting the output block time before DC braking.
ADV-15 DC-Brake Time	Set the time duration for the DC voltage supply to the motor.
ADV-16 DC-Brake Level	Set the amount of DC braking to apply. The parameter setting is based on the rated current of the motor.
ADV-17 DC-Brake Freq	Set the frequency to start DC braking. When the frequency is reached, the inverter starts deceleration. If the dwell frequency is set lower than the DC braking frequency, dwell operation will not work and DC braking will start instead.



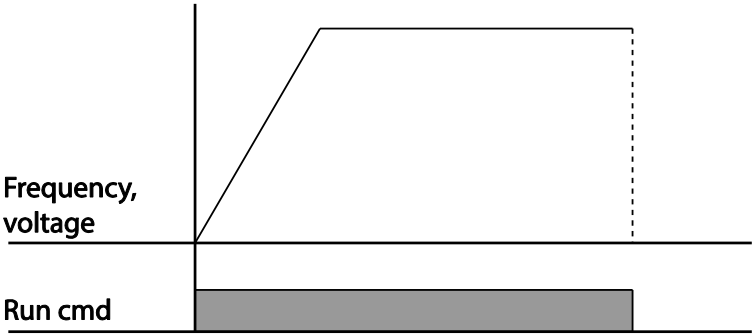
⚠ Caution

- Note that the motor can overheat or be damaged if excessive amount of DC braking is applied to the motor, or DC braking time is set too long.
- DC braking is configured based on the motor's rated current. To prevent overheating or damaging motors, do not set the current value higher than the inverter's rated current.

4.17.3 Free Run Stop

When the Operation command is off, the inverter output turns off, and the load stops due to residual inertia.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
ADV	08	Stop Method	Stop Mode	2	Free-Run	0–4	-



⚠ Caution

Note that when there is high inertia on the output side and the motor is operating at high speed, the load's inertia will cause the motor to continue rotating even if the inverter output is blocked.

4.17.4 Power Braking

When the inverter's DC voltage rises above a specified level due to motor regenerated energy, a control is made to either adjust the deceleration gradient level or reaccelerate the motor in order to reduce the regenerated energy. Power braking can be used when short deceleration times are needed without brake resistors, or when optimum deceleration is needed without causing an over voltage fault trip.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
ADV	08	Stop mode	Stop Mode	4	Power Braking	0–4	-

ⓘ Caution

- To prevent overheating or damaging the motor, do not apply power braking to the loads that require frequent deceleration.
- Stall prevention and power braking only operate during deceleration, and power braking takes priority over stall prevention. In other words, when both PRT-50 (stall prevention and flux braking) and ADV-08 (power braking) are set, power braking will take precedence and operate.
- Note that if deceleration time is too short or inertia of the load is too great, an overvoltage fault trip may occur.
- Note that if a free run stop is used, the actual deceleration time can be longer than the pre-set deceleration time.

4.18 Frequency Limit

Operation frequency can be limited by setting maximum frequency, start frequency, upper limit frequency and lower limit frequency.

4.18.1 Frequency Limit Using Maximum Frequency and Start Frequency

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
DRV	19	Start frequency	Start Freq	0.50	0.01–10.00	Hz
	20	Maximum frequency	Max Freq	50.00	40.00–400.00	Hz

Frequency Limit Using Maximum Frequency and Start Frequency - Setting Details

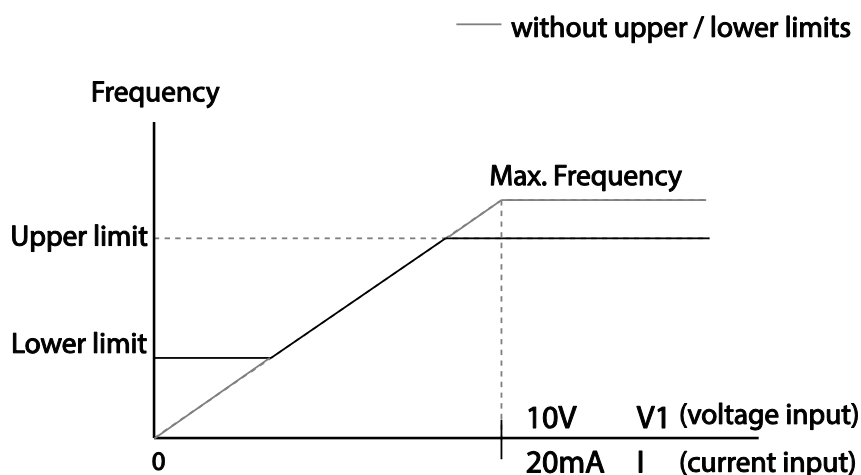
Code	Description
DRV-19 Start Freq	Set the lower limit value for speed unit parameters that are expressed in Hz or rpm. If an input frequency is lower than the start frequency, the parameter value will be 0.00.
DRV-20 Max Freq	Set upper and lower frequency limits. All frequency selections are restricted to frequencies from within the upper and lower limits. This restriction also applies when you input a frequency reference using the keypad.

4.18.2 Frequency Limit Using Upper and Lower Limit Frequency Values

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
ADV	24	Frequency limit	Freq Limit	1 Yes	0–1	-
	25	Frequency lower limit value	Freq Limit Lo	0.50	0.0–maximum frequency	Hz
	26	Frequency upper limit value	Freq Limit Hi	Maximum frequency	minimum–maximum frequency	Hz

Frequency Limit Using Upper and Lower Limit Frequencies - Setting Details

Code	Description
ADV-24 Freq Limit	The initial setting is 0 (No). Changing the setting to 1 (Yes) allows the setting of frequencies between the lower limit frequency (ADV-25) and the upper limit frequency (ADV-26). When the setting is 0 (No), codes ADV-25 and ADV-26 are not visible.
ADV-25 Freq Limit Lo, ADV-26 Freq Limit Hi	Set an upper limit frequency to all speed unit parameters that are expressed in Hz or rpm, except for the base frequency (DRV-18). Frequency cannot be set higher than the upper limit frequency.

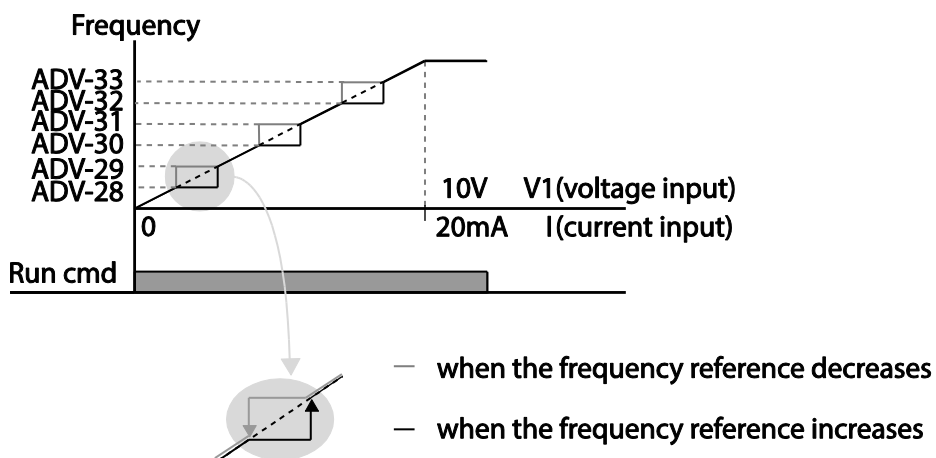


4.18.3 Frequency Jump

Use frequency jump to avoid mechanical resonance frequencies. Jump through frequency bands when a motor accelerates and decelerates. Operation frequencies cannot be set within the pre-set frequency jump band.

When a frequency setting is increased, while the frequency parameter setting value (voltage, current, RS-485 communication, keypad setting, etc.) is within a jump frequency band, the frequency will be maintained at the lower limit value of the frequency band. Then, the frequency will increase when the frequency parameter setting exceeds the range of frequencies used by the frequency jump band.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
ADV	27	Frequency jump	Jump Freq	0	No	0–1	-
	28	Jump frequency lower limit1	Jump Lo 1	10.00		0.00–Jump frequency upper limit 1	Hz
	29	Jump frequency upper limit1	Jump Hi 1	15.00		Jump frequency lower limit 1–Maximum frequency	Hz
	30	Jump frequency lower limit 2	Jump Lo 2	20.00		0.00–Jump frequency upper limit 2	Hz
	31	Jump frequency upper limit 2	Jump Hi 2	25.00		Jump frequency lower limit 2–Maximum frequency	Hz
	32	Jump frequency lower limit 3	Jump Lo 3	30.00		0.00–Jump frequency upper limit 3	Hz
	33	Jump frequency upper limit 3	Jump Hi 3	35.00		Jump frequency lower limit 3–Maximum frequency	Hz



4.19 2nd Operation Mode Setting

Apply two types of operation modes and switch between them as required. For both the first and second command source, set the frequency after shifting operation commands to the multi-function input terminal. Mode switching can be used to stop remote control during an operation using the communication option and to switch operation mode to operate via the local panel, or to operate the inverter from another remote control location.

Select one of the multi-function terminals from codes IN- 65–71 and set the parameter value to 15 (2nd Source).

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	06	Command source	Cmd Source*	1	Fx/Rx-1	0–4	-
	07	Frequency reference source	Freq Ref Src	2	V1	0–12	-
BAS	04	2 nd Command source	Cmd 2nd Src	0	Keypad	0–4	-
	05	2 nd Frequency reference source	Freq 2nd Src	0	KeyPad-1	0–12	-
IN	65–71	Px terminal configuration	Px Define (Px: P1–P7)	15	2nd Source	0–54	-

2nd Operation Mode Setting Details

Code	Description
BAS-04 Cmd 2nd Src BAS-05 Freq 2nd Src	If signals are provided to the multi-function terminal set as the 2 nd command source (2nd Source), the operation can be performed using the set values from BAS-04-05 instead of the set values from the 06 and 07 codes in the DRV group. The 2nd command source settings cannot be changed while operating with the 1 st command source (Main Source).

⚠ Caution













- When setting the multi-function terminal to the 2nd command source (2nd Source) and input (On) the signal, operation state is changed because the frequency setting and the Operation command will be changed to the 2nd command. Before shifting input to the multi-function terminal, ensure that the 2nd command is correctly set. Note that if the deceleration time is too short or inertia of the load is too high, an overvoltage fault trip may occur.
- Depending on the parameter settings, the inverter may stop operating when you switch the command modes.

4.20 Multi-function Input Terminal Control

Filter time constants and the type of multi-function input terminals can be configured to improve the response of input terminals

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
IN	85	Multi-function input terminal On filter	DI On Delay	10	0–10000	ms
	86	Multi-function input terminal Off filter	DI Off Delay	3	0–10000	ms
	87	Multi-function input terminal selection	DI NC/NO Sel	000 0000*	-	-
	90	Multi-function input terminal status	DI Status	000 0000*	-	-

Multi-function Input Terminal Control Setting Details

Code	Description						
IN-85 DI On Delay, IN-86 DI Off Delay	If the input terminal's state is not changed during the set time, when the terminal receives an input, it is recognized as On or Off.						
IN-87 DI NC/NO Sel	Select terminal contact types for each input terminal. The position of the indicator light corresponds to the segment that is on as shown in the table below. With the bottom segment on, it indicates that the terminal is configured as a A terminal (Normally Open) contact. With the top segment on, it indicates that the terminal is configured as a B terminal (Normally Closed) contact. Terminals are numbered P1–P7, from right to left.						
	<table><tr><td>Type</td><td>B terminal status (Normally Closed)</td><td>A terminal status (Normally Open)</td></tr><tr><td>LCD keypad</td><td></td><td></td></tr></table>	Type	B terminal status (Normally Closed)	A terminal status (Normally Open)	LCD keypad		
	Type	B terminal status (Normally Closed)	A terminal status (Normally Open)				
LCD keypad							
IN-90 DI Status	Display the configuration of each contact. When a segment is configured as A terminal using DRV-87, the On condition is indicated by the top segment turning on. The Off condition is indicated when the bottom segment is turned on. When contacts are configured as B terminals, the segment lights behave conversely. Terminals are numbered P1–P7, from right to left.						
	<table><tr><td>Type</td><td>A terminal setting (On)</td><td>A terminal setting (Off)</td></tr><tr><td>LCD keypad</td><td></td><td></td></tr></table>	Type	A terminal setting (On)	A terminal setting (Off)	LCD keypad		
	Type	A terminal setting (On)	A terminal setting (Off)				
LCD keypad							

4.21 P2P Setting

The P2P function is used to share input and output devices between multiple inverters. To enable P2P setting, RS-485 communication must be turned on.

Inverters connected through P2P communication are designated as either a master or slaves. The Master inverter controls the input and output of slave inverters. Slave inverters provide input and output actions. When using the multi-function output, a slave inverter can select to use either the master inverter's output or its own output. When using P2P communication, first designate the slave inverter and then the master inverter. If the master inverter is designated first, connected inverters may interpret the condition as a loss of communication.

Master Parameter

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
COM	95	P2P Communication selection	Int 485 Func	1	P2P Master	0–3	-
USS	80	Analog input1	P2P In V1	0		0–12,000	%
	81	Analog input2	P2P In I2	0		-12,000–12,000	%
	82	Digital input	P2P In DI	0		0–0x7F	bit
	85	Analog output	P2P Out AO1	0		0–10,000	%
	88	Digital output	P2P Out DO	0		0–0x03	bit

Slave Parameter

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
COM	95	P2P Communication selection	Int 485 Func	2	P2P Slave	0–3	-
	96	P2P DO setting selection	P2P OUT Sel	0	No	0–2	bit

P2P Setting Details

Code	Description
COM-95 Int 485 Func	Set master inverter to 1(P2P Master), slave inverter to 2(P2P Slave).
USS-80–82 P2P Input Data	Input data sent from the slave inverter.
USS-85, 88 P2P Output Data	Output data transmitted to the slave inverter.

⚠ Caution

- P2P features work only with code version 1.00, IO S/W version 0.11, and keypad S/W version 1.07 or higher versions.

- Set the user sequence functions to use P2P features.

4.22 Multi-keypad Setting

Use multi-keypad settings to control more than one inverter with one keypad. To use this function, first configure RS-485 communication.

The group of inverters to be controlled by the keypad will include a master inverter. The master inverter monitors the other inverters, and slave inverter responds to the master inverter's input. When using multi-function output, a slave inverter can select to use either the master inverter's output or its own output. When using the multi keypad, first designate the slave inverter and then the master inverter. If the master inverter is designated first, connected inverters may interpret the condition as a loss of communication.

Master Parameter

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
COM	95	P2P Communication selection	Int 485 Func	3	KPD-Ready	0–3	-
CNF	03	Multi-keypad ID	Multi KPD ID	3		3–99	-
	42	Multi-function key selection	Multi Key Sel	4	Multi KPD	0–4	-

Slave Parameter

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
COM	01	Station ID	Int485 St ID	3		3–99	-
	95	P2P communication options	Int 485 Func	3	KPD-Ready	0–3	-

Multi-keypad Setting Details

Code	Description
COM-01 Int485 St ID	Prevents conflict by designating a unique identification value to an inverter. Values can be selected from numbers between 3–99.
COM-95 Int 485 Func	Set the value to 3 (KPD-Ready) for both master and slave inverter
CNF-03 Multi KPD ID	Select an inverter to monitor from the group of inverters.
CNF-42 Multi key Sel	Select a multi-function key type 4 (Multi KPD).

⚠ Caution

- Multi-keypad (Multi-KPD) features work only with code version 1.00, IO S/W version 0.11, and keypad S/W version 1.07 or higher versions.
- The multi-keypad feature will not work when the multi-keypad ID (CNF-03 Multi-KPD ID) setting is identical to the RS-485 communication station ID (CM-01 Int485 st ID) setting.
- The master/slave setting cannot be changed while the inverter is operating in slave mode.

4.23 User Sequence Setting

User Sequence creates a simple sequence from a combination of different function blocks. The sequence can comprise of a maximum of 18 steps using 29 function blocks and 30 void parameters.

1 Loop refers to a single execution of a user configured sequence that contains a maximum of 18 steps. Users can select a Loop Time of between 10-1,000 ms.

The codes for user sequences configuration can be found in the USS group (for user sequence settings) and the USF group (for function block settings).

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
APP	02	User sequence activation	User Seq En	0	0-1	-
USS	01	User sequence operation command	User Seq Con	0	0-2	-
	02	User sequence operation time	User Loop Time	0	0-5	-
	11-28	Output address link1-18	Link UserOut1-18	0	0-0xFFFF	-
	31-60	Input value setting1-30	Void Para1-30	0	-9999-9999	-
	80	Analog input 1	P2P In V1(-10-10 V)	0	0-12,000	%
	81	Analog input 2	P2P In I2	0	-12,000	%
	82	Digital input	P2P In D	0	-12,000	bit
	85	Analog output	P2P Out AO1	0	0-0x7F	%
	88	Digital output	P2P Out DO	0	0-0x03	bit
USF	01	User function 1	User Func1	0	0-28	-
	02	User function input 1-A	User Input 1-A	0	0-0xFFFF	-
	03	User function input 1-B	User Input 1-B	0	0-0xFFFF	-
	04	User function input 1-C	User Input 1-C	0	0-0xFFFF	-

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
	05	User function output 1	User Output 1	0	-32767– 32767	-
	06	User function 2	User Func2	0	0–28	-
	07	User function input 2-A	User Input 2-A	0	0–0xFFFF	-
	08	User function input 2-B	User Input 2-B	0	0–0xFFFF	-
	09	User function input 2-C	User Input 2-C	0	0–0xFFFF	-
	10	User function output 2	User Output 2	0	-32767– 32767	-
	11	User function 3	User Func3	0	0–28	-
	12	User function input 3-A	User Input 3-A	0	0–0xFFFF	-
	13	User function input 3-B	User Input 3-B	0	0–0xFFFF	-
	14	User function input 3-C	User Input 3-C	0	0–0xFFFF	-
	15	User function output 3	User Output 3	0	-32767– 32767	-
	16	User function 4	User Func4	0	0–28	-
	17	User function input 4-A	User Input 4-A	0	0–0xFFFF	-
	18	User function input 4-B	User Input 4-B	0	0–0xFFFF	-
	19	User function input 4-C	User Input 4-C	0	0–0xFFFF	-
	20	User function output 4	User Output 4	0	-32767– 32767	-
	21	User function 5	User Func5	0	0–28	-
	22	User function input 5-A	User Input 5-A	0	0–0xFFFF	-
	23	User function input 5-B	User Input 5-B	0	0–0xFFFF	-
	24	User function input 5-C	User Input 5-C	0	0–0xFFFF	-
	25	User function output 5	User Output 5	0	-32767– 32767	-
	26	User function 6	User Func6	0	0–28	-
	27	User function input 6-A	User Input 6-A	0	0–0xFFFF	-
	28	User function input 6-B	User Input 6-B	0	0–0xFFFF	-
	29	User function input 6-C	User Input 6-C	0	0–0xFFFF	-
	30	User function output 6	User Output 6	0	-32767– 32767	-

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
	31	User function 7	User Func7	0	0–28	-
	32	User function input 7-A	User Input 7-A	0	0–0xFFFF	-
	33	User function input 7-B	User Input 7-B	0	0–0xFFFF	-
	34	User function input 7-C	User Input 7-C	0	0–0xFFFF	-
	35	User function output 7	User Output 7	0	-32767– 32767	-
	36	User function 8	User Func8	0	0–28	-
	37	User function input 8-A	User Input 8-A	0	0–0xFFFF	-
	38	User function input 8-B	User Input 8-B	0	0–0xFFFF	-
	39	User function input 8-C	User Input 8-C	0	0–0xFFFF	-
	40	User function output 8	User Output 8	0	-32767– 32767	-
	41	User function 9	User Func9	0	0–28	-
	42	User function input 9-A	User Input 9-A	0	0–0xFFFF	-
	43	User function input 9-B	User Input 9-B	0	0–0xFFFF	-
	44	User function input 9-C	User Input 9-C	0	0–0xFFFF	-
	45	User function output 9	User Output 9	0	-32767– 32767	-
	46	User function 10	User Func10	0	0–28	-
	47	User function input 10-A	User Input 10-A	0	0–0xFFFF	-
	48	User function input 10-B	User Input 10-B	0	0–0xFFFF	-
	49	User function input 10-C	User Input 10-C	0	0–0xFFFF	-
	50	User function output 10	User Output 10	0	-32767– 32767	-
	51	User function 11	User Func11	0	0–28	-
	52	User function input 11-A	User Input 11-A	0	0–0xFFFF	-
	53	User function input 11-B	User Input 11-B	0	0–0xFFFF	-
	54	User function input 11-C	User Input 11-C	0	0–0xFFFF	-
	55	User function output 11	User Output 11	0	-32767– 32767	-
	56	User function 12	User Func12	0	0–28	-
	57	User function input 12-A	User Input 12-A	0	0–0xFFFF	-

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
	58	User function input 12-B	User Input 12-B	0	0-0xFFFF	-
	59	User function input 12-C	User Input 12-C	0	0-0xFFFF	-
	60	User function output 12	User Output 12	0	-32767- 32767	-
	61	User function 13	User Func13	0	0-28	-
	62	User function input 13-A	User Input 13-A	0	0-0xFFFF	-
	63	User function input 13-B	User Input 13-B	0	0-0xFFFF	-
	64	User function input 13-C	User Input 13-C	0	0-0xFFFF	-
	65	User function output 13	User Output 13	0	-32767- 32767	-
	66	User function 14	User Func14	0	0-28	-
	67	User function input 14-A	User Input 14-A	0	0-0xFFFF	-
	68	User function input 14-B	User Input 14-B	0	0-0xFFFF	-
	69	User function input 14-C	User Input 14-C	0	0-0xFFFF	-
	70	User function output 14	User Output 14	0	-32767- 32767	-
	71	User function 15	User Func15	0	0-28	-
	72	User function input 15-A	User Input 15-A	0	0-0xFFFF	-
	73	User function input 15-B	User Input 15-B	0	0-0xFFFF	-
	74	User function input 15-C	User Input 15-C	0	0-0xFFFF	-
	75	User function output 15	User Output 15	0	-32767- 32767	-
	76	User function 16	User Func16	0	0-28	-
	77	User function input 16-A	User Input 16-A	0	0-0xFFFF	-
	78	User function input 16-B	User Input 16-B	0	0-0xFFFF	-
	79	User function input 16-C	User Input 16-C	0	0-0xFFFF	-
	80	User function output 16	User Output 16	0	-32767- 32767	-
	81	User function 17	User Func17	0	0-28	-
	82	User function input 17-A	User Input 17-A	0	0-0xFFFF	-
	83	User function input 17-B	User Input 17-B	0	0-0xFFFF	-
	84	User function input 17-C	User Input 17-C	0	0-0xFFFF	-

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
	85	User function output 17	User Output 17	0	-32767– 32767	-
	86	User function 18	User Func18	0	0–28	-
	87	User function input 18-A	User Input 18-A	0	0–0xFFFF	-
	88	User function input 18-B	User Input 18-B	0	0–0xFFFF	-
	89	User function input 18-C	User Input 18-C	0	0–0xFFFF	-
	90	User function output 18	User Output 18	0	-32767– 32767	-

User Sequence Setting Details

Code	Description
APP-02 User Seq En	Display the parameter groups related to a user sequence.
USS-01 User Seq Con	Set Sequence Run and Sequence Stop with the keypad. Parameters cannot be adjusted during an operation. To adjust parameters, the operation must be stopped.
USS-02 User Loop Time	Set the user sequence Loop Time. User sequence loop time can be set to 0.01s/0.02s/ 0.05s/0.1s/0.5s/1s.
USS-11–28 Link UserOut1–18	Set parameters to connect 18 Function Blocks. If the input value is 0x0000, an output value cannot be used. To use the output value in step 1 for the frequency reference (Cmd Frequency), input the communication address (0x1101) of the Cmd frequency as the Link UserOut1 parameter.
USS-31–60 Void Para1–30	Set 30 void parameters. Use when constant (Const) parameter input is needed in the user function block.
USF-01–90	Set user defined functions for the 18 function blocks. If the function block setting is invalid, the output of the User Output@ is -1. All the outputs from the User Output@ are read only, and can be used with the user output link@ (Link UserOut@) of the USS group.

Function Block Parameter Structure

Type	Description
User Func @*	Choose the function to perform in the function block.
User Input @-A	Communication address of the function's first input parameter.
User Input @-B	Communication address of the function's second input parameter.
User Input @-C	Communication address of the function's third input parameter.
User Output @	Output value (Read Only) after performing the function block.

* @ is the step number (1-18).

User Function Operation Condition

Number	Type	Description
0	NOP	No Operation.
1	ADD	Addition operation, $(A + B) + C$ If the C parameter is 0x0000, it will be recognized as 0.
2	SUB	Subtraction operation, $(A - B) - C$ If the C parameter is 0x0000, it will be recognized as 0.
3	ADDSUB	Addition and subtraction compound operation, $(A + B) - C$ If the C parameter is 0x0000, it will be recognized as 0.
4	MIN	Output the smallest value of the input values, MIN(A, B, C). If the C parameter is 0x0000, operate only with A, B.
5	MAX	Output the largest value of the input values, MAX(A, B, C). If the C parameter is 0x0000, operate only with A, B.
6	ABS	Output the absolute value of the A parameter, $ A $. This operation does not use the B, or C parameter.
7	NEGATE	Output the negative value of the A parameter, $-(A)$. This operation does not use the B, or C parameter.
8	REMAINDER	Remainder operation of A and B, $A \% B$ This operation does not use the C parameter.
9	MPYDIV	Multiplication, division compound operation, $(A \times B)/C$. If the C parameter is 0x0000, output the multiplication operation of $(A \times B)$.
10	COMPARE-GT (greater than)	Comparison operation: if $(A > B)$ the output is C; if $(A \leq B)$ the output is 0. If the condition is met, the output parameter is C. If the condition is not met, the output is 0(False). If the C parameter is 0x0000 and if the condition is met, the output is 1(True).
11	COMPARE-GTEQ (great than or equal to)	Comparison operation; if $(A \geq B)$ output is C; if $(A < B)$ the output is 0. If the condition is met, the output parameter is C. If the condition is not met, the output is 0(False). If the C parameter is 0x0000 and if the condition is met, the output is 1(True).
12	COMPARE-EQUAL	Comparison operation, if $(A == B)$ then the output is C. For all other values the output is 0. If the condition is met, the output parameter is C. if the condition is not met, the output is 0(False). If the C parameter is 0x0000 and if the condition is met, the output is 1(True).
13	COMPARE-NEQUAL	Comparison operation, if $(A != B)$ then the output is C. For all other values the output is 0. If the condition is met, the output parameter is C. If the condition is not met, the output is 0(False). If the C parameter is 0x0000 and if the condition is met, the output is 1(True).
14	TIMER	Adds 1 each time a user sequence completes a loop. A: Max Loop, B: Timer Run/Stop, C: Choose output mode. If input of B is 1, timer stops (output is 0). If input is 0, timer runs. If input of C is 1, output the current timer value. If input of C is 0, output 1 when timer value exceeds A(Max) value.

Number	Type	Description
		If the C parameter is 0x0000, C will be recognized as 0. Timer overflow Initializes the timer value to 0.
15	LIMIT	Sets a limit for the A parameter. If input to A is between B and C, output the input to A. If input to A is larger than B, output B. If input of A is smaller than C, output C. B parameter must be greater than or equal to the C parameter.
16	AND	Output the AND operation, (A and B) and C. If the C parameter is 0x0000, operate only with A, B.
17	OR	Output the OR operation, (A B) C. If the C parameter is 0x0000, operate only with A, B.
18	XOR	Output the XOR operation, (A ^ B) ^ C. If the C parameter is 0x0000, operate only with A, B.
19	AND/OR	Output the AND/OR operation, (A and B) C. If the C parameter is 0x0000, operate only with A, B.
20	SWITCH	Output a value after selecting one of two inputs, if (A) then B otherwise C. If the input at A is 1, the output will be B. If the input at A is 0, the output parameter will be C.
21	BITTEST	Test the B bit of the A parameter, BITTEST(A, B). If the B bit of the A input is 1, the output is 1. If it is 0, then the output is 0. The input value of B must be between 0–16. If the value is higher than 16, it will be recognized as 16. If input at B is 0, the output is always 0.
22	BITSET	Set the B bit of the A parameter, BITSET(A, B). Output the changed value after setting the B bit to input at A. The input value of B must be between 0–16. If the value is higher than 16, it will be recognized as 16. If the input at B is 0, the output is always 0. This operation does not use the C parameter.
23	BITCLEAR	Clear the B bit of the A parameter, BITCLEAR(A, B). Output the changed value after clearing the B bit to input at A. The input value of B must be between 0–16. If the value is higher than 16, it will be recognized as 16. If the input at B is 0, the output is always 0. This operation does not use the C parameter.
24	LOWPASSFILTER	Output the input at A as the B filter gains time constant, $B \times US-02$ (US Loop Time). In the above formula, set the time when the output of A reaches 63.3% C stands for the filter operation. If it is 0, the operation is started.
25	PI_CONTROL	P, I gain = A, B parameter input, then output as C. Conditions for PI_PROCESS output: C = 0: Const PI, C = 1: PI_PROCESS-B >= PI_PROCESS-OUT >= 0, C = 2: PI_PROCESS-B >= PI_PROCESS-OUT >= -(PI_PROCESS-B), P gain = A/100, I gain = 1/(Bx Loop Time), If there is an error with PI settings, output -1.
26	PI_PROCESS	A is an input error, B is an output limit, C is the value of Const PI output.

Number	Type	Description
		Range of C is 0–32,767.
27	UPCOUNT	<p>Upcounts the pulses and then output the value- UPCOUNT(A, B, C). After receiving a trigger input (A), outputs are upcounted by C conditions. If the B inputs is 1, do not operate and display 0. If the B inputs is 0, operate. If the C parameter is 0, upcount when the input at A changes from 0 to 1. If the C parameter is 1, upcount when the input at A is changed from 1 to 0. If the C parameter is 2, upcount whenever the input at A changes.</p> <p>Output range is: 0–32767</p>
28	DOWNCOUNT	<p>Downcounts the pulses and then output the value- DOWNCOUNT(A, B, C). After receiving a trigger input (A), outputs are downcounted by C conditions. If the B input is 1, do not operate and display the initial value of C. If the B input is 0, operate. Downcounts when the A parameter changes from 0 to 1.</p>

Note

The PI process block (PI_PROCESS Block) must be used after the PI control block (PI_CONTROL Block) for proper PI control operation. PI control operation cannot be performed if there is another block between the two blocks, or if the blocks are placed in an incorrect order.

⚠ Caution

User sequence features work only with code version 1.00, IO S/W version 0.11, and keypad S/W version 1.07 or higher versions.

4.24 Fire Mode Operation

This function is used to allow the inverter to ignore minor faults during emergency situations, such as fire, and provides continuous operation to fire pumps.

When turned on, Fire mode forces the inverter to ignore all minor fault trips and repeat a Reset and Restart for major fault trips, regardless of the restart trial count limit. The retry delay time set at PRT-10 (Retry Delay) still applies while the inverter performs a Reset and Restart.

Fire Mode Parameter Settings

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
ADV	80	Fire Mode selection	Fire Mode Sel	2	Fire Mode	0–2	-
	81	Fire Mode frequency	Fire Mode Freq	0–50		0–50	
	82	Fire Mode run direction	Fire Mode Dir	0 (Forward)		0–1	
	83	Fire Mode operation count	Fire Mode Cnt	Not configurable		-	-
IN	65–71	Px terminal configuration	Px Define (Px: P1–P7)	51	Fire Mode	0–54	-

The inverter runs in Fire mode when ADV-80 (Fire Mode Sel) is set to '2 (Fire Mode)', and the multi-function terminal (IN-65–71) configured for Fire mode (51: Fire Mode) is turned on. The Fire mode count increases by 1 at ADV-83 (Fire Mode Count) each time a Fire mode operation is run.

⚠ Caution

Fire mode operation may result in inverter malfunction. Note that Fire mode operation voids the product warranty – the inverter is covered by the product warranty only when the Fire mode count is '0'.

Fire Mode Function Setting Details

Code	Description	Details
ADV-81 Fire Mode frequency	Fire mode frequency reference	The frequency set at ADV-81 (Fire mode frequency) is used for the inverter operation in Fire mode. The Fire mode frequency takes priority over the Jog frequency, Multi-step frequencies, and the keypad input frequency.
DRV-03 Acc Time / DRV-04 Dec Time	Fire mode Acc/Dec times	When Fire mode operation is turned on, the inverter accelerates for the time set at DRV-03 (Acc Time), and then decelerates based on the deceleration time set at DRV-04 (Dec Time). It stops when the Px terminal input is turned off (Fire mode operation is turned off).
PRT-10 Retry Delay	Fault trip process	<p>Some fault trips are ignored during Fire mode operation. The fault trip history is saved, but trip outputs are disabled even when they are configured at the multi-function output terminals.</p> <p>Fault trips that are ignored in Fire mode BX, External Trip, Low Voltage Trip, Inverter Overheat, Inverter Overload, Overload, Electrical Thermal Trip, Input/Output Open Phase, Motor Overload, Fan Trip, No Motor Trips, and other minor fault trips.</p> <p>For the following fault trips, the inverter performs a Reset and Restart until the trip conditions are released. The retry delay time set at PRT-10 (Retry Delay) applies while the inverter performs a Reset and Restart.</p> <p>Fault trips that force a Reset Restart in Fire mode Over Voltage, Over Current1(OC1), Ground Fault Trip</p> <p>The inverter stops operating when the following fault trips occur:</p> <p>Fault trips that stop inverter operation in Fire mode H/W Diag, Over Current 2 (Arm-Short)</p>

5 RS-485 Communication Features

This section in the user manual explains how to control the inverter with a PLC or a computer over a long distance using the RS-485 communication features. To use the RS-485 communication features, connect the communication cables and set the communication parameters on the inverter. Refer to the communication protocols and parameters to configure and use the RS-485 communication features.

5.1 Communication Standards

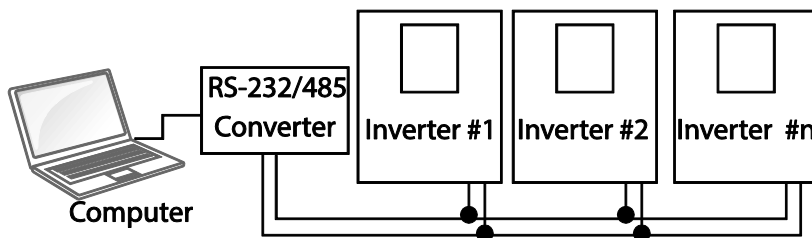
Following the RS-485 communication standards, MD100G products exchange data with a PLC and computer. The RS-485 communication standards support the Multi-drop Link System and offer an interface that is strongly resistant to noise. Please refer to the following table for details about the communication standards.

Item	Standard
Communication method/ Transmission type	RS-485/Bus type, Multi-drop Link System
Inverter type name	MD100G
Number of connected inverters/ Transmission distance	Maximum of 16 inverters / Maximum 1,200 m (recommended distance: within 700 m)
Recommended cable size	0.75 mm ² , (18AWG), Shielded Type Twisted-Pair (STP) Wire
Installation type	Dedicated terminals (S+/S-/SG) on the control terminal block
Power supply	Supplied by the inverter - insulated power source from the inverter's internal circuit
Communication speed	1,200/2,400/9,600/19,200/38,400/57,600/115,200 bps
Control procedure	Asynchronous communications system
Communication system	Half duplex system
Character system	Modbus-RTU: Binary / LS Bus: ASCII
Stop bit length	1-bit/2-bit
Frame error check	2 bytes
Parity check	None/Even/Odd

5.2 Communication System Configuration

In an RS-485 communication system, the PLC or computer is the master device and the inverter is the slave device. When using a computer as the master, the RS-232 converter must be integrated with the computer, so that it can communicate with the inverter through the RS-232/RS-485 converter. Specifications and performance of converters may vary depending on the manufacturer, but the basic functions are identical. Please refer to the converter manufacturer's user manual for details about features and specifications.

Connect the wires and configure the communication parameters on the inverter by referring to the following illustration of the communication system configuration.



5.2.1 Communication Line Connection

Make sure that the inverter is turned off completely, and then connect the RS-485 communication line to the S+/-/SG terminals of the terminal block. The maximum number of inverters you can connect is 16. For communication lines, use shielded twisted pair (STP) cables.

The maximum length of the communication line is 1,200 meters, but it is recommended to use no more than 700 meters of communication line to ensure stable communication. Please use a repeater to enhance the communication speed when using a communication line longer than 1,200 meters or when using a large number of devices. A repeater is effective when smooth communication is not available due to noise interference.

ⓘ Caution

When wiring the communication line, make sure that the SG terminals on the PLC and inverter are connected. SG terminals prevent communication errors due to electronic noise interference.

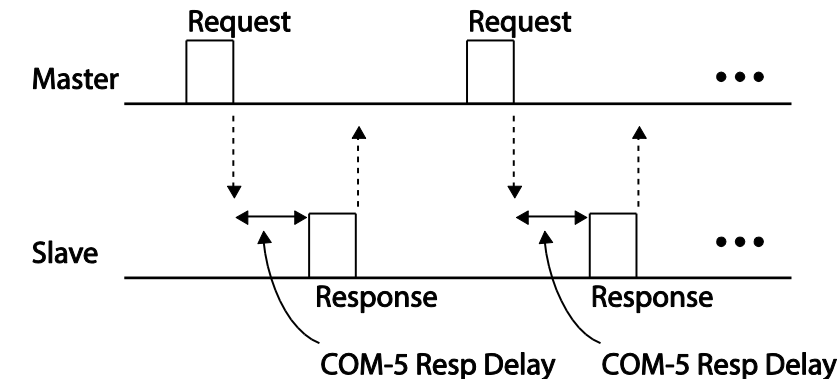
5.2.2 Setting Communication Parameters

Before proceeding with setting communication configurations, make sure that the communication lines are connected properly. Turn on the inverter and set the communication parameters.

Group	Code	Name	LCD Display	Parameter Setting		Setting range	Unit
COM	01	Built-in communication inverter ID	Int485 St ID	1		1-250	-
	02	Built-in communication protocol	Int485 Proto	0	ModBus RTU	0, 2	-
	03	Built-in communication speed	Int485 BaudR	3	9600 bps	0-7	-
	04	Built-in communication frame setting	Int485 Mode	0	D8/PN/S1	0-3	-
	05	Transmission delay after reception	Resp Delay	5		0-1000	ms

Communication Parameters Setting Details

Code	Description		
COM-01 Int485 St ID	Set the inverter station ID between 1 and 250.		
COM-02 Int485 Proto	Select one of the two built-in protocols: Modbus-RTU or LS INV 485.		
	Setting		Function
	0	Modbus-RTU	Modbus-RTU compatible protocol
	2	LS INV 485	Dedicated protocol for the LS inverter
COM-03 Int485 BaudR	Set a communication setting speed up to 115,200 bps.		
	Setting		Function
	0		1,200 bps
	1		2,400 bps
	2		4,800 bps
	3		9,600 bps
	4		19,200 bps
	5		38,400 bps
	6		56K bps
	7		115 Kbps
COM-04 Int485 Mode	Set a communication configuration. Set the data length, parity check method, and the number of stop bits.		
	Setting		Function
	0	D8/PN/S1	8-bit data / no parity check / 1 stop bit

Code	Description		
	1	D8/PN/S2	8-bit data / no parity check / 2 stop bits
	2	D8/PE/S1	8-bit data / even parity / 1 stop bit
	3	D8/PO/S1	8-bit data / odd parity / 1 stop bit
COM-05 Resp Delay	<p>Set the response time for the slave (inverter) to react to the request from the master. Response time is used in a system where the slave device response is too fast for the master device to process. Set this code to an appropriate value for smooth master-slave communication.</p> 		

5.2.3 Setting Operation Command and Frequency

To select the built-in RS485 communication as the source of command, set the DRV-06 code to 3 (Int485). Then, set common area parameters for the operation command and frequency via communication.

Group	Code	Name	LCD Display	Parameter Setting		Setting range	Unit
DRV	06	Command source	Cmd Source	3	Int 485	0-4	-
	07	Frequency setting method	Freq Ref Src	6	Int 485	0-12	-

5.2.4 Command Loss Protective Operation

Configure the command loss decision standards and protective operations run when a communication problem lasts for a specified period of time.

Command Loss Protective Operation Setting Details

Code	Description		
PRT-12 Lost Cmd Mode, PRT-13 Lost Cmd Time	Select the operation to run when a communication error has occurred and lasted exceeding the time set at PRT- 13.		
	Setting		Function
	0	None	The speed command immediately becomes the operation frequency without any protection function.
	1	Free-Run	The inverter blocks output. The motor performs in free-run condition.
	2	Dec	The motor decelerates and then stops at the time set at PRT-07 (Trip Dec Time).
	3	Hold Input	The inverter calculates the average input value for 10 seconds before the loss of the speed command and uses it as the speed reference.
	4	Hold Output	The inverter calculates the average output value for 10 seconds before the loss of the speed command and uses it as the speed reference.
	5	Lost Preset	The inverter operates at the frequency set at PRT-14 (Lost Preset F).

5.2.5 Setting Virtual Multi-Function Input

Multi-function input can be controlled using a communication address (0h0385). Set codes COM-70–77 to the functions to operate, and then set the BIT relevant to the function to 1 at 0h0322 to operate it. Virtual multi-function operates independently from IN-65-71 analog multi-function inputs and cannot be set redundantly. Virtual multi-function input can be monitored using COM-86 (Virt DI Status). Before you configure the virtual multi-function inputs, set the DRV-06 code according to the command source.

Group	Code	Name	LCD Display	Parameter Setting		Setting range	Unit
COM	70-77	Communication multi-function input x	Virtual DI x (x: 1-8)	0	None	0-49	-
	86	Communication multi-function input monitoring	Virt DI Status	-	-	-	-

Example: When sending an Fx command by controlling virtual multi-function input in the common area via Int485, set COM-70 to FX and set address 0h0322 to 0h0001.

Note

The following are values and functions that are applied to address 0h0322:.

Setting	Function
0h0001	Forward operation (Fx)
0h0003	Reverse operation (Rx)
0h0000	Stop

5.2.6 Saving Parameters Defined by Communication

If you turn off the inverter after setting the common area parameters or keypad parameters via communication and operate the inverter, the changes are lost and the values changed via communication revert to the previous setting values when you turn on the inverter.

Set CNF-48 to 1 (Yes) to allow all the changes over communication to be saved, so that the inverter retains all the existing values even after the power has been turned off.

Setting address 0h03E0 to 0 and then setting it again to 1 via communication allows the existing parameter settings to be saved. However, setting address 0h03E0 to 1 and then setting it to 0 does not carry out the same function.

Group	Code	Name	LCD Display	Parameter Setting		Setting range	Unit
CNF	48	Save parameters	Parameter Save	0	No	0-1	-
				1	Yes		

5.2.7 Total Memory Map for Communication

Communication Area	Memory Map	Details
Communication common compatible area	0h0000-0h00FF	iS5, iP5A, iV5, iG5A compatible area
Parameter registration type area	0h0100-0h01FF	Areas registered at COM-31–38 and COM-51–58
	0h0200-0h023F	Area registered for User Group
	0h0240-0h027F	Area registered for Macro Group
	0h0280-0h02FF	Reserved
MD100G communication common area	0h0300-0h037F	Inverter monitoring area
	0h0380-0h03DF	Inverter control area
	0h03E0-0h03FF	Inverter memory control area
	0h0400-0h0FFF	Reserved
	0h1100	DRV Group
	0h1200	BAS Group
	0h1300	ADV Group
	0h1400	CON Group
	0h1500	IN Group
	0h1600	OUT Group
	0h1700	COM Group
	0h1800	APP Group
	0h1B00	PRT Group
	0h1C00	M2 Group

5.2.8 Parameter Group for Data Transmission

By defining a parameter group for data transmission, the communication addresses registered in the communication function group (COM) can be used in communication. Parameter group for data transmission may be defined to transmit multiple parameters at once, into the communication frame.

Group	Code	Name	LCD Display	Parameter Setting		Setting range	Unit
COM	31-38	Output communication address x	Para Status-x	-	-	0000-FFFF	Hex
	51-58	Input communication address x	Para Control-x	-	-	0000-FFFF	Hex

Currently Registered CM Group Parameter

Address	Parameter	Assigned content by bit
0h0100-0h0107	Status Parameter-1- Status Parameter-8	Parameter communication code value registered at COM-31-38 (Read-only)
0h0110-0h0117	Control Parameter-1- Control Parameter-8	Parameter communication code value registered at COM-51-58 (Read/Write access)

Note

When registering control parameters, register the operation speed (0h0005, 0h0380, 0h0381) and operation command (0h0006, 0h0382) parameters at the end of a parameter control frame. For example, when the parameter control frame has 5 parameter control items (Para Control - x), register the operation speed at Para Control-4 and the operation command to Para Control-5.

5.3 Communication Protocol

The built-in RS-485 communication supports LS INV 485 and Modbus-RTU protocols.

5.3.1 LS INV 485 Protocol

The slave device (inverter) responds to read and write requests from the master device (PLC or PC).

Request

ENQ	Station ID	CMD	Data	SUM	EOT
1 byte	2 bytes	1 byte	n bytes	2 bytes	1 byte

Normal Response

ACK	Station ID	CMD	Data	SUM	EOT
1 byte	2 bytes	1 byte	n x 4 bytes	2 bytes	1 byte

Error Response

NAK	Station ID	CMD	Error code	SUM	EOT
1 byte	2 bytes	1 byte	2 bytes	2 bytes	1 byte

- A request starts with ENQ and ends with EOT.
- A normal response starts with ACK and ends with EOT.
- An error response starts with NAK and ends with EOT.
- A station ID indicates the inverter number and is displayed as a two-byte ASCII-HEX string that uses characters 0-9 and A-F.
- CMD: Uses uppercase characters (returns an IF error if lowercase characters are encountered)—please refer to the following table.

Character	ASCII-HEX	Command
'R'	52h	Read
'W'	57h	Write
'X'	58h	Request monitor registration
'Y';	59h	Perform monitor registration

- Data: ASCII-HEX (for example, when the data value is 3000: 3000 → '0"B"B"8'h → 30h 42h 42h 38h)

- Error code: ASCII-HEX (refer to [5.3.1.4 Error Code](#) on page 141)
- Transmission/reception buffer size: Transmission=39 bytes, Reception=44 bytes
- Monitor registration buffer: 8 Words
- SUM: Checks communication errors via sum.
SUM=a total of the lower 8 bits values for station ID, command and data (Station ID+CMD+Data) in ASCII-HEX.
For example, a command to read 1 address from address 3000:
SUM='0'+ '1'+ 'R'+ '3'+ '0'+ '0'+ '0'+ '1' = 30h+31h+52h+33h+30h+30h+30h+31h = 1A7h (the control value is not included: ENQ, ACK, NAK, etc.).

ENQ	Station ID	CMD	Address	Number of Addresses	SUM	EOT
05h	'01'	'R'	'3000'	'1'	'A7'	04h
1 byte	2 bytes	1 byte	4 bytes	1 byte	2 bytes	1 byte

Note

Broadcasting

Broadcasting sends commands to all inverters connected to the network simultaneously. When commands are sent from station ID 255, each inverter acts on the command regardless of the station ID. However no response is issued for commands transmitted by broadcasting.

5.3.1.1 Detailed Read Protocol

Read Request: Reads successive n words from address XXXX.

ENQ	Station ID	CMD	Address	Number of Addresses	SUM	EOT
05h	'01'-FA'	'R'	'XXXX'	'1'-8' = n	'XX'	04h
1 byte	2 bytes	1 byte	4 bytes	1 byte	2 bytes	1 byte

Total bytes=12. Characters are displayed inside single quotation marks(').

Read Normal Response

ACK	Station ID	CMD	Data	SUM	EOT
06h	'01'-FA'	'R'	'XXXX'	'XX'	04h
1 byte	2 bytes	1 byte	n x 4 bytes	2 bytes	1 byte

Total bytes= (7 x n x 4): a maximum of 39

Read Error Response

NAK	Station ID	CMD	Error code	SUM	EOT
15h	'01'-'FA'	'R'	'**'	'XX'	04h
1 byte	2 bytes	1 byte	2 bytes	2 bytes	1 byte

Total bytes=9

5.3.1.2 Detailed Write Protocol

Write Request: Writes successive n words to address XXXX.

ENQ	Station ID	CMD	Address	Number of Addresses	Data	SUM	EOT
05h	'01'-'FA'	'W'	'XXXX'	'1'-'8' = n	'XXXX...'	'XX'	04h
1 byte	2 bytes	1 byte	4 bytes	1 byte	n x 4 bytes	2 bytes	1 byte

Total bytes= (12 + n x 4): a maximum of 44

Write Normal Response

ACK	Station ID	CMD	Data	SUM	EOT
06h	'01'-'FA'	'W'	'XXXX...'	'XX'	04h
1 byte	2 bytes	1 byte	n x 4 bytes	2 bytes	1 byte

Total bytes= (7 + n x 4): a maximum of 39

Write Error Response

NAK	Station ID	CMD	Error Code	SUM	EOT
15h	'01'-'FA'	'W'	'**'	'XX'	04h
1 byte	2 bytes	1 byte	2 bytes	2 bytes	1 byte

Total bytes=9

5.3.1.3 Monitor Registration Detailed Protocol

Monitor registration request is made to designate the type of data that requires continuous monitoring and periodic updating.

Monitor Registration Request: Registration requests for n addresses (where n refers to the number of addresses. The addresses do not have to be contiguous.)

ENQ	Station ID	CMD	Number of Addresses	Address	SUM	EOT
05h	'01'-FA'	'X'	'1'-8'=n	'XXXX...'	'XX'	04h
1 byte	2 bytes	1 byte	1 byte	n x 4 bytes	2 bytes	1 byte

Total bytes= (8 + n x 4): a maximum of 40

Monitor Registration Normal Response

ACK	Station ID	CMD	SUM	EOT
06h	'01'-FA'	'X'	'XX'	04h
1 byte	2 bytes	1 byte	2 bytes	1 byte

Total bytes=7

Monitor Registration Error Response

NAK	Station ID	CMD	Error Code	SUM	EOT
15h	'01'-FA'	'X'	'**'	'XX'	04h
1 byte	2 bytes	1 byte	2 bytes	2 bytes	1 byte

Total bytes=9

Monitor Registration Perform Request: A data read request for a registered address, received from a monitor registration request

ENQ	Station ID	CMD	SUM	EOT
05h	'01'-FA'	'Y'	'XX'	04h
1 byte	2 bytes	1 byte	2 bytes	1 byte

Total bytes=7

Monitor Registration Execution Normal Response

ACK	Station ID	CMD	Data	SUM	EOT
06h	'01'-FA'	'Y'	'XXXX...'	'XX'	04h
1 byte	2 bytes	1 byte	n x 4 bytes	2 bytes	1 byte

Total bytes= (7 + n x 4): a maximum of 39

Monitor Registration Execution Error Response

NAK	Station ID	CMD	Error Code	SUM	EOT
15h	'01'-'FA'	'Y'	'**'	'XX'	04h
1 byte	2 bytes	1 byte	2 bytes	2 bytes	1 byte

Total bytes=9

5.3.1.4 Error Code

Code	Abbreviation	Description
ILLEGAL FUNCTION	IF	The requested function cannot be performed by a slave because the corresponding function does not exist.
ILLEGAL DATA ADDRESS	IA	The received parameter address is invalid at the slave.
ILLEGAL DATA VALUE	ID	The received parameter data is invalid at the slave.
WRITE MODE ERROR	WM	Tried writing (W) to a parameter that does not allow writing (read-only parameters, or when writing is prohibited during operation)
FRAME ERROR	FE	The frame size does not match.

5.3.1.5 ASCII Code

Character	Hex	Character	Hex	Character	Hex
A	41	q	71	@	40
B	42	r	72	[5B
C	43	s	73	\	5C
D	44	t	74]	5D
E	45	u	75		5E
F	46	v	76		5F
G	47	w	77		60
H	48	x	78	{	7B
I	49	y	79		7C
J	4A	z	7A	}	7D
K	4B	0	30	-	7E
L	4C	1	31	BEL	07
M	4D	2	32	BS	08
N	4E	3	33	CAN	18
O	4F	4	34	CR	0D
P	50	5	35	DC1	11
Q	51	6	36	DC2	12
R	52	7	37	DC3	13
S	53	8	38	DC4	14
T	54	9	39	DEL	7F

Character	Hex	Character	Hex	Character	Hex
U	55	space	20	DLE	10
V	56	!	21	EM	19
W	57	"	22	ACK	06
X	58	#	23	ENQ	05
Y	59	\$	24	EOT	04
Z	5A	%	25	ESC	1B
a	61	&	26	ETB	17
b	62	'	27	ETX	03
c	63	(28	FF	0C
d	64)	29	FS	1C
e	65	*	2A	GS	1D
f	66	+	2B	HT	09
g	67	,	2C	LF	0A
h	68	-	2D	NAK	15
i	69	.	2E	NUL	00
j	6A	/	2F	RS	1E
k	6B	:	3A	S1	0F
l	6C	;	3B	SO	0E
m	6D	<	3C	SOH	01
n	6E	=	3D	STX	02
o	6F	>	3E	SUB	1A
p	70	?	3F	SYN	16
				US	1F
				VT	0B

5.3.2 Modbus-RTU Protocol

5.3.2.1 Function Code and Protocol (unit: byte)

In the following section, station ID is the value set at COM-01 (Int485 St ID), and starting address is the communication address. (starting address size is in bytes). For more information about communication addresses, refer to [5.4 Compatible Common Area Parameter](#) on page [146](#).

Function Code #03: Read Holding Register

Query Field Name	Response Field Name
Station ID	Station ID
Function(0x03)	Function (0x03)
Starting Address Hi	Byte Count
Starting Address Lo	Data Hi
# of Points Hi	Data Lo
# of Points Lo	...
CRC Lo	...
CRC Hi	Data Hi
	Data Lo
	CRC Lo
	CRC Hi

number of Points

Function Code #04: Read Input Register

Query Field Name	Response Field Name
Station ID	Station ID
Function(0x04)	Function (0x04)
Starting Address Hi	Byte Count
Starting Address Lo	Data Hi
# of Points Hi	Data Lo
# of Points Lo	...
CRC Lo	...
CRC Hi	Data Hi
	Data Lo
	CRC Lo
	CRC Hi

number of Points

Function Code #06: Preset Single Register

Query Field Name	Response Field Name
Station ID	Station ID
Function (0x06)	Function (0x06)
Starting Address Hi	Register Address Hi
Register Address Lo	Register Address Lo
Preset Data Hi	Preset Data Hi
Preset Data Lo	Preset Data Lo
CRC Lo	CRC Lo
CRC Hi	CRC Hi

Function Code #16 (hex 0h10): Preset Multiple Register

Query Field Name	Response Field Name
Station ID	Station ID
Function (0x10)	Function (0x10)
Starting Address Hi	Starting Address Hi
Starting Address Lo	Starting Address Lo
# of Register Hi	# of Register Hi
# of Register Lo	# of Register Lo
Byte Count	CRC Lo
Data Hi	CRC Hi
Data Lo	
...	
...	
Data Hi	
Data Lo	
CRC Lo	
CRC Hi	

number of Points

Exception Code

Code
01: ILLEGAL FUNCTION
02: ILLEGAL DATA ADDRESS
03: ILLEGAL DATA VALUE
06: SLAVE DEVICE BUSY

Response

Field Name
Station ID
Function*
Exception Code
CRC Lo
CRC Hi

* The function value uses the top level bit for all query values.

Example of Modbus-RTU Communication in Use

When the Acc time (Communication address 0x1103) is changed to 5.0 sec and the Dec time (Communication address 0x1104) is changed to 10.0 sec.

Frame Transmission from Master to Slave (Request)

Item	Station ID	Function	Starting Address	# of Register	Byte Count	Data 1	Data 2	CRC
Hex	0x01	0x10	0x1102	0x0002	0x04	0x0032	0x0064	0x1202
Description	COM-01 Int485 St ID	Preset Multiple Register	Starting Address -1 (0x1103-1)	-	-	50 (ACC time 5.0sec)	100 (DEC time 10.0sec)	-

Frame Transmission from Slave to Master (Response)

Item	Station ID	Function	Starting Address	# of Register	CRC
Hex	0x01	0x10	0x1102	0x0002	0xE534
Description	COM-01 Int485 St ID	Preset Multiple Register	Starting Address -1 (0x1103-1)	-	-

5.4 Compatible Common Area Parameter

The following are common area parameters compatible with iS5, iP5A, iV5, and iG5A.

Comm. Address	Parameter	Scale	Unit	R/W	Assigned Content by Bit	
0h0000	Inverter model	-	-	R	6: MD100G	
0h0001	Inverter capacity	-	-	R	0: 0.75 kW, 1: 1.5 kW, 2: 2.2 kW 3: 3.7 kW, 4: 5.5 kW, 5: 7.5 kW 6: 11 kW, 7: 15 kW, 8: 18.5 kW 9: 22 kW 10: 30 kW, 11: 37 kW 12: 45 kW 13: 55 kW, 14: 75 kW 256: 0.4 kW, 257: 1.1 kW, 258: 3.0 kW 259: 4.0 kW	
0h0002	Inverter input voltage	-	-	R	0: 220 V product 1: 440 V product	
0h0003	Version	-	-	R	Example 0h0100: Version 1.00 Example 0h0101: Version 1.01	
0h0004	Reserved	-	-	R/W		
0h0005	Command frequency	0.01	Hz	R/W		
0h0006	Operation command (option)	-	-	R	B15	Reserved
					B14	0: Keypad Freq,
					B13	1: Keypad Torq
					B12	2-16: Terminal block multi-
					B11	step speed
					B10	17: Up, 18: Down
					B9	19: STEADY
						22: V1, 24: V2, 25: I2,
						26: Reserved
						27: Built-in 485
						28: Communication option
						30: JOG, 31: PID
				B8	0: Keypad	
				B7	1: Fx/Rx-1	
				B6	2: Fx/Rx-2	
					3: Built-in 485	
4: Communication option						
R/W	B5	Reserved				
	B4	Emergency stop				
	B3	W: Trip initialization (0→1), R: Trip status				
	B2	Reverse operation (R)				
	B1	Forward operation (F)				
	B0	Stop (S)				
0h0007	Acceleration time	0.1	s	R/W	-	

Comm. Address	Parameter	Scale	Unit	R/W	Assigned Content by Bit	
0h0008	Deceleration time	0.1	s	R/W	-	
0h0009	Output current	0.1	A	R	-	
0h000A	Output frequency	0.01	Hz	R	-	
0h000B	Output voltage	1	V	R	-	
0h000C	DC link voltage	1	V	R	-	
0h000D	Output power	0.1	kW	R	-	
0h000E	Operation status	-	-	R	B15	0: Remote, 1: Keypad Local
					B14	1: Frequency command source by communication (built-in, option)
					B13	1: Operation command source by communication (built-in, option)
					B12	Reverse operation command
					B11	Forward operation command
					B10	Brake release signal
					B9	Jog mode
					B8	Drive stopped.
					B7	DC Braking
					B6	Speed reached
					B5	Decelerating
					B4	Accelerating
					B3	Fault Trip - operates according to PRT-30 setting
					B2	Operating in reverse direction
0h000F	Fault trip information	-	-	R	B1	Operating in forward direction
					B0	Stopped
					B15	Reserved
					B14	Reserved
					B13	Reserved
					B12	Reserved
					B11	Reserved
					B10	H/W-Diag
					B9	Reserved
					B8	Reserved
					B7	Reserved
					B6	Reserved
					B5	Reserved
					B4	Reserved
					B3	Level Type trip
					B2	Reserved
					B1	Reserved

Comm. Address	Parameter	Scale	Unit	R/W	Assigned Content by Bit	
					B0	Latch Type trip
0h0010	Input terminal information	-	-	R	B15-B7	Reserved
					B6	P7
					B5	P6
					B4	P5
					B3	P4
					B2	P3
					B1	P2
					B0	P1
0h0011	Output terminal information	-	-	R	B15	Reserved
					B14	Reserved
					B13	Reserved
					B12	Reserved
					B11	Reserved
					B10	Reserved
					B9	Reserved
					B8	Reserved
					B7	Reserved
					B6	Reserved
					B5	Reserved
					B4	Reserved
					B3	Reserved
					B2	Reserved
					B1	MO
					B0	Relay 1
0h0012	V1	0.01	%	R	V1 input voltage	
0h0013	V2	0.01	%	R	V2 input voltage	
0h0014	I2	0.01	%	R	I2 input current	
0h0015	Motor rotation speed	1	rpm	R	Displays existing motor rotation speed	
0h0016-0h0019	Reserved	-	-	-	-	
0h001A	Select Hz/rpm	-	-	R	0: Hz unit, 1: rpm unit	
0h001B	Display the number of poles for the selected motor	-	-	R	Display the number of poles for the selected motor	

5.5 MD100G Expansion Common Area Parameter

5.5.1 Monitoring Area Parameter (Read Only)

Comm.	Address	Parameter	Scale	Unit	Assigned content by bit
0h0300		Inverter model	-	-	MD100G: 0006h
0h0301	Inverter capacity	-	-		0.4 kW: 1900h, 0.75 kW: 3200h
					1.1 kW: 4011h, 1.5 kW: 4015h
					2.2 kW: 4022h, 3.0 kW: 4030h
					3.7 kW: 4037h, 4.0 kW: 4040h
					5.5 kW: 4055h, 7.5 kW: 4075h
					11 kW: 40B0h, 15 kW: 40F0h
					18.5 kW: 4125h, 22 kW: 4160h
					30 kW: 41E0h, 37 kW: 4250h
0h0302	Inverter input voltage/power (Single phase, 3-phase)/cooling method	-	-		45 kW: 42D0h, 55 kW: 4370h
					75 kW: 44B0h
					100 V single phase self cooling: 0120h, 200 V 3-phase forced cooling: 0231h
					100 V single phase forced cooling: 0121h, 400 V single phase self cooling: 0420h
					200 V single phase self cooling: 0220h, 400 V 3-phase self cooling: 0430h
					200 V 3-phase self cooling: 0230h, 400 V single phase forced cooling: 0421h
0h0303	Inverter S/W version	-	-		200 V single phase forced cooling: 0221h, 400 V 3-phase forced cooling: 0431h
					(Ex) 0h0100: Version 1.00
0h0304	Reserved	-	-		0h0101: Version 1.01
0h0305	Inverter operation state	-	-	B15	0: Normal state
				B14	4: Warning occurred
				B13	8: Fault occurred [operates according to PRT- 30 (Trip Out Mode) setting.]
				B12	
				B11 -	
				B8	-
				B7	1: Speed searching

Comm. Address	Parameter	Scale	Unit	Assigned content by bit	
				B6	2: Accelerating
				B5	3: Operating at constant rate
				B4	4: Decelerating
					5: Decelerating to stop
					6: H/W OCS
					7: S/W OCS
					8: Dwell operating
				B3	0: Stopped
0h0306	Inverter operation frequency command source	-	-	B2	1: Operating in forward direction
				B1	2: Operating in reverse direction
				B0	3: DC operating (0 speed control)
				B15	Operation command source
				B14	
				B13	
				B12	
				B11	
				B10	
				B9	
				B8	
				B7	Frequency command source
				B6	0: Keypad speed
				B5	1: Keypad torque
				B4	2-4: Up/Down operation speed
				B3	5: V1, 7: V2, 8: I2
				B2	9: Pulse
				B1	10: Built-in RS 485
0h0307	LCD keypad S/W version	-	-	B0	11: Communication option
					13: Jog
					14: PID
					25-39: Multi-step speed frequency
0h0308	LCD keypad title version	-	-	(Ex.) 0h0101: Version 1.01	
0h0309-0h30F	Reserved	-	-	-	
0h0310	Output current	0.1	A	-	
0h0311	Output frequency	0.01	Hz	-	
0h0312	Output rpm	0	rpm	-	
0h0313	Motor feedback speed	0	rpm	-32768 rpm-32767 rpm (directional)	
0h0314	Output voltage	1	V	-	
0h0315	DC Link voltage	1	V	-	

Comm. Address	Parameter	Scale	Unit	Assigned content by bit	
0h0316	Output power	0.1	kW	-	
0h0317	Output torque	0.1	%	-	
0h0318	PID reference	0.1	%	-	
0h0319	PID feedback	0.1	%	-	
0h031A	Display the number of poles for the 1 st motor	-	-	Displays the number of poles for the first motor	
0h031B	Display the number of poles for the 2 nd motor	-	-	Displays the number of poles for the 2nd motor	
0h031C	Display the number of poles for the selected motor	-	-	Displays the number of poles for the selected motor	
0h031D	Select Hz/rpm	-	-	0: Hz, 1: rpm	
0h031E - 0h031F	Reserved	-	-	-	
0h0320	Digital input information			B15	Reserved
				-	-
				B7	Reserved
				B6	P7(I/O board)
				B5	P6(I/O board)
				B4	P5(I/O board)
				B3	P4(I/O board)
				B2	P3(I/O board)
				B1	P2(I/O board)
				B0	P1(I/O board)
0h0321	Digital output information	-	-	B15	Reserved
				-	Reserved
				B4	Reserved
				B3	Reserved
				B2	Reserved
				B1	Q1
				B0	Relay 1
0h0322	Virtual digital input information	-	-	B15	Reserved
				-	Reserved
				B8	Reserved
				B7	Virtual DI 8(COM-77)
				B6	Virtual DI 7(COM-76)
				B5	Virtual DI 6(COM-75)
				B4	Virtual DI 5(COM-74)
				B3	Virtual DI 4(COM-73)
				B2	Virtual DI 3(COM-72)

Comm. Address	Parameter	Scale	Unit	Assigned content by bit	
				B1	Virtual DI 2(COM-71)
				B0	Virtual DI 1(COM-70)
0h0323	Display the selected motor	-	-	0: 1st motor/1: 2nd motor	
0h0324	AI1	0.01	%	Analog input V1 (I/O board)	
0h0325	Reserved	0.01	%		
0h0326	AI3	0.01	%	Analog input V2 (I/O board)	
0h0327	AI4	0.01	%	Analog input I2 (I/O board)	
0h0328	AO1	0.01	%	Analog output 1 (I/O board)	
0h0329	AO2	0.01	%	Analog output 2 (I/O board)	
0h032A	AO3	0.01	%	Reserved	
0h032B	AO4	0.01	%	Reserved	
0h032C	Reserved	-	-	-	
0h032D	Reserved	-	-	-	
0h032E	Reserved	-	-	-	
0h032F	Reserved	-	-	-	
0h0330	Latch type trip information - 1	-	-	BI5	Fuse Open Trip
				BI4	Over Heat Trip
				BI3	Arm Short
				BI2	External Trip
				BI1	Overvoltage Trip
				BI0	Overcurrent Trip
				B9	NTC Trip
				B8	Reserved
				B7	Reserved
				B6	Input open-phase trip
				B5	Output open-phase trip
				B4	Ground Fault Trip
				B3	E-Thermal Trip
				B2	Inverter Overload Trip
				B1	Underload Trip
				B0	Overload Trip
0h0331	Latch type trip information - 2	-	-	BI5	Reserved
				BI4	Reserved
				BI3	Safety option to block inverter output at the terminal block input (only for products rated at 90 kW and above).
				BI2	Reserved
				BI1	Reserved
				BI0	Bad option card
				B9	No motor trip
				B8	External brake trip

Comm. Address	Parameter	Scale	Unit	Assigned content by bit	
				B7	Bad contact at basic I/O board
				B6	Pre PID Fail
				B5	Error while writing parameter
				B4	Reserved
				B3	FAN Trip
				B2	PTC (Thermal sensor) Trip
				B1	Reserved
				B0	MC Fail Trip
0h0332	Level type trip information	-	-	B15	Reserved
				-	-
				B8	Reserved
				B7	Reserved
				B6	Reserved
				B5	SafetyB
				B4	SafetyA
				B3	Keypad Lost Command
				B2	Lost Command
0h0333	H/W Diagnosis Trip information	-	-	B1	LV
				B0	BX
				B15	Reserved
				-	Reserved
				B6	Reserved
				B5	Queue Full
				B4	Reserved
				B3	Watchdog-2 error
0h0334	Warning information	-	-	B2	Watchdog-1 error
				B1	EEPROM error
				B0	ADC error
				B15	Reserved
				-	Reserved
				B10	Reserved
				B9	Auto Tuning failed
				B8	Keypad lost
				B7	Encoder disconnection
				B6	Wrong installation of encoder
				B5	DB
				B4	FAN running
				B3	Lost command
				B2	Inverter Overload
				B1	Underload

Comm. Address	Parameter	Scale	Unit	Assigned content by bit	
				B0	Overload
0h0335-0h033F	Reserved	-	-	-	
0h0340	On Time date	0	Day	Total number of days the inverter has been powered on	
0h0341	On Time minute	0	Min	Total number of minutes excluding the total number of On Time days	
0h0342	Run Time date	0	Day	Total number of days the inverter has driven the motor	
0h0343	Run Time minute	0	Min	Total number of minutes excluding the total number of Run Time days	
0h0344	Fan Time date	0	Day	Total number of days the heat sink fan has been running	
0h0345	Fan Time minute	0	Min	Total number of minutes excluding the total number of Fan Time days	
0h0346-0h0348	Reserved	-	-	-	
0h0349	Reserved	-	-	-	
0h034A	Option 1	-	-	0: None, 9: CANopen	
0h034B	Reserved	-	-		
0h034C	Reserved				

5.5.2 Control Area Parameter (Read/Write)

Comm. Address	Parameter	Scale	Unit	Assigned Content by Bit	
0h0380	Frequency command	0.01	Hz	Command frequency setting	
0h0381	RPM command	1	rpm	Command rpm setting	
0h0382	Operation command	-	-	B7	Reserved
				B6	Reserved
				B5	Reserved
				B4	Reserved
				B3	0 → 1: Free-run stop
				B2	0 → 1: Trip initialization
				B1	0: Reverse command, 1: Forward command
				B0	0: Stop command, 1: Run command
				Example: Forward operation command 0003h, Reverse operation command 0001h.	
0h0383	Acceleration time	0.1	s	Acceleration time setting	
0h0384	Deceleration time	0.1	s	Deceleration time setting	
0h0385	Virtual digital input control (0: Off, 1: On)	-	-	B15	Reserved
				-	Reserved
				B8	Reserved
				B7	Virtual DI 8(COM-77)
				B6	Virtual DI 7(COM-76)
				B5	Virtual DI 6(COM-75)
				B4	Virtual DI 5(COM-74)
				B3	Virtual DI 4(COM-73)
				B2	Virtual DI 3(COM-72)
				B1	Virtual DI 2(COM-71)
				B0	Virtual DI 1(COM-70)
0h0386	Digital output control (0: Off, 1: On)	-	-	B15	Reserved
				B14	Reserved
				B13	Reserved
				B12	Reserved
				B11	Reserved
				B10	Reserved
				B9	Reserved
				B8	Reserved
				B7	Reserved
				B6	Reserved

Comm. Address	Parameter	Scale	Unit	Assigned Content by Bit	
				B5	Reserved
				B4	Reserved
				B3	Reserved
				B2	Reserved
				B1	Q1 (I/O board, OUT-33: None)
				B0	Relay 1 (I/O board, OUT-31: None)
0h0387	Reserved	-	-	Reserved	
0h0388	PID reference	0.1	%	PID reference command	
0h0389	PID feedback value	0.1	%	PID feedback value	
0h038A	Motor rated current	0.1	A	-	
0h038B	Motor rated voltage	1	V	-	
0h038C-0h038F	Reserved			-	
0h0390	Torque Ref	0.1	%	Torque command	
0h0391	Fwd Pos Torque Limit	0.1	%	Forward motoring torque limit	
0h0392	Fwd Neg Torque Limit	0.1	%	Forward regenerative torque limit	
0h0393	Rev Pos Torque Limit	0.1	%	Reverse motoring torque limit	
0h0394	Rev Neg Torque Limit	0.1	%	Reverse regenerative torque limit	
0h0395	Torque Bias	0.1	%	Torque bias	
0h0396-0h0399	Reserved	-	-	-	
0h039A	Anytime Para	-	-	Set the CNF-20 value	
0h039B	Monitor Line-1	-	-	Set the CNF-21 value	
0h039C	Monitor Line-2	-	-	Set the CNF-22 value	
0h039D	Monitor Line-3	-	-	Set the CNF-23 value	

Note

A frequency set via communication using the common area frequency address (0h0380, 0h0005) is not saved even when used with the parameter save function. To save a changed frequency to use after a power cycle, follow these steps:

- 1** Set DRV-07 to Keypad-1 and select a random target frequency.
- 2** Set the frequency via communication into the parameter area frequency address (0h1101).
- 3** Perform the parameter save (0h03E0: '1') before turning off the power. After the power cycle, the frequency set before turning off the power is displayed.

5.5.3 Inverter Memory Control Area Parameter (Read and Write)

Comm. Address	Parameter	Scale	Unit	Changeable During Operation	Function
0h03E0	Save parameters	-	-	X	0: No, 1: Yes
0h03E1	Monitor mode initialization	-	-	O	0: No, 1: Yes
0h03E2	Parameter initialization	-	-	X	0: No, 1: All Grp, 2: DRV Grp, 3: BAS Grp, 4: ADV Grp, 5: CON Grp, 6: IN Grp, 7: OUT Grp, 8: COM Grp, 9: APP Grp, 12: PRT Grp, 13: M2 Grp Setting is prohibited during fault trip interruptions.
0h03E3	Display changed parameters	-	-	O	0: No, 1: Yes
0h03E4	Reserved	-	-	-	-
0h03E5	Delete all fault history	-	-	O	0: No, 1: Yes
0h03E6	Delete user-registered codes	-	-	O	0: No, 1: Yes
0h03E7	Hide parameter mode	0	Hex	O	Write: 0-9999 Read: 0: Unlock, 1: Lock
0h03E8	Lock parameter mode	0	Hex	O	Write: 0-9999 Read: 0: Unlock, 1: Lock
0h03E9	Easy start on (easy parameter setup mode)	-	-	O	0: No, 1: Yes
0h03EA	Initializing power consumption	-	-	O	0: No, 1: Yes
0h03EB	Initialize inverter operation accumulative time	-	-	O	0: No, 1: Yes
0h03EC	Initialize cooling fan accumulated operation time	-	-	O	0: No, 1: Yes

Note

- When setting parameters in the inverter memory control area, the values are reflected to the inverter operation and saved. Parameters set in other areas via communication are reflected to the inverter operation, but are not saved. All set values are cleared following an inverter power cycle and revert back to its previous values. When setting parameters via communication, ensure that a parameter save is completed prior to shutting the inverter down.
- Set parameters very carefully. After setting a parameter to 0 via communication, set it to another value. If a parameter has been set to a value other than 0 and a non-zero value is entered again, an error message is returned. The previously-set value can be identified by reading the parameter when operating the inverter via communication.
- The addresses 0h03E7 and 0h03E8 are parameters for entering the password. When the password is entered, the condition will change from Lock to Unlock, and vice versa. When the same parameter value is entered continuously, the parameter is executed just once. Therefore, if the same value is entered again, change it to another value first and then re-enter the previous value. For example, if you want to enter 244 twice, enter it in the following order: 244 → 0 → 244.

⚠ Caution

It may take longer to set the parameter values in the inverter memory control area because all data is saved to the inverter. Be careful as communication may be lost during parameter setup if parameter setup is continues for an extended period of time.

6 Table of Functions

This chapter lists all the function settings for MD100G series inverter. Set the parameters required according to the following references. If a set value input is out of range, the following messages will be displayed on the keyboard. In these cases, the inverter will not operate with the [ENT] key.

- Set value not allocated: **rd**
- Set value repetition (multi-function input, PID reference, PID feedback related): **OL**
- Set value not allowed (select value, V2, I2): **no**

6.1 Drive group (PAR→DRV)

In the following table, data shaded in grey will be displayed when the related code has been selected.

SL: Sensorless vector control (DRV-09)

***O/X:** Write-enabled during operation

Code	Comm. Address	Name	LCD Display	Setting Range	Initial value	Property*	V/F	SL	Ref.
00	-	Jump Code	Jump Code	1-99	9	O	O	O	p.54
01	0h1101	Target frequency	Cmd Frequency	Start frequency - Maximum frequency(Hz)	0.00	O	O	O	p.68
02	0h1102	Torque command	Cmd Torque	-180~180[%]	0.0	O	X	O	-
03	0h1103	Acceleration time	Acc Time	0.0-600.0(s)	20.0	O	O	O	p.91
04	0h1104	Deceleration time	Dec Time	0.0-600.0(s)	30.0	O	O	O	p.91
06	0h1106	Command source	Cmd Source	0 Keypad	1: Fx/Rx-1	X	O	O	p.83
				1 Fx/Rx-1					
				2 Fx/Rx-2					
				3 Int 485					
				4 Field Bus					
07	0h1107	Frequency reference source	Freq Ref Src	0 Keypad-1	0: Keypad-1	X	O	O	p.68
				1 Keypad-2					
				2 V1					
				4 V2					
				5 I2					
				6 Int 485					

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range		Initial value	Property*	V/F	SL	Ref.
				8	Field Bus					
				12	Pulse					
08	0h1108	Torque Reference Setting	Trq Ref Scr	0	Keypad-1	0: Keypad-1	X	X	O	
				1	Keypad-2					
				2	V1					
				4	V2					
				5	I2					
				6	Int485					
				8	Fieldbus					
				12	Pulse					
09	0h1109	Control mode	Control Mode	0	V/F	0: V/F	X	O	O	<u>p.100,</u>
				2	Slip Compen					
				4	IM Sensorless					
10	0h110A	Torque Control	Torque Control	0	No	0: No	X	X	O	
				1	Yes					
11	0h110B	Jog frequency	Jog Frequency	0.00, Start frequency-Maximum frequency(Hz)		10.00	O	O	O	
12	0h110C	Jog run acceleration time	Jog Acc Time	0.0-600.0(s)		20.0	O	O	O	
13	0h110D	Jog run deceleration time	Jog Dec Time	0.0-600.0(s)		30.0	O	O	O	
14	0h110E	Motor capacity	Motor Capacity	0: 0.2 kW, 1: 0.4 kW 2: 0.75 kW, 3: 1.1 kW 4: 1.5 kW, 5: 2.2 kW 6: 3.0 kW, 7: 3.7 kW 8: 4.0 kW, 9: 5.5 kW 10: 7.5 kW, 11: 11.0 kW 12: 15.0 kW, 13: 18.5 kW 14: 22.0 kW 15: 30.0 kW		Varies by Motor capacity	X	O	O	

Code	Comm. Address	Name	LCD Display	Setting Range	Initial value	Property*	V/F	SL	Ref.
				16:37 kW 17:45.0 kW 18:55.0 kW 19:75 kW 20:90 kW					
15	0h110F	Torque boost options	Torque Boost	0 Manual 1 Auto	0: Manual	X	O	X	
16 ¹	0h1110	Forward Torque boost	Fwd Boost	0.0-15.0(%)	2.0	X	O	X	p.104
17 ¹	0h1111	Reverse Torque boost	Rev Boost	0.0-15.0(%)	2.0	X	O	X	p.104
18	0h1112	Base frequency	Base Freq	30.00-400.00(Hz)	50.00	X	O	O	p.100
19	0h1113	Start frequency	Start Freq	0.01-10.00(Hz)	0.50	X	O	O	p.100
20	0h1114	Maximum frequency	Max Freq	40.00-400.00(Hz)[V/F, Slip Compen] 40.00-120.00(Hz)[IM Sensorless]	50.00	X	O	O	p.111
21	0h1115	Select speed unit	Hz/Rpm Sel	0 Hz Display 1 Rpm Display	0:Hz Display	O	O	O	p.80
22 ²	0h1116	(+) Torque Gain	(+) Trq Gain	50.0–150.0[%]	100[%]	O	X	O	-
23 ²	0h1117	(-)Torque Gain	(-) Trq Gain	50.0–150.0[%]	80.0[%]	O	X	O	-
24 ²	0h1118	(-)Torque Gain0	(-) Trq Gain0	50.0–150.0[%]	80.0[%]	O	X	O	-
25 ²	0h1119	(-)Torque Offset	(-) Trq Offset	0.0-100.0[%]	40.0[%]	O	X	O	-
80	0h1150	Select ranges at power input	-	Select ranges inverter displays at power input 0 Run frequency 1 Acceleratio	0: run frequency	O	O	O	-

¹ Displayed when DRV-15 is set to 0 (Manual)

² Displayed when DRV-10 is set to 1 (Yes)

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range		Initial value	Property*	V/F	SL	Ref.
					n time					
				2	Deceleration time					
				3	Command source					
				4	Frequency reference source					
				5	Multi-step speed frequency1					
				6	Multi-step speed frequency2					
				7	Multi-step speed frequency3					
				8	Output current					
				9	Motor RPM					
				10	Inverter DC voltage					
				11	User select signal (DRV-81)					
				12	Currently out of order					
				13	Select run direction					
				14	output current2					
				15	Motor RPM2					
				16	Inverter DC voltage2					
				17	User select signal2 (DRV-81)					
81	0h1151	Select monitor code	-	Monitors user selected code		0: output voltage	O	O	O	-
				0	Output voltage(V)					

Code	Comm. Address	Name	LCD Display	Setting Range		Initial value	Property*	V/F	SL	Ref.
				1	Output electric power(kW)					
				2	Torque(kgf · m)					
89	0h03E3	Display changed parameter	-	0	View All	0: View All	O	O	O	
				1	View Changed					
90	0h115A	[ESC] key functions	-	0	Move to initial position	0: None	X	O	O	
				1	JOG Key					
				2	Local/Remote					
93	0h115D	Parameter initialization	-	0	No	0:No	X	O	O	
				1	All Grp					
				2	DRV Grp					
				3	BAS Grp					
				4	ADV Grp					
				5	CON Grp					
				6	IN Grp					
				7	OUT Grp					
				8	COM Grp					
				9	APP Grp					
				12	PRT Grp					
				13	M2 Grp					
94	0h115E	Password registration		0-99		-	O	O	O	
95	0h115F	Parameter lock settings		0-99		-	O	O	O	
97	0h1161	Software version	-			-	-	O	O	-
98	0h1162	Display I/O board version	IO S/W Ver			-	-	O	O	
99	0h1163	Display I/O board HW version	IO H/W Ver	0	Multiple IO	Standard IO	-	O	O	-
				1	Standard IO					
				2	Standard IO (M)					

6.2 Basic Function group (PAR→BAS)

In the following table, the data shaded in grey will be displayed when a related code has been selected.

SL: Sensorless vector control function (DRV-09)

***O/X:** Write-enabled during operation

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
00	-	Jump Code	Jump Code	1-99	20	O	O	O	p.54
01	0h1201	Auxiliary reference source	Aux Ref Src	0	None	0:None	X	O	O
				1	V1				
				3	V2				
				4	I2				
				6	Pulse				
02 ³	0h1202	Auxiliary command calculation type	Aux Calc Type	0	M+(G*A)	0: M+(GA)	X	O	O
				1	Mx (G*A)				
				2	M/(G*A)				
				3	M+[M*(G*A)]				
				4	M+G*2(A-50%)				
				5	Mx[G*2(A-50%)				
				6	M/[G*2(A-50%)]				
				7	M+M*G*2(A-50%)				
03 ³	0h1203	Auxiliary command gain	Aux Ref Gain	-200.0-200.0(%)	100.0	O	O	O	
04	0h1204	2nd command source	Cmd 2nd Src	0	Keypad	1: Fx/Rx-1	X	O	O
				1	Fx/Rx-1				
				2	Fx/Rx-2				
				3	Int 485				
				4	FieldBus				
05	0h1205	2nd frequency source	Freq 2nd Src	0	Keypad-1	0: Keypad	O	O	O
				1	Keypad-2				

³ Displayed when BAS-01 is not set to 0 (None)

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
				2	V1	-1				
				4	V2					
				5	I2					
				6	Int 485					
				8	FieldBus					
				12	Pulse					
06 ⁴	0h1206	2nd Torque command source	Trq 2 nd Src	0	Keypad-1	0: Keypad -1	O	X	O	
				1	Keypad-2					
				2	V1					
				4	V2					
				5	I2					
				6	Int 485					
				8	FieldBus					
				12	Pulse					
07	0h1207	V/F pattern options	V/F Pattern	0	Linear	0: Linear	X	O	X	<u>p.100</u>
				1	Square					
				2	User V/F					
				3	Square 2					
08	0h1208	Acc/dec standard frequency	Ramp T Mode	0	Max Freq	0: Max Freq	X	O	O	<u>p.91</u>
				1	Delta Freq					
09	0h1209	Time scale settings	Time Scale	0	0.01 sec	1:0.1 sec	X	O	O	<u>p.91</u>
				1	0.1 sec					
				2	1 sec					
10	0h120A	Input power frequency	60/50 Hz Sel	0	60 Hz	1:50 Hz	X	O	O	
				1	50 Hz					
11	0h120B	Number of motor poles	Pole Number	2-48		Depen dent on motor setting	X	O	O	
12	0h120C	Rated slip speed	Rated Slip	0-3000(Rpm)			X	O	O	
13	0h120D	Motor rated current	Rated Curr	1.0-1000.0(A)			X	O	O	
14	0h120E	Motor noload current	Noload Curr	0.0-1000.0(A)			X	O	O	
15	0h120F	Motor rated voltage	Rated Volt	170-480(V)		0	X	O	O	<u>p.105</u>
16	0h1210	Motor efficiency	Efficiency	70-100(%)		Depen dent on motor	X	O	O	

⁴ Displayed when DRV-09 is set to 4(IM Sensorless)

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
					setting				
17	0h1211	Load inertia rate	Inertia Rate	0-8		X	O	O	
18	0h1212	Trim power display	Trim Power %	70-130(%)		O	O	O	
19	0h1213	Input power voltage	AC Input Volt	170-480 V	240/415V	O	O	O	
20	-	Auto Tuning	Auto Tuning	0	None	0:None	X	X	O
				1	All (Rotation type)				
				2	ALL (Static type)				
				3	Rs+Lsigma (Rotation type)				
				6	Tr (Static type)				
21	-	Stator resistor	Rs	Dependent on motor setting	Dependent on motor setting	X	X	O	
22	-	Leakage inductance	Lsigma			X	X	O	
23	-	Stator inductance	Ls			X	X	O	
24 ⁴	-	Rotor time constant	Tr	25-5000(ms)	-	X	X	O	
25 ⁴	-	Stator inductance scale	Ls Scale	50-150(%)	100	X	X	O	-
26 ⁴	-	Rotor time constant scale	Tr Scale	50-150(%)	100	X	X	O	-
31 ⁴		Regeneration inductance scale	Ls Regen Scale	70 ~ 100[%]	80	X	X	O	-
41 ⁵	0h1229	User frequency1	User Freq 1	0.00-Maximum frequency(Hz)	15.00	X	O	X	p.102
42 ⁵	0h122A	User voltage1	User Volt 1	0-100(%)	25	X	O	X	p.102
43 ⁵	0h122B	User frequency2	User Freq 2	0.00-0.00-Maximum frequency(Hz)	30.00	X	O	X	p.102
44 ⁵	0h122C	User voltage2	User Volt 2	0-100(%)	50	X	O	X	p.102

⁵ Displayed when either BAS-07 or M2-25 is set to 2 (User V/F)

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
45 ⁵	0h122D	User frequency3	User Freq 3	0.00-Maximum frequency(Hz)	45.00	X	O	X	p.102
46 ⁵	0h122E	User voltage3	User Volt 3	0-100(%)	75	X	O	X	p.102
47 ⁵	0h122F	User frequency4	User Freq 4	0.00-Maximum frequency(Hz)	Maximum frequency	X	O	X	p.102
48 ⁵	0h1230	User voltage4	User Volt 4	0-100(%)	100	X	O	X	p.102
50 ⁶	0h1232	Multi-step speed frequency1	Step Freq-1	0.00-Maximum frequency(Hz)	10.00	O	O	O	p.81
51 ⁶	0h1233	Multi-step speed frequency2	Step Freq-2	0.00-Maximum frequency(Hz)	20.00	O	O	O	p.81
52 ⁶	0h1234	Multi-step speed frequency3	Step Freq-3	0.00-Maximum frequency(Hz)	30.00	O	O	O	p.81
53 ⁶	0h1235	Multi-step speed frequency4	Step Freq-4	0.00-Maximum frequency(Hz)	40.00	O	O	O	p.81
54 ⁶	0h1236	Multi-step speed frequency5	Step Freq-5	0.00-Maximum frequency(Hz)	50.00	O	O	O	p.81
55 ⁶	0h1237	Multi-step speed frequency6	Step Freq-6	0.00-Maximum frequency(Hz)	Maximum frequency	O	O	O	p.81
56 ⁶	0h1238	Multi-step speed frequency7	Step Freq-7	0.00-Maximum frequency(Hz)	Maximum frequency	O	O	O	p.81
70	0h1246	Multi-step acceleration time1	Acc Time-1	0.0-600.0(s)	20.0	O	O	O	p.93
71	0h1247	Multi-step deceleration time1	Dec Time-1	0.0-600.0(s)	20.0	O	O	O	p.93
72 ⁷	0h1248	Multi-step	Acc Time-2	0.0-600.0(s)	30.0	O	O	O	p.93

⁶ Displayed when one of IN-65-71 is set to Speed-L/M/H

⁷ Displayed when one of IN-65-71 is set to Xcel-L/M/H

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
		acceleration time2							
73 ⁷	0h1249	Multi-step deceleration time2	Dec Time-2	0.0-600.0(s)	30.0	O	O	O	p.93
74 ⁷	0h124A	Multi-step acceleration time3	Acc Time-3	0.0-600.0(s)	40.0	O	O	O	p.93
75 ⁷	0h124B	Multi-step deceleration time3	Dec Time-3	0.0-600.0(s)	40.0	O	O	O	p.93
76 ⁷	0h124C	Multi-step acceleration time4	Acc Time-4	0.0-600.0(s)	50.0	O	O	O	p.93
77 ⁷	0h124D	Multi-step deceleration time4	Dec Time-4	0.0-600.0(s)	50.0	O	O	O	p.93
78 ⁷	0h124E	Multi-step acceleration time5	Acc Time-5	0.0-600.0(s)	40.0	O	O	O	p.93
79 ⁷	0h124F	Multi-step deceleration time5	Dec Time-5	0.0-600.0(s)	40.0	O	O	O	p.93
80 ⁷	0h1250	Multi-step acceleration time6	Acc Time-6	0.0-600.0(s)	30.0	O	O	O	p.93
81 ⁷	0h1251	Multi-step deceleration time6	Dec Time-6	0.0-600.0(s)	30.0	O	O	O	p.93
82 ⁷	0h1252	Multi-step acceleration time7	Acc Time-7	0.0-600.0(s)	20.0	O	O	O	p.93
83 ⁷	0h1253	Multi-step deceleration time7	Dec Time-7	0.0-600.0(s)	20.0	O	O	O	p.93

6.3 Advanced Function group (PAR→ADV)

In the following table, the data shaded in grey will be displayed when a related code has been selected.

SL: Sensorless vector control (DRV-09)

***O/X:** Write-enabled during operation

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
00	-	Jump Code	Jump Code	1-99		24	O	O	O	<u>p.54</u>
01	0h1301	Acceleration pattern	Acc Pattern	0	Linear	0: Linear	X	O	O	<u>p.97</u>
02	0h1302	Deceleration pattern	Dec Pattern	1	S-curve		X	O	O	<u>p.97</u>
03 ⁸	0h1303	S-curve acceleration start point gradient	Acc S Start	1-100(%)		40	X	O	O	<u>p.97</u>
04 ⁸	0h1304	S-curve acceleration end point gradient	Acc S End	1-100(%)		40	X	O	O	<u>p.97</u>
05 ⁹	0h1305	S-curve deceleration start point gradient	Dec S Start	1-100(%)		40	X	O	O	<u>p.97</u>
06 ⁹	0h1306	S-curve deceleration end point gradient	Dec S End	1-100(%)		40	X	O	O	<u>p.97</u>
07	0h1307	Start Mode	Start Mode	0	Acc	0:Acc	X	O	O	<u>p.106</u>
				1	DC-Start					
08	0h1308	Stop Mode	Stop Mode	0	Dec	0:Dec	X	O	O	<u>p.107</u>
				1	DC-Brake					
				2	Free-Run					
				4	Power Braking					
09	0h1309	Selection of prohibited rotation direction	Run Prevent	0	None	0: None	X	O	O	<u>p.88</u>
				1	Forward Prev					
				2	Reverse Prev					

⁸ Displayed when ADV- 01 is set to 1 (S-curve)

⁹ Displayed when ADV- 02 is set to 1 (S-curve)

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
10	0h130A	Starting with power on	Power-on Run	0 No	0:No	O	O	O	p.89
				1 Yes					
12 ¹⁰	0h130C	DC braking time at startup	DC-Start Time	0.00-60.00(s)	0.00	X	O	O	p.106
13	0h130D	Amount of applied DC	DC Inj Level	0-200(%)	50	X	O	O	p.106
14 ¹¹	0h130E	Output blocking time before DC braking	DC-Block Time	0.00- 60.00(s)	0.10	X	O	O	p.107
15 ¹¹	0h130F	DC braking time	DC-Brake Time	0.00- 60.00(s)	1.00	X	O	O	p.107
16 ¹¹	0h1310	DC braking rate	DC-Brake Level	0-200(%)	50	X	O	O	p.107
17 ¹¹	0h1311	DC braking frequency	DC-Brake Freq	Start frequency-50 Hz	5.00	X	O	O	p.107
20	0h1314	Dwell frequency on acceleration	Acc Dwell Freq	Start frequency-Maximum frequency(Hz)	5.00	X	O	O	
21	0h1315	Dwell operation time on acceleration	Acc Dwell Time	0.0-60.0(s)	0.0	X	O	O	
22	0h1316	Dwell frequency on deceleration	Dec Dwell Freq	Start frequency-Maximum frequency(Hz)	5.00	X	O	O	
23	0h1317	Dwell operation time on deceleration	Dec Dwell Time	0.0-60.0(s)	0.0	X	O	O	
24	0h1318	Frequency limit	Freq Limit	0 No	1:Yes	X	O	O	p.111
				1 Yes					
25 ¹²	0h1319	Frequency lower limit value	Freq Limit Lo	0.00-Upper limit frequency(Hz)	0.50	O	O	O	p.111
26 ¹²	0h131A	Frequency upper limit value	Freq Limit Hi	Lower limit frequency-Maximum frequency(Hz)	maximum frequency	X	O	O	p.111
27	0h131B	Frequency jump	Jump Freq	0 No	0:No	X	O	O	p.113
				1 Yes					

¹⁰ Displayed when ADV- 07 is set to 1 (DC-Start)

¹¹ Displayed when ADV- 08 is set to 1 (DC-Brake)

¹² Displayed when ADV- 24 is set to 1 (Yes)

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
28 ¹³	0h131C	Jump frequency lower limit1	Jump Lo 1	0.00-Jump frequency upper limit1(Hz)	10.00	O	O	O	p.113
29 ¹³	0h131D	Jump frequency upper limit1	Jump Hi 1	Jump frequency lower limit1-Maximum frequency(Hz)	15.00	O	O	O	p.113
30 ¹³	0h131E	Jump frequency lower limit2	Jump Lo 2	0.00-Jump frequency upper limit2(Hz)	20.00	O	O	O	p.113
31 ¹³	0h131F	Jump frequency upper limit2	Jump Hi 2	Jump frequency lower limit2-Maximum frequency(Hz)	25.00	O	O	O	p.113
32 ¹³	0h1320	Jump frequency lower limit3	Jump Lo 3	0.00-Jump frequency upper limit3(Hz)	30.00	O	O	O	p.113
33 ¹³	0h1321	Jump frequency upper limit3	Jump Hi 3	Jump frequency lower limit3-Maximum frequency(Hz)	35.00	O	O	O	p.113
41 ¹⁴	0h1329	Brake release current	BR Rls Curr	0.0-180.0(%)	50.0	O	O	O	
42 ¹⁴	0h132A	Brake release delay time	BR Rls Dly	0.00-10.00(s)	1.00	X	O	O	
44 ¹⁴	0h132C	Brake release Forward frequency	BR Rls Fwd Fr	0.00-Maximum frequency(Hz)	1.00	X	O	O	
45 ¹⁴	0h132D	Brake release Reverse frequency	BR Rls Rev Fr	0.00-Maximum frequency(Hz)	1.00	X	O	O	
46 ¹⁴	0h132E	Brake engage delay time	BR Eng Dly	0.00-10.00(s)	1.00	X	O	O	
47 ¹⁴	0h132F	Brake engage frequency	BR Eng Fr	0.00-Maximum frequency(Hz)	2.00	X	O	O	
50	0h1332	Energy saving operation	E-Save Mode	0	None	0:None	X	O	X
				1	Manual				
				2	Auto				

¹³ Displayed when ADV- 27 is set to 1 (Yes)

¹⁴ Displayed when either OUT-31 or OUT-33 is set to 35 (BR Control)

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
51 ¹⁵	0h1333	Energy saving level	Energy Save	0-30(%)	0	O	O	X	
60	0h133C	Acc/Dec time transition frequency	Xcel Change Fr	0.00-Maximum frequency(Hz)	0.00	X/A	O	O	<u>p.95</u>
64	0h1340	Cooling fan control	FAN Control	<div>0 During Run</div> <div>1 Always ON</div> <div>2 Temp Control</div>	0:During Run	O/A	O	O	
65	0h1341	Up/down operation frequency save	U/D Save Mode	<div>0 No</div> <div>1 Yes</div>	0:No	O/A	O	O	
66	0h1342	Output contact On/Off control options	On/Off Ctrl Src	<div>0 None</div> <div>1 V1</div> <div>3 V2</div> <div>4 I2</div> <div>6 Pulse</div>	0:None	X/A	O	O	
67	0h1343	Output contact On level	On-Ctrl Level	Output contact off level- 100.00%	90.00	X/A	O	O	
68	0h1344	Output contact Off level	Off-Ctrl Level	-100.00-output contact on level (%)	10.00	X/A	O	O	
70	0h1346	Safe operation selection	Run En Mode	<div>0 Always Enable</div> <div>1 DI Dependent</div>	0:Always Enable	X/A	O	O	
71 ¹⁶	0h1347	Safe operation stop options	Run Dis Stop	<div>0 Free-Run</div> <div>1 Q-Stop</div> <div>2 Q-Stop Resume</div>	0:Free-Run	X/A	O	O	
72 ¹⁶	0h1348	Safe operation deceleration time	Q-Stop Time	0.0-600.0(s)	5.0	O/A	O	O	
74	0h134A	Selection of regeneration evasion function for press	RegenAvd Sel	<div>0 No</div> <div>1 Yes</div>	0:No	X/A	O	O	
75	0h134B	Voltage level of	RegenAvd	200 V : 300-400 V	350	X/A	O	O	

¹⁵ Displayed when ADV-50 is not set to 0 (None)

¹⁶ Displayed when ADV-70 is set to 1 (DI Dependent)

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
		regeneration evasion motion for press	Level	400 V : 600-800 V	700				
76 ¹⁷	0h134C	Compensation frequency limit of regeneration evasion for press	CompFreq Limit	0.00- 10.00 Hz	1.00	X/A	O	O	
77 ¹⁷	0h134D	Regeneration evasion for press P gain	RegenAvd Pgain	0.0- 100.0%	50.0	O/A	O	O	
78 ¹⁷	0h134E	Regeneration evasion for press I gain	RegenAvd Igain	20-30000(ms)	500	O/A	O	O	
80	0h1350	Fire Mode Selection	Fire Mode Sel	0 None	0:None	X	O	X	p.126
				1 Fire Mode					
				2 Fire Mode Test					
81 ¹⁸	0h1351	Fire Mode operation frequency	Fire Mode Freq	0.00–50.00[Hz]	0.00	X	O	X	p.126
82 ¹⁸	0h1352	Fire Mode operation direction	Fire Mode Dir	0 Forward	0	X	O	X	p.126
				1 Reverse					
83 ¹⁸	-	Fire Mode Count	Fire Mode Cnt	Not able to modify	-	-	-	-	p.126

¹⁷ Displayed when ADV-74 is set to 1 (Yes)¹⁸ Displayed when ADV-80 is set to 1 (Yes)

6.4 Control Function group (PAR→CON)

In the following table, the data shaded in grey will be displayed when a related code has been selected.

SL: Sensorless vector control (DRV-09)

***O/X:** Write-enabled during operation

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
00	-	Jump Code	Jump Code	1-99		4	O	O	O	<u>p.54</u>
04	0h1404	Carrier frequency	Carrier Freq	HD	30–45 kW	V/F : 1.0– 10.0 [kHz] SL : 2.0–10.0 [kHz]	3.0	O	O	O
					55–75 kW	V/F : 1.0– 7.0 [kHz] SL : 2.0–7.0 [kHz]				
				ND	30–45 kW	V/F : 1.0– 5.0 [kHz] SL : 2.0–5.0 [kHz]	2.0	O	O	O
					55–75 kW	V/F : 1.0– 3.0 [kHz] SL : 2.0–3.0 [kHz]				
05	0h1405	Switching mode	PWM Mode	0	Normal PWM	0:Normal PWM	X	O	O	
				1	Lowleakage PWM					
09	0h1409	Initial excitation time	PreExTime	0.00–60.00(s)		1.00	X	X	O	
10	0h140A	Initial excitation amount	Flux Force	100.0–300.0(%)		100.0	X	X	O	
11	0h140B	Continued operation duration	Hold Time	0.00–60.00(s)		0.00	X	X	O	
20	0h1414	Sensorless	SL2 G View	0	No	0:No	O	X	O	

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
		2 nd gain display setting	Sel	1	Yes					
21	0h1415	Sensorless speed controller proportional gain1	ASR-SL P Gain1	0-5000(%)		Dependent on motor setting	O	X	O	
22	0h1416	Sensorless speed controller integral gain1	ASR-SL I Gain1	10-9999(ms)			O	X	O	
23 ¹⁹	0h1417	Sensorless speed controller proportional gain2	ASR-SL P Gain2	1.0-1000.0(%)		Dependent on motor setting	O	X	O	
24 ¹⁹	0h1418	Sensorless speed controller integral gain2	ASR-SL I Gain2	1.0-1000.0(%)			O	X	O	
25 ¹⁹	0h1419	Sensorless speed controller integral gain0	ASR-SL I Gain0	1.0-999.9(ms)			O	X	O	
26 ¹⁹	0h141A	Flux estimator proportional gain	Flux P Gain	10-200(%)			O	X	O	
27 ¹⁹	0h141B	Flux estimator integral gain	Flux I Gain	10-200(%)			O	X	O	
28 ¹⁹	0h141C	Speed estimator proportional gain	S-Est P Gain1	0-32767			O	X	O	

¹⁹ Displayed when DRV-09 is set to 4 (IM Sensorless) and CIN-20 is set to 1 (YES)

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
29 ¹⁹	0h141D	Speed estimator integral gain1	S-Est I Gain1	100-1000		O	X	O	
30 ¹⁹	0h141E	Speed estimator integral gain2	S-Est I Gain2	100-10000		O	X	O	
31 ¹⁹	0h141F	Sensorless current controller proportional gain	ACR SL P Gain	10-1000		O	X	O	
32 ¹⁹	0h1420	Sensorless current controller integral gain	ACR SL I Gain	10-1000		O	X	O	
48	-	Current controller P gain	ACR P Gain	0-10000	1200	O	X	O	
49	-	Current controller I gain	ACR I Gain	0-10000	120	O	X	O	
52	0h1434	Torque controller output filter	Torque Out LPF	0-2000(ms)	0	X	X	O	
53	0h1435	Torque limit setting options	Torque Lmt Src	0	0: Keypad-1	X	X	O	
				1					
				2					
				4					
				5					
				6					
				8					
				12					
54 ²⁰	0h1436	Positive-direction reverse torque	FWD +Trq Lmt	0.0-200.0(%)	180	O	X	O	

²⁰ Displayed when DRV-09 is set to 1 (Yes). This will change the initial value of the parameter at ADV-74 (Torque limit) to 150%.

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
		limit								
55 ²⁰	0h1437	Positive-direction regeneration torque limit	FWD –Trq Lmt	0.0-200.0(%)		180	O	X	O	
56 ²⁰	0h1438	Negative-direction reverse torque limit	REV +Trq Lmt	0.0-200.0(%)		180	O	X	O	
57 ²⁰	0h1439	Negative-direction regeneration torque limit	REV –Trq Lmt	0.0-200.0(%)		180	O	X	O	
62 ²⁰	0h143E	Speed limit setting	Speed Lmt Src	0	Keypad-2	0:Keypad -1	X	X	O	
				1	V1					
				3	V2					
				4	I2					
				5	Int 485					
				6	FieldBus					
				7	Keypad-2					
63 ²⁰	0h143F	Positive-direction speed limit	FWD Speed Lmt	0.00–Maximum frequency [Hz]		50.00	O	X	O	
64 ²⁰	0h1440	Negative-direction speed limit	REV Speed Lmt	0.00–Maximum frequency [Hz]		50.00	O	X	O	
65 ²⁰	0h1441	Speed limit operation gain	Speed Lmt Gain	100~5000(%)		500	O	X	O	
70	0h1446	Speed search mode selection	SS Mode	0	Flying Start-1 ²¹	0: Flying Start-1	X	O	O	
				1	Flying Start-2					
71	0h1447	Speed	Speed	bit	0000- 1111	0000	X	O	O	

²¹ Will not be Displayed when DRV-09 is set to 4 (IM Sensorless)

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
		search operation selection	Search	0001	Selection of speed search on acceleration					
				0010	When starting on initialization after fault trip					
				0100	When restarting after instantaneous power interruption					
				1000	When starting with power on					
72 ²²	0h1448	Speed search reference current	SS Sup-Current	80-200(%)		150	O	O	O	
73 ²³	0h1449	Speed search proportional gain	SS P-Gain	0-9999		Flying Start-1 : 100	O	O	O	
						Flying Start-2 : 600 ²⁴				
74 ²³	0h144A	Speed search integral gain	SS I-Gain	0-9999		Flying Start-1 : 200	O	O	O	
						Flying Start-2 : 1000				
75 ²³	0h144B	Output blocking time before speed search	SS Block Time	0.0-60.0(s)		1.0	X	O	O	
76 ²³	0h144C	Speed search Estimator	Spd Est Gain	50-150(%)		100	O	O	O	

²² Displayed when any of the CON-71 code bits are set to 1 and CON-70 is set to 0 (Flying Start-1)

²³ Displayed when any of the CON-71 code bits are set to 1

²⁴ The initial value is 1200 when the motor-rated capacity is less than 7.5 kW

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
		gain								
77	0h144D	Energy buffering selection	KEB Select	0	No	0:No	X	O	O	
				1	Yes					
78 ²⁵	0h144E	Energy buffering start level	KEB Start Lev	110.0-140.0(%)		125.0	X	O	O	
79 ²⁵	0h144F	Energy buffering stop level	KEB Stop Lev	125.0-145.0(%)		130.0	X	O	O	
80 ²⁵	0h1450	Energy buffering gain	KEB Gain	1-20000		1000	O	O	O	
85 ²⁶	0h1455	Flux estimator proportional gain1	Flux P Gain1	100-700		370	O	X	O	
86 ²⁶	0h1456	Flux estimator proportional gain2	Flux P Gain2	0-100		0	O	X	O	
87 ²⁶	0h1457	Flux estimator proportional gain3	Flux P Gain3	0-500		100	O	X	O	
88 ²⁶	0h1458	Flux estimator integral gain1	Flux I Gain1	0-200		50	O	X	O	
89 ²⁶	0h1459	Flux estimator integral gain2	Flux I Gain2	0-200		50	O	X	O	
90 ²⁶	0h145A	Flux estimator integral gain3	Flux I Gain3	0-200		50	O	X	O	
91 ²⁶	0h145B	Sensorless voltage	SL Volt Comp1	0-60		Dependent on	O	X	O	

²⁵ Displayed when CON-77 is set to 1 (Yes)

²⁶ Displayed when CON-20 is set to 1 (Yes)

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
		compensation1			motor setting				
92 ²⁶	0h145C	Sensorless voltage compensation2	SL Volt Comp2	0-60		O	X	O	
93 ²⁶	0h145D	Sensorless voltage compensation3	SL Volt Comp3	0-60		O	X	O	
94 ²⁶	0h145E	Sensorless field weakening start frequency	SL FW Freq	80.0-110.0(%)	100.0	X	X	O	
95 ²⁶	0h145F	Sensorless gain switching frequency	SL Fc Freq	0.00-8.00(Hz)	2.00	X	X	O	

6.5 Input Terminal Block Function group (PAR→IN)

In the following table, the data shaded in grey will be displayed when a related code has been selected.

SL: Sensorless vector control (DRV-09)

***O/X:** Write-enabled during operation

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
00	-	Jump Code	Jump Code	1-99	65	O	O	O	p.54
01	0h1501	Frequency for maximum analog input	Freq at 100%	Start frequency- Maximum frequency(Hz)	Maximum frequency	O	O	O	p.69
02	0h1502	Torque at maximum analog input	Torque at100%	0.0-200.0(%)	100.0	O	X	X	-
05	0h1505	V1 input voltage display	V1 Monitor(V)	-12.00-12.00(V)	0.00	O	O	O	p.69
06	0h1506	V1 input polarity selection	V1 Polarity	<div>0 Unipolar</div> <div>1 Bipolar</div>	<div>0: Unipolar</div> <div>Unipolar</div>	X	O	O	p.69
07	0h1507	Time constant of V1 input filter	V1 Filter	0-10000(ms)	10	O	O	O	p.69
08	0h1508	V1 Minimum input voltage	V1 Volt x1	0.00-10.00(V)	0.00	O	O	O	p.69
09	0h1509	V1 output at Minimum voltage (%)	V1 Perc y1	0.00-100.00(%)	0.00	O	O	O	p.69
10	0h150A	V1 Maximum input voltage	V1 Volt x2	0.00-12.00(V)	10.00	O	O	O	p.69
11	0h150B	V1 output at Maximum voltage (%)	V1 Perc y2	0.00-100.00(%)	100.00	O	O	O	p.69
12 ²⁷	0h150C	V1 Minimum input voltage	V1 -Volt x1'	-10.00-0.00(V)	0.00	O	O	O	p.74
13 ²⁷	0h150D	V1 output at Minimum voltage (%)	V1 -Perc y1'	-100.00-0.00(%)	0.00	O	O	O	p.74

²⁷ Displayed when IN-06 is set to 1 (Bipolar)

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
14 ²⁷	0h150E	V1 Maximum input voltage	V1 –Volt x2'	-12.00-0.00(V)	-10.00	O	O	O	p.74
15 ²⁷	0h150F	V1 output at Maximum voltage (%)	V1 –Perc y2'	-100.00-0.00(%)	-100.00	O	O	O	p.74
16	0h1510	V1 rotation direction change	V1 Inverting	0 No	0: No	O	O	O	p.69
				1 Yes					
17	0h1511	V1 quantization level	V1 Quantizing	0.00 ²⁸ , 0.04-10.00(%)	0.04	X	O	O	p.69
35 ²⁹	0h1523	V2 input voltage display	V2 Monitor(V)	0.00-12.00(V)	0.00	O	O	O	p.77
37 ²⁹	0h1525	V2 input filter time constant	V2 Filter	0-10000(ms)	10	O	O	O	p.77
38 ²⁹	0h1526	V2 Minimum input voltage	V2 Volt x1	0.00-10.00(V)	0.00	O	X	X	p.77
39 ²⁹	0h1527	V2 output at Minimum voltage (%)	V2 Perc y1	0.00-100.00(%)	0.00	O	O	O	p.77
40 ²⁹	0h1528	V2 Maximum input voltage	V2 Volt x2	0.00-10.00(V)	10	O	X	X	p.77
41 ²⁹	0h1529	V2 output at Maximum voltage (%)	V2 Perc y2	0.00-100.00(%)	100.00	O	O	O	p.77
46 ²⁹	0h152E	V2 rotation direction change	V2 Inverting	0 No	0:No	O	O	O	p.77
				1 Yes					
47 ²⁹	0h152F	V2 quantization level	V2 Quantizing	0.00 ²⁸ , 0.04-10.00(%)	0.04	O	O	O	p.77
50 ³⁰	0h1532	I2 input current display	I2 Monitor (mA)	0-24(mA)	0.00	O	O	O	p.76
52 ³⁰	0h1534	I2 input filter time constant	I2 Filter	0-10000(ms)	10	O	O	O	p.76

²⁸ Quantizing is not used when set to 0.

²⁹ Displayed when V is selected on the analog current/voltage input circuit selection switch (SW2)

³⁰ Displayed when I is selected on the analog current/voltage input circuit selection switch (SW2)

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
53 ³⁰	0h1535	I2 minimum input current	I2 Curr x1	0.00-20.00(mA)		4.00	O	O	O	p.76
54 ³⁰	0h1536	I2 output at Minimum current (%)	I2 Perc y1	0.00-100.00(%)		0.00	O	O	O	p.76
55 ³⁰	0h1537	I2 maximum input current	I2 Curr x2	0.00-24.00(mA)		20.00	O	O	O	p.76
56 ³⁰	0h1538	I2 output at Maximum current (%)	I2 Perc y2	0.00-100.00(%)		100.00	O	O	O	p.76
61 ³⁰	0h153D	Changing rotation direction of I2	I2 Inverting	0	No	0:No	O	O	O	p.76
				1	Yes					
62 ³⁰	0h153E	I2 quantization level	I2 Quantizing	0.00 ²⁸ ,0.04-10.00(%)		0.04	O	O	O	p.76
65	0h1541	P1 terminal function setting	P1 Define	0	None	1:Fx	X	O	O	p.83
				1	Fx					
66	0h1542	P2 terminal function setting	P2 Define	2	Rx	2:Rx	X	O	O	p.83
67	0h1543	P3 terminal function setting	P3 Define	3	RST	5:BX	X	O	O	
68	0h1544	P4 terminal function setting	P4 Define	4	External Trip	3:RST	X	O	O	
69	0h1545	P5 terminal function setting	P5 Define	5	BX	7:Sp-L	X	O	O	
70	0h1546	P6 terminal function setting	P6 Define	6	JOG	8:Sp-M	X	O	O	
71	0h1547	P7 terminal function setting	P7 Define	7	Speed-L	9:Sp-H	X	O	O	p.81
				8	Speed-M					p.81
				9	Speed-H					p.81
				11	XCEL-L					p.93
				12	XCEL-M					p.93
				13	RUN Enable					

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
				14 3-Wire					
				15 2nd Source					p.114
				16 Exchange					
				17 Up					
				18 Down					
				20 U/D Clear					
				21 Analog Hold					p.80
				22 I-Term Clear					
				23 PID Openloop					
				24 P Gain2					
				25 XCEL Stop					p.99
				26 2nd Motor					
				34 Pre Excite					
				38 Timer In					
				40 dis Aux Ref					
				46 FWD JOG					
				47 REV JOG					
				49 XCEL-H					
				50 User Seq					p.93
				51 Fire Mode					
				54 TI					
85	0h1555	Multi-function input terminal On filter	DI On Delay	0-10000(ms)	10	O	O	O	p.115
86	0h1556	Multi-function input terminal Off filter	DI Off Delay	0-10000(ms)	3	O	O	O	p.115
87	0h1557	Multi-function input contact selection	DI NC/NO Sel	P7 – P1 0 A contact (NO) 1 B contact (NC)	000 0000	X	O	O	p.115
89	0h1559	Multi-step command delay time	InCheck Time	1-5000(ms)	1	X	O	O	p.81
90	0h155A	Multi-function input terminal status	DI Status	P7 – P1 0 release(Off) 1 Connection (On)	000 0000	O	O	O	p.115
91	0h155B	Pulse input amount display	Pulse Monitor (kHz)	0.00-50.00(kHz)	0.00	O	O	O	p.78
92	0h155C	TI input filter time constant	TI Filter	0-9999(ms)	10	O	O	O	p.78

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
93	0h155D	TI Minimum input pulse	TI Pls x1	0.00-32.00(kHz)	0	O/A	O	O	p.78
94	0h153E	TI output at Minimum pulse (%)	TI Perc y1	0.00-100.00(%)	0.00	O/A	O	O	p.78
95	0h155F	TI Maximum input pulse	TI Pls x2	0.00-32.00(kHz)	32.00	O/A	O	O	p.78
96	0h1560	TI Output at Maximum pulse (%)	TI Perc y2	0-100(%)	100.00	O/A	O	O	p.78
97	0h1561	TI rotation direction change	TI Inverting	0 No	0:No	O/A	O	O	p.78
				1 Yes					
98	0h1562	TI quantization level	TI Quantizing	0.00 ²⁸ , 0.04-10.00(%)	0.04	O/A	O	O	p.78
99	0h1563	SW1(NPN/PNP)/ SW2(V2[I2]) Status display	IO SW State	Bit 00~11	00	O	O	O	-
				00 V2, NPN					
				01 V2, PNP					
				10 I2, NPN					
				11 I2, PNP					

6.6 Output Terminal Block Function group (PAR→OUT)

In the following table, the data shaded in grey will be displayed when a related code has been selected.

SL: Sensorless vector control (DRV-09)

***O/X:** Write-enabled during operation

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
00	-	Jump Code	JumpCode	1-99		30	O	O	O	<u>p.54</u>
01	0h1601	Analog output 1 item	AO1 Mode	0	Frequency	0: Frequency	O	O	O	
				1	Output Current					
				2	Output Voltage					
				3	DCLink Voltage					
				4	Torque					
				5	Output Power					
				6	Idse					
				7	Iqse					
				8	Target Freq					
				9	Ramp Freq					
				10	Speed Fdb					
				12	PID Ref Value					
				13	PID Fdb Value					
				14	PID Output					
				15	Constant					
02	0h1602	Analog output 1 gain	AO1 Gain	-1000.0-1000.0(%)		100.0	O	O	O	
03	0h1603	Analog output 1 bias	AO1 Bias	-100.0-100.0(%)		0.0	O	O	O	
04	0h1604	Analog output 1 filter	AO1 Filter	0-10000(ms)		5	O	O	O	
05	0h1606	Analog constant output 1	AO1 Const %	0.0-100.0(%)		0.0	O	O	O	
06	0h1606	Analog output 1 monitor	AO1 Monitor	0.0-1000.0(%)		0.0		O	O	
07	0h1607	Analog output 2 item	AO2 Mode	0	Frequency					
				1	Output Current					
				2	Output Voltage					
				3	DCLink Voltage					
				4	Torque					
				5	Output Power					
				6	Idse					

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
				7	Iqse					
				8	Target Freq					
				9	Ramp Freq					
				10	Speed Fdb					
				12	PID Ref Value					
				13	PID Fdb Value					
				14	PID Output					
				15	Constant					
08	0h1608	Analog output 2 gain	AO2 Gain	-1000.0~1000.0(%)		100.0	O	O	O	
09	0h1609	Analog output 2 bias	AO2 Bias	-100.0~100.0(%)		0.0	O	O	O	
10	0h160A	Analog output 2 filter	AO2 Filter	0~10000(ms)		5	O	O	O	
11	0h160B	Analog constant output 2	AO2 Const %	0.0~100.0(%)		0.0	O	O	O	
12	0h160C	Analog output 2 monitor	AO2 Monitor	0.0~1000.0(%)		0.0		O	O	
30	0h161E	Fault output item	Trip Out Mode	bit	000-111	010	O	O	O	
				1	Low voltage					
				2	Any faults other than low voltage					
				3	Automatic restart final failure					
31	0h161F	Multi-function relay 1 item	Relay 1	0	None	29:Trip	O	O	O	
				1	FDT-1					
				2	FDT-2					
				3	FDT-3					
				4	FDT-4					
				5	Over Load					
				6	IOL					
				7	Under Load					
				8	Fan Warning					
				9	Stall					
				10	Over Voltage					
				11	Low Voltage					
				12	Over Heat					
				13	Lost Command					
				14	Run					

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
				15	Stop				
				16	Steady				
				17	Inverter Line				
				18	Comm Line				
				19	Speed Search				
				22	Ready				
				28	Timer Out				
				29	Trip				
				31	DB Warn%ED				
				34	On/Off Control				
				35	BR Control				
				36	CAP. Warning				
				37	Fan Exchange				
				38	Fire Mode				
32	0h1620	Multi-function relay 2 item	Relay 2	0	None	14: Run	O	O	O
				1	FDT-1				
				2	FDT-2				
				3	FDT-3				
				4	FDT-4				
				5	Over Load				
				6	IOL				
				7	Under Load				
				8	Fan Warning				
				9	Stall				
				10	Over Voltage				
				11	Low Voltage				
				12	Over Heat				
				13	Lost Command				
				14	Run				
				15	Stop				
				16	Steady				
				17	Inverter Line				
				18	Comm Line				
				19	Speed Search				
				22	Ready				
				28	Timer Out				
				29	Trip				
				31	DB Warn%ED				
				34	On/Off Control				
				35	BR Control				
				36	CAP. Warning				

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
33	0h1621	Multi-function output1 item	Q1 Define	37 Fan Exchange	14:Run	O	O	O	
				38 Fire Mode					
				0 None					
				1 FDT-1					
				2 FDT-2					
				3 FDT-3					
				4 FDT-4					
				5 Over Load					
				6 IOL					
				7 Under Load					
				8 Fan Warning					
				9 Stall					
				10 Over Voltage					
				11 Low Voltage					
				12 Over Heat					
				13 Lost Command					
				14 Run					
				15 Stop					
				16 Steady					
				17 Inverter Line					
				18 Comm Line					
				19 Speed Search					
				22 Ready					
				28 Timer Out					
				29 Trip					
				31 DB Warn%ED					
				34 On/Off Control					
				35 BR Control					
				36 CAP. Warning					
				37 Fan Exchange					
				38 Fire Mode					
				39 TO					
41	0h1629	Multi-function output monitor	DO Status	-	00	X	-	-	
50	0h1632	Multi-function output On delay	DO On Delay	0.00-100.00(s)	0.00	O	O	O	
51	0h1633	Multi-function output Off delay	DO Off Delay	0.00-100.00(s)	0.00	O	O	O	
52	0h1634	Multi-function	DO	Q1, Relay1	00	X	O	O	

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
		output contact selection	NC/NO Sel	0	A contact (NO)					
				1	B contact (NC)					
53	0h1635	Fault output On delay	TripOut OnDly	0.00-100.00(s)		0.00	O	O	O	
54	0h1636	Fault output Off delay	TripOut OffDly	0.00-100.00(s)		0.00	O	O	O	
55	h1637	Timer On delay	TimerOn Delay	0.00-100.00(s)		0.00	O	O	O	
56	0h1638	Timer Off delay	TimerOff Delay	0.00-100.00(s)		0.00	O	O	O	
57	0h1639	Detected frequency	FDT Frequency	0.00-Maximum frequency(Hz)		30.00	O	O	O	
58	0h163A	Detected frequency band	FDT Band	0.00-Maximum frequency(Hz)		10.00	O	O	O	
61	0h163D	Pulse output gain	TO Mode	0	Frequency	0: Frequency	O/A	O	O	
				1	Output Current					
				2	Output Voltage					
				3	DCLink Voltage					
				4	Torque					
				5	Output Power					
				6	Idse					
				7	Iqse					
				8	Target Freq					
				9	Ramp Freq					
				10	Speed Fdb					
				12	PID Ref Value					
				13	PID Fdb Value					
				14	PID Output					
				15	Constant					
62	0h163E	Pulse output gain	TO Gain	-1000.0-1000.0(%)		100.0	O	O	O	
63	0h163F	Pulse output bias	TO Bias	-100.0-100.0(%)		0.0	O	O	O	
64	0h1640	Pulse output filter	TO Filter	0-10000(ms)		5	O	O	O	
65	0h1641	Pulse output constant output 2	TO Const %	0.0-100.0(%)		0.0	O	O	O	
66	0h1642	Pulse output monitor	TO Monitor	0.0-1000.0(%)		0.0	O	O	O	

6.7 Communication Function group (PAR→COM)

In the following table, the data shaded in grey will be displayed when a related code has been selected.

SL: Sensorless vector control (DRV-09)

***O/X:** Write-enabled during operation

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
00	-	Jump Code	Jump Code	1-99		20	O	O	O	p.54
01	0h1701	Built-in communication inverter ID	Int485 St ID	1-250		1	O	O	O	p.131
02 ³¹	0h1702	Built-in communication protocol	Int485 Proto	0	ModBus RTU	0: ModBus RTU	O	O	O	p.131
				2	LS Inv 485					
03 ³¹	0h1703	Built-in communication speed	Int485 BaudR	0	1200 bps	3: 9600 bps	O	O	O	p.131
				1	2400 bps					
				2	4800 bps					
				3	9600 bps					
				4	19200 bps					
				5	38400 bps					
				6	56 Kbps					
				7	115 Kbps ³²					
04 ³¹	0h1704	Built-in communication frame setting	Int485 Mode	0	D8/PN/S1	0: D8/PN/S1	O	O	O	p.131
				1	D8/PN/S2					
				2	D8/PE/S1					
				3	D8/PO/S1					
05 ³¹	0h1705	Transmission delay after reception	Resp Delay	0-1000(ms)		5ms	O	O	O	p.131
06 ³³	0h1706	Communication option S/W version	FBus S/W Ver	-		0.00	O	O	O	-
07 ³³	0h1707	Communication option inverter ID	FBus ID	0-255		1	O	O	O	-

³¹ Will not be displayed when P2P and Multi KPD is set

³² 115,200 bps

³³ Displayed only when a communication option card is installed

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
08 ³⁴	0h1708	FIELD BUS communication speed	FBUS BaudRate	-	12Mbps	-	O	O	-
09 ³⁴	0h1709	Communication option LED status	FieldBus LED	-	-	O	O	O	-
30	0h171E	Number of output parameters	ParaStatus Num	0-8	3	O	O	O	p.136
31 ³⁴	0h171F	Output Communication address1	Para Stauts-1	0000-FFFF Hex	000A	O	O	O	p.136
32 ³⁴	0h1720	Output Communication address2	Para Stauts-2	0000-FFFF Hex	000E	O	O	O	p.136
33 ³⁴	0h1721	Output Communication address3	Para Stauts-3	0000-FFFF Hex	000F	O	O	O	p.136
34 ³⁴	0h1722	Output Communication address4	Para Stauts-4	0000-FFFF Hex	0000	O	O	O	p.136
35 ³⁴	0h1723	Output Communication address5	Para Stauts-5	0000-FFFF Hex	0000	O	O	O	p.136
36 ³⁴	0h1724	Output Communication address6	Para Stauts-6	0000-FFFF Hex	0000	O	O	O	p.136
37 ³⁴	0h1725	Output Communication address7	Para Stauts-7	0000-FFFF Hex	0000	O	O	O	p.136
38 ³⁴	0h1726	Output Communication address8	Para Stauts-8	0000-FFFF Hex	0000	O	O	O	p.136
50	0h1732	Number of input parameters	Para Ctrl Num	0-8	2	O	O	O	p.136
51 ³⁵	0h1733	Input Communication address1	Para Control-1	0000-FFFF Hex	0005	X	O	O	p.136
52 ³⁵	0h1734	Input	Para	0000-FFFF Hex	0006	X	O	O	p.136

³⁴ Only the range of addresses set at COM-30 is displayed.

³⁵ Only the range of addresses set at COM-50 is displayed.

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
		Communication address2	Control-2							
53 ³⁵	0h1735	Input Communication address3	Para Control-3	0000-FFFF Hex		0000	X	O	O	p.136
54 ³⁵	0h1736	Input Communication address4	Para Control-4	0000-FFFF Hex		0000	X	O	O	p.136
55 ³⁵	0h1737	Input Communication address5	Para Control-5	0000-FFFF Hex		0000	X	O	O	p.136
56 ³⁵	0h1738	Input Communication address6	Para Control-6	0000-FFFF Hex		0000	X	O	O	p.136
57 ³⁵	0h1739	Input Communication address7	Para Control-7	0000-FFFF Hex		0000	X	O	O	p.136
58 ³⁵	0h173A	Input Communication address8	Para Control-8	0000-FFFF Hex		0000	X	O	O	p.136
68	0h1744	Field bus data swap	FBus Swap Sel	0 1	No Yes	0	X	O	O	-
70	0h1746	Communication multi-function input 1	Virtual DI 1	0	None	0:None	O	O	O	p.155
71	0h1747	Communication multi-function input 2	Virtual DI 2	1	Fx	0:None	O	O	O	p.155
72	0h1748	Communication multi-function input 3	Virtual DI 3	2	Rx	0:None	O	O	O	p.155
73	0h1749	Communication multi-function input 4	Virtual DI 4	3	RST	0:None	O	O	O	p.155
74	0h174A	Communication multi-function input 5	Virtual DI 5	4	External Trip	0:None	O	O	O	p.155
75	0h174B	Communication multi-function input 6	Virtual DI 6	5	BX	0:None	O	O	O	p.155
76	0h174C	Communication multi-function input 7	Virtual DI 7	6	JOG	0:None	O	O	O	p.155

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
77	0h174D	Communication multi-function input 8	Virtual DI 8	7	Speed-L	0:None	O	O	O	<u>p.155</u>
				8	Speed-M					
				9	Speed-H					
				11	XCEL-L					
				12	XCEL-M					
				13	RUN Enable					
				14	3-Wire					
				15	2nd Source					
				16	Exchange					
				17	Up					
				18	Down					
				20	U/D Clear					
				21	Analog Hold					
				22	I-Term Clear					
				23	PID Openloop					
				24	P Gain2					
				25	XCEL Stop					
				26	2nd Motor					
				34	Pre Excite					
				38	Timer In					
40	dis Aux Ref									
46	FWD JOG									
47	REV JOG									
49	XCEL-H									
86	0h1756	Communication multi-function input monitoring	Virt DI Status	-		0	X	O	O	<u>p.134</u>
90	0h175A	Selection of data frame communication monitor	Comm Mon Sel	0	Int485	0	O	O	O	-
				1	Keypad					
91	0h175B	Data frame Rev count	Rev Frame Num	0-65535		0	O	O	O	-
92	0h175C	Data frame Err count	Err Frame Num	0-65535		0	O	O	O	-
93	0h175D	NAK frame count	NAK Frame Num	0-65535		0	O	O	O	-
94 ³⁶	-	Communication data upload	Comm Update	0	No	0:No	-	O	O	-
				1	Yes					

³⁶ Displayed only when a communication option card is installed

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
95	0h1760	P2P communication selection	Int 485 Func	0	Disable All	0: Disable All	X	O	O	p.116
				1	P2P Master					
				2	P2P Slave					
				3	KPD-Ready					
96 ³⁷	-	DO setting selection	P2P DO Sel	0	No	0:No	O	O	O	p.116
				1	Multi-function setting					
				2	Multi-function output					

6.8 Application Function group (PAR→APP)

In the following table, the data shaded in grey will be displayed when a related code has been selected.

SL: Sensorless vector control (DRV-09)

***O/X:** Write-enabled during operation

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
00	-	Jump Code	Jump Code	1-99		20	O	O	O	p.54
01	0h1801	Application function selection	App Mode	0	None	0: None	X	O	O	
				1	-					
				2	Proc PID					
02	-	Enable user sequence	User Seq En	0	No	0:No	X	O	O	p.118
				1	Yes					
16 ³⁸	0h1810	PID output monitor	PID Output	(%)		0.00		O	O	
17 ³⁸	0h1811	PID reference monitor	PID Ref Value	(%)		50.00		O	O	
18 ³⁸	0h1812	PID feedback monitor	PID Fdb Value	(%)		0.00		O	O	
19 ³⁸	0h1813	PID reference setting	PID Ref Set	-100.00-100.00(%)		50.00	O	O	O	
20 ³⁸	0h1814	PID reference	PID	0	Keypad	0:	X	O	O	

³⁷ Displayed when APP-01 is set to 2 (Proc PID)

³⁸ Displayed when APP-01 is set to 2 (Proc PID)

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
		source	Ref Source	1	V1	Keypad				
				3	V2					
				4	I2					
				5	Int 485					
				7	FieldBus					
				11	Pulse					
21 ³⁸	0h1815	PID feedback source	PID F/B Source	0	V1	0:V1	X	O	O	
				2	V2					
				3	I2					
				4	Int 485					
				6	FieldBus					
				10	Pulse					
22 ³⁸	0h1816	PID controller proportional gain	PID P-Gain	0.0-1000.0(%)		50.0	O	O	O	
23 ³⁸	0h1817	PID controller integral time	PID I-Time	0.0-200.0(s)		10.0	O	O	O	
24 ³⁸	0h1818	PID controller differentiation time	PID D-Time	0-1000(ms)		0	O	O	O	
25 ³⁸	0h1819	PID controller feed-forward compensation gain	PID F-Gain	0.0-1000.0(%)		0.0	O	O	O	
26 ³⁸	0h181A	Proportional gain scale	P Gain Scale	0.0-100.0(%)		100.0	X	O	O	
27 ³⁸	0h181B	PID output filter	PID Out LPF	0-10000(ms)		0	O	O	O	
28 ³⁸	0h181C	PID Mode	PID Mode	0	Process PID	0	X	O	O	
				1	Normal PID					
29 ³⁸	0h181D	PID upper limit frequency	PID Limit Hi	PID lower limit frequency-300.00(Hz)		50.00	O	O	O	
30 ³⁸	0h181E	PID lower limit frequency	PID Limit Lo	-300.00 -PID upper limit frequency(Hz)		-50.00	O	O	O	
31 ³⁸	0h181F	PID output inverse	PID Out Inv	0	No	0:No	X	O	O	
				1	Yes					
32 ³⁸	0h1820	PID output scale	PID Out Scale	0.1-1000.0(%)		100.0	X	O	O	
34 ³⁸	0h1822	PID controller motion	Pre-PID Freq	0.00-Maximum		0.00	X	O	O	

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
		frequency		frequency(Hz)						
35 ³⁸	0h1823	PID controller motion level	Pre-PID Exit	0.0-100.0(%)		0.0	X	O	O	
36 ³⁸	0h1824	PID controller motion delay time	Pre-PID Delay	0-9999(s)		600	O	O	O	
37 ³⁸	0h1825	PID sleep mode delay time	PID Sleep DT	0.0-999.9(s)		60.0	O	O	O	
38 ³⁸	0h1826	PID sleep mode frequency	PID Sleep Freq	0.00-Maximum frequency(Hz)		0.00	O	O	O	
39 ³⁸	0h1827	PID wake-up level	PIDWakeUp Lev	0-100(%)		35	O	O	O	
40 ³⁸	0h1828	PID wake-up mode setting	PID WakeUp Mod	0	Below Level	0:Below Level	O	O	O	
				1	Above Level					
				2	Beyond Level					
42 ³⁸	0h182A	PID controller unit selection	PID Unit Sel	0	%	0:%	O	O	O	
				1	Bar					
				2	mBar					
				3	Pa					
				4	kPa					
				5	Hz					
				6	rpm					
				7	V					
				8	I					
				9	kW					
				10	HP					
				11	°C					
				12	°F					
43 ³⁸	0h182B	PID unit gain	PID Unit Gain	0.00-300.00(%)		100.00	O	O	O	
44 ³⁸	0h182C	PID unit scale	PID Unit Scale	0	x100	2:x 1	O	O	O	
				1	x10					
				2	x 1					
				3	x 0.1					
				4	x 0.01					
45 ³⁸	0h182D	PID 2nd proportional gain	PID P2-Gain	0.0-1000.0(%)		100.0	X	O	O	

6.9 Protection Function group (PAR→PRT)

In the following table, the data shaded in grey will be displayed when a related code has been selected.

SL: Sensorless vector control (DRV-09)

***O/X:** Write-enabled during operation,

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
00	-	Jump Code	Jump Code	1-99		40	O	O	O	<u>p.54</u>
04	0h1B04	Load level setting	Load Duty	0	Normal Duty	1:Heavy Duty	X	O	O	
				1	Heavy Duty					
05	0h1B05	Input/output open-phase protection	Phase Loss Chk	bit	00-11	00	X	O	O	
				01	Output open phase					
				10	Input open phase					
06	0h1B06	Input voltage range during open-phase	IPO V Band	1-100(V)		15	X	O	O	
07	0h1B07	Deceleration time at fault trip	Trip Dec Time	0.0-600.0(s)		3.0	O	O	O	
08	0h1B08	Selection of startup on trip reset	RST Restart	0	No	0:No	O	O	O	
				1	Yes					
09	0h1B09	Number of automatic restarts	Retry Number	0-10		0	O	O	O	
10 ³⁹	0h1B0A	Automatic restart delay time	Retry Delay	0.0-60.0(s)		1.0	O	O	O	
12	0h1B0C	Motion	Lost Cmd	0	None	0:None	O/A	O	O	

³⁹ Displayed when PRT-09 is set higher than 0

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
		at speed command loss	Mode	1	Free-Run					
				2	Dec					
				3	Hold Input					
				4	Hold Output					
				5	Lost Preset					
13 ⁴⁰	0h1B0D	Time to decide speed command loss	Lost Cmd Time	0.1-120(s)		1.0	O	O	O	
14 ⁴⁰	0h1B0E	Operation frequency at speed command loss	Lost Preset F	Start frequency-Maximum frequency(Hz)		0.00	O	O	O	
15 ⁴⁰	0h1B0F	Analog input loss decision level	AI Lost Level	0	Half x1	0:Half of x1	O	O	O	
				1	Below x1					
17	0h1B11	Overload warning selection	OL Warn Select	0	No	0:No	O	O	O	
				1	Yes					
18	0h1B12	Overload alarm level	OL Warn Level	30-180(%)		150	O	O	O	
19	0h1B13	Overload warning time	OL Warn Time	0.0-30.0(s)		10.0	O	O	O	
20	0h1B14	Motion at overload fault	OL Trip Select	0	None	1:Free-Run	O	O	O	
				1	Free-Run					
				2	Dec					
21	0h1B15	Overload fault level	OL Trip Level	30-200(%)		180	O	O	O	
22	0h1B16	Overload fault time	OL Trip Time	0.0-60.0(s)		60.0	O	O	O	
25	0h1B19	Underload warning selection	UL Warn Sel	0	No	0:No	O	O	O	
				1	Yes					
26	0h1B1A	Underload warning time	UL Warn Time	0.0-600.0(s)		10.0	O	O	O	
27	0h1B1B	Underload fault selection	UL Trip Sel	0	None	0:None	O	O	O	
				1	Free-Run					

⁴⁰ Displayed when PRT-12 is not set to 0 (NONE)

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
				2	Dec					
28	0h1B1C	Underload fault time	UL Trip Time	0.0-600.0(s)		30.0	O	O	O	
29	0h1B1D	Underload lower limit level	UL LF Level	10-30(%)		30	O	O	O	
30	0h1B1E	Underload upper limit level	UL BF Level	30-100(%)		30	O	O	O	
31	0h1B1F	No motor motion at detection	No Motor Trip	0	None	0:None	O	O	O	
				1	Free-Run					
32	0h1B20	No motor detection current level	No Motor Level	1-100(%)		5	O	O	O	
33	0h1B21	No motor detection delay	No Motor Time	0.1-10.0(s)		3.0	O	O	O	
40	0h1B28	Electronic thermal fault selection	ETH Trip Sel	0	None	0:None	O	O	O	
				1	Free-Run					
				2	Dec					
41	0h1B29	Motor cooling fan type	Motor Cooling	0	Self-cool	0:Self-cool	O	O	O	
				1	Forced-cool					
42	0h1B2A	Electronic thermal 1 minute rating	ETH 1min	120-200(%)		150	O	O	O	
43	0h1B2B	Electronic thermal continuous rating	ETH Cont	50-150(%)		120	O	O	O	
45	0h1B2D	BX trip mode	BX Mode	0	Free-Run	0	X	O	O	
				1	Dec					
50	0h1B32	Stall prevention motion and flux braking	Stall Prevent	bit	0000-1111	1000	X	O	O	
				00 01	Accelerating					
				00 10	At constant speed					

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
				01 00	At deceleration					
				10 00	FluxBraking					
51	0h1B33	Stall frequency1	Stall Freq 1	Start frequency- Stall frequency2(Hz)		50.00	O	O	O	
52	0h1B34	Stall level1	Stall Level 1	30-250(%)		180	X	O	O	
53	0h1B35	Stall frequency2	Stall Freq 2	Stall frequency1- Stall frequency3(Hz)		50.00	O	O	O	
54	0h1B36	Stall level2	Stall Level 2	30-250(%)		180	X	O	O	
55	0h1B37	Stall frequency3	Stall Freq 3	Stall frequency2- Stall frequency4(Hz)		50.00	O	O	O	
56	0h1B38	Stall level3	Stall Level 3	30-250(%)		180	X	O	O	
57	0h1B39	Stall frequency4	Stall Freq 4	Stall frequency3- Maximum frequency(Hz)		50.00	O	O	O	
58	0h1B3A	Stall level4	Stall Level 4	30-250(%)		180	X	O	O	
59	0h1B3B	Flux braking gain	Flux Brake Kp	0~150		0	O	O	O	
60	0h1B3C	CAP diagnosis current level	CAP. DiagCurr Perc	10~100(%)		0	O	O	O	
61 ⁴¹	0h1B3D	CAP diagnosis mode	CAP. Diag	0	None	0	X	O	-	
				1	Ref Diag					
				2	Pre Diag					
				3	Init Diag					
62 ⁴¹	0h1B3E	CAP Exchange Level	CAP Exchange Level	50.0~95.0(%)		0	X	O	O	
63 ⁴¹	0h1B3F	CAP Diag Level	CAP Diag Level	0.0~100.0(%)		100.0	-	O	O	
66	0h1B42	DB resistor warning level	DB Warn %ED	0-30(%)		0	O	O	O	
73	0h1B22	Speed deviation	Speed Dev	0	No	0:No	O	O	O	

⁴¹ The PRT-61–63 codes are displayed when the PRT-60 (CAP. DiagPerc) is set to more than 0.

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property [#]	V/F	SL	Ref.
		trip	Trip	1	Yes					
74	0h1B23	Speed deviation band	Speed Dev Band	1~20		5	O	O	O	
75	0h1B24	Speed deviation decision time	Speed Dev Time	0~120		60	O	O	O	
79	0h1B4F	Cooling fan fault selection	FAN Trip Mode	0	Trip	0:Trip	O	O	O	
				1	Warning					
80	0h1B50	Motion selection at option trip	Opt Trip Mode	0	None	1:Free-Run	O	O	O	
				1	Free-Run					
				2	Dec					
81	0h1B51	Low voltage fault decision delay time	LVT Delay	0.0~60.0(s)		0.0	X	O	O	
82	0h1B52	LV2 Selection	LV2 Enable	0	No	0: No	X	O	O	-
				1	Yes					
86	0h1B56	Accumulated percent of fan usage	Fan Time Perc	0.0~100.0(%)		0.0	-	O	O	-
87	0h1B57	Fan exchange warning level	Fan Exchange level	0.0~100.0(%)		90.0	O	O	O	-
88	0h1B58	Fan reset time	Fan Time Rst	0	No	0	X	O	O	-
				1	Yes					
89	0h1B59	CAP, FAN Status	CAP, FAN State	Bit 00~10		00	-	O	O	-
				00 -						
				01 CAP Warning						
				10 FAN Warning						
90	0h1B5A	Warning information	-	-		-		O	O	-
91	0h1B5B	Fault history 1	-	-		-		O	O	-
92	0h1B5C	Fault history 2	-	-		-		O	O	-
93	0h1B5D	Fault history 3	-	-		-		O	O	-
94	0h1B5E	Fault history 4	-	-		-		O	O	-
95	0h1B5F	Fault history 5	-	-		-		O	O	-
96	0h1B60	Fault history deletion	-	0	No	0:No		O	O	-
				1	Yes					

6.10 2nd Motor Function group (PAR→M2)

The 2nd Motor function group will be displayed if any of IN-65-71 is set to 26 (2nd MOTOR). In the following table, the data shaded in grey will be displayed when a related code has been selected.

SL: Sensorless vector control (DRV-09)

***O/X:** Write-enabled during operation

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
00	-	Jump Code	Jump Code	1-99	14	O	O	O	<u>p.54</u>
04	0h1C04	Acceleration time	M2-Acc Time	0.0-600.0(s)	20.0	O	O	O	
05	0h1C05	Deceleration time	M2-Dec Time	0.0-600.0(s)	30.0	O	O	O	
06	0h1C06	Motor capacity	M2-Capacity	0	0.2 kW	-	X	O	O
				1	0.4 kW				
				2	0.75 kW				
				3	1.1 kW				
				4	1.5 kW				
				5	2.2 kW				
				6	3.0 kW				
				7	3.7 kW				
				8	4.0 kW				
				9	5.5 kW				
				10	7.5 kW				
				11	11.0 kW				
				12	15.0 kW				
				13	18.5 kW				
				14	22.0 kW				
				15	30.0 kW				
				16	37.0 kW				
				17	45.0 kW				
				18	55.0 kW				
				19	75.0 kW				
				20	90.0 kW				
07	0h1C07	Base frequency	M2-Base Freq	30.00-400.00(Hz)	50.00	X	O	O	
08	0h1C08	Control mode	M2-Ctrl Mode	0	V/F	0:V/F	X	O	O
				2	Slip Compen				
				4	IM Sensorless				
10	0h1C0A	Number of	M2-Pole	2-48	Depen	X	O	O	

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
		motor poles	Num			dent on motor settings				
11	0h1C0B	Rated slip speed	M2-Rated Slip	0-3000(rpm)			X	O	O	
12	0h1C0C	Motor rated current	M2-Rated Curr	1.0-1000.0(A)			X	O	O	
13	0h1C0D	Motor no-load current	M2-Noload Curr	0.5-1000.0(A)			X	O	O	
14	0h1C0E	Motor rated voltage	M2-Rated Volt	170-480(V)			X	O	O	
15	0h1C0F	Motor efficiency	M2-Efficiency	70-100(%)			X	O	O	
16	0h1C10	Load inertia rate	M2-Inertia Rt	0-8			X	O	O	
17	-	Stator resistor	M2-Rs	Dependent on motor settings			X	O	O	
18	-	Leakage inductance	M2-Lsigma				X	O	O	
19	-	Stator inductance	M2-Ls				X	O	O	
20 ⁴²	-	Rotor time constant	M2-Tr	25-5000(ms)		X	O	O		
25	0h1C19	V/F pattern	M2-V/F Patt	0	Linear	0: Linear	X	O	O	
				1	Square					
				2	User V/F					
26	0h1C1A	Forward Torque boost	M2-Fwd Boost	0.0-15.0(%)		2.0	X	O	O	
27	0h1C1B	Reverse Torque boost	M2-Rev Boost	0.0-15.0(%)			X	O	O	
28	0h1C1C	Stall prevention level	M2-Stall Lev	30-150(%)		150	X	O	O	
29	0h1C1D	Electronic thermal 1 minute rating	M2-ETH 1min	100-200(%)		150	X	O	O	
30	0h1C1E	Electronic thermal continuous rating	M2-ETH Cont	50-150(%)		100	X	O	O	

⁴² Displayed when M2-08 is set to 4 (IM Sensorless)

6.11 User Sequence group (USS)

This group appears when APP-02 is set to 1 (Yes) or COM-95 is set to 2 (P2P Master). The parameter cannot be changed while the user sequence is running.

SL: Sensorless vector control function (DRV-09)

***O/X:** Write-enabled during operation

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
00	-	Jump code	Jump Code	1-99	31	O	O	O	p.54
01	0h1D01	User sequence operation command	User Seq Con	0 Stop	0: Stop	X	O	O	p.118
				1 Run					
				2 Digital In Run					
02	0h1D02	User sequence operation loop time	US Loop Time	0 0.01s	1: 0.02s	X	O	O	p.118
				1 0.02s					
				2 0.05s					
				3 0.1s					
				4 0.5s					
				5 1s					
11	0h1D0B	Output address link1	Link UserOut1	0-0xFFFF	0	X	O	O	p.118
12	0h1D0C	Output address link2	Link UserOut2	0-0xFFFF	0	X	O	O	p.118
13	0h1D0D	Output address link3	Link UserOut3	0-0xFFFF	0	X	O	O	p.118
14	0h1D0E	Output address link4	Link UserOut4	0-0xFFFF	0	X	O	O	p.118
15	0h1D0F	Output address link5	Link UserOut5	0-0xFFFF	0	X	O	O	p.118
16	0h1D10	Output address link6	Link UserOut6	0-0xFFFF	0	X	O	O	p.118
17	0h1D11	Output address link7	Link UserOut7	0-0xFFFF	0	X	O	O	p.118
18	0h1D12	Output address link8	Link UserOut8	0-0xFFFF	0	X	O	O	p.118
19	0h1D13	Output address link9	Link UserOut9	0-0xFFFF	0	X	O	O	p.118
20	0h1D14	Output address link10	Link UserOut10	0-0xFFFF	0	X	O	O	p.118

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
21	0h1D15	Output address link11	Link UserOut11	0-0xFFFF	0	X	O	O	p.118
22	0h1D16	Output address link12	Link UserOut12	0-0xFFFF	0	X	O	O	p.118
23	0h1D17	Output address link13	Link UserOut13	0-0xFFFF	0	X	O	O	p.118
24	0h1D18	Output address link14	Link UserOut14	0-0xFFFF	0	X	O	O	p.118
25	0h1D19	Output address link15	Link UserOut15	0-0xFFFF	0	X	O	O	p.118
26	0h1D1A	Output address link16	Link UserOut16	0-0xFFFF	0	X	O	O	p.118
27	0h1D1B	Output address link17	Link UserOut17	0-0xFFFF	0	X	O	O	p.118
28	0h1D1C	Output address link18	Link UserOut18	0-0xFFFF	0	X	O	O	p.118
31	0h1D1F	Input constant setting1	Void Para1	-9999-9999	0	X	O	O	p.118
32	0h1D20	Input constant setting2	Void Para2	-9999-9999	0	X	O	O	p.118
33	0h1D21	Input constant setting3	Void Para3	-9999-9999	0	X	O	O	p.118
34	0h1D22	Input constant setting4	Void Para4	-9999-9999	0	X	O	O	p.118
35	0h1D23	Input constant setting5	Void Para5	-9999-9999	0	X	O	O	p.118
36	0h1D24	Input constant setting6	Void Para6	-9999-9999	0	X	O	O	p.118
37	0h1D25	Input constant setting7	Void Para7	-9999-9999	0	X	O	O	p.118
38	0h1D26	Input constant setting8	Void Para8	-9999-9999	0	X	O	O	p.118
39	0h1D27	Input constant setting9	Void Para9	-9999-9999	0	X	O	O	p.118
40	0h1D28	Input constant setting10	Void Para10	-9999-9999	0	X	O	O	p.118
41	0h1D29	Input constant setting11	Void Para11	-9999-9999	0	X	O	O	p.118
42	0h1D2A	Input constant setting12	Void Para12	-9999-9999	0	X	O	O	p.118
43	0h1D2B	Input constant setting13	Void Para13	-9999-9999	0	X	O	O	p.118
44	0h1D2C	Input constant	Void Para14	-9999-9999	0	X	O	O	p.118

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
		setting14							
45	0h1D2D	Input constant setting15	Void Para15	-9999-9999	0	X	O	O	p.118
46	0h1D2E	Input constant setting16	Void Para16	-9999-9999	0	X	O	O	p.118
47	0h1D2F	Input constant setting17	Void Para17	-9999-9999	0	X	O	O	p.118
48	0h1D30	Input constant setting18	Void Para18	-9999-9999	0	X	O	O	p.118
49	0h1D31	Input constant setting19	Void Para19	-9999-9999	0	X	O	O	p.118
50	0h1D32	Input constant setting20	Void Para20	-9999-9999	0	X	O	O	p.118
51	0h1D33	Input constant setting21	Void Para21	-9999-9999	0	X	O	O	p.118
52	0h1D34	Input constant setting22	Void Para22	-9999-9999	0	X	O	O	p.118
53	0h1D35	Input constant setting23	Void Para23	-9999-9999	0	X	O	O	p.118
54	0h1D36	Input constant setting24	Void Para24	-9999-9999	0	X	O	O	p.118
55	0h1D37	Input constant setting25	Void Para25	-9999-9999	0	X	O	O	p.118
56	0h1D38	Input constant setting26	Void Para26	-9999-9999	0	X	O	O	p.118
57	0h1D39	Input constant setting27	Void Para27	-9999-9999	0	X	O	O	p.118
58	0h1D3A	Input constant setting28	Void Para28	-9999-9999	0	X	O	O	p.118
59	0h1D3B	Input constant setting29	Void Para29	-9999-9999	0	X	O	O	p.118
60	0h1D3C	Input constant setting30	Void Para30	-9999-9999	0	X	O	O	p.118
80	0h1D50S	Analog input 1	P2P In V1	0-12,000			O	O	p.118
81	0h1D51	Analog input2	P2P In I2	-12,000-12,000			O	O	p.118
82	0h1D52	Digital input	P2P In DI	0-0x7F			O	O	p.118
85	0h1D55	Analog output	P2P OutAO1	0-10,000	0	X	O	O	p.118
89	0h1D58	Digital output	P2P OutDO	0-0x03	0	X	O	O	p.118

6.12 User Sequence Function group(USF)

This group appears when APP-02 is set to 1 (Yes) or COM-95 is set to 2 (P2P Master). The parameter cannot be changed while the user sequence is running.

SL: Sensorless vector control function (DRV-09)

***O/X:** Write-enabled during operation

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
00	-	Jump code	Jump Code	1-99		41	O	O	O	<u>p.54</u>
01	0h1E01	User function1	User Func1	0	NOP	0:NOP	X	O	O	<u>p.118</u>
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ					
				12	COMPARE-EQUAL					
				13	COMPARE-NEQUAL					
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					
				18	XOR					
				19	ANDOR					
				20	SWITCH					
				21	BITTEST					
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
				26	PI_PROCESS				
				27	UPCOUNT				
				28	DOWNCOUNT				
02	0h1E02	User function input1-A	User Input1-A	0-0xFFFF	0	X	O	O	p.118
03	0h1E03	User function input1-B	User Input1-B	0-0xFFFF	0	X	O	O	p.118
04	0h1E04	User function input1-C	User Input1-C	0-0xFFFF	0	X	O	O	p.118
05	0h1E05	User function output1	User Output1	-32767-32767	0		O	O	p.118
06	0h1E06	User function 2	User Func2	0	NOP	0: NOP	X	O	O
				1	ADD				
				2	SUB				
				3	ADDSUB				
				4	MIN				
				5	MAX				
				6	ABS				
				7	NEGATE				
				8	MPYDIV				
				9	REMAINDER				
				10	COMPARE-GT				
				11	COMPARE-GEQ				
				12	COMPARE-EQUAL				
				13	COMPARE-NEQUAL				
				14	TIMER				
				15	LIMIT				
				16	AND				
				17	OR				
				18	XOR				
				19	ANDOR				
				20	SWITCH				
				21	BITTEST				
				22	BITSET				
				23	BITCLEAR				

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
				24 LOWPASSFILTER					
				25 PI_CONTORL					
				26 PI_PROCESS					
				27 UPCOUNT					
				28 DOWNCOUNT					
07	0h1E07	User function input2-A	User Input2-A	0-0xFFFF	0	X	O	O	<u>p.118</u>
08	0h1E08	User function input2-B	User Input2-B	0-0xFFFF	0	X	O	O	<u>p.118</u>
09	0h1E09	User function input2-C	User Input2-C	0-0xFFFF	0	X	O	O	<u>p.118</u>
10	0h1E0A	User function output2	User Output2	-32767-32767	0		O	O	<u>p.118</u>
				0 NOP					
				1 ADD					
				2 SUB					
				3 ADDSUB					
				4 MIN					
				5 MAX					
				6 ABS					
				7 NEGATE					
				8 MPYDIV					
				9 REMAINDER					
				10 COMPARE-GT					
11	0h1E0B	User function3	User Func3	11 COMPARE-GEQ	0:NOP	X	O	O	<u>p.118</u>
				12 COMPARE-EQUAL					
				13 COMPARE-NEQUAL					
				14 TIMER					
				15 LIMIT					
				16 AND					
				17 OR					
				18 XOR					
				19 ANDOR					
				20 SWITCH					
				21 BITTEST					

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
12	0h1E0C	User function input3-A	User Input3-A	0-0xFFFF		0	X	O	O	p.118
13	0h1E0D	User function input3-B	User Input3-B	0-0xFFFF		0	X	O	O	p.118
14	0h1E0E	User function input3-C	User Input3-C	0-0xFFFF		0	X	O	O	p.118
15	0h1E0F	User function output3	User Output3	-32767-32767		0		O	O	p.118
16	0h1E10	User function4	User Func4	0	NOP	0:NOP	X	O	O	p.118
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ					
				12	COMPARE-EQUAL					
				13	COMPARE-NEQUAL					
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					
				18	XOR					
19	ANDOR									

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
				20	SWITCH				
				21	BITTEST				
				22	BITSET				
				23	BITCLEAR				
				24	LOWPASSFILTER				
				25	PI_CONTORL				
				26	PI_PROCESS				
				27	UPCOUNT				
				28	DOWNCOUNT				
17	0h1E11	User function input4-A	User Input4-A	0-0xFFFF	0	X	O	O	<u>p.118</u>
18	0h1E12	User function input4-B	User Input4-B	0-0xFFFF	0	X	O	O	<u>p.118</u>
19	0h1E13	User function input4-C	User Input4-C	0-0xFFFF	0	X	O	O	<u>p.118</u>
20	0h1E14	User function output4	User Output4	-32767-32767	0		O	O	<u>p.118</u>
21	0h1E15	User function5	User Func5	0	NOP	0:NOP	X	O	O
				1	ADD				
				2	SUB				
				3	ADDSUB				
				4	MIN				
				5	MAX				
				6	ABS				
				7	NEGATE				
				8	MPYDIV				
				9	REMAINDER				
				10	COMPARE-GT				
				11	COMPARE-GEQ				
				12	COMPARE-EQUAL				
				13	COMPARE-NEQUAL				
				14	TIMER				
				15	LIMIT				
				16	AND				
				17	OR				
				18	XOR				
				19	ANDOR				

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
				20	SWITCH					
				21	BITTEST					
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
22	0h1E16	User function input5-A	User Input5-A	0-0xFFFF		0	X	O	O	p.118
23	0h1E17	User function input5-B	User Input5-B	0-0xFFFF		0	X	O	O	p.118
24	0h1E18	User function input5-C	User Input5-C	0-0xFFFF		0	X	O	O	p.118
25	0h1E19	User function output5	User Output5	-32767-32767		0		O	O	p.118
26	0h1E1A	User function6	User Func6	0	NOP	0: NOP	X	O	O	p.118
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ					
				12	COMPARE-EQUAL					
				13	COMPARE-NEQUAL					
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
				18 XOR					
				19 ANDOR					
				20 SWITCH					
				21 BITTEST					
				22 BITSET					
				23 BITCLEAR					
				24 LOWPASSFILTER					
				25 PI_CONTORL					
				26 PI_PROCESS					
				27 UPCOUNT					
				28 DOWNCOUNT					
27	0h1E1B	User function input6-A	User Input6-A	0-0xFFFF	0	X	O	O	<u>p.118</u>
28	0h1E1C	User function input6-B	User Input6-B	0-0xFFFF	0	X	O	O	<u>p.118</u>
29	0h1E1D	User function input6-C	User Input6-C	0-0xFFFF	0	X	O	O	<u>p.118</u>
30	0h1E1E	User function output6	User Output6	-32767-32767	0		O	O	<u>p.118</u>
31	0h1E1F	User function7	User Func7	0 NOP	0:NOP	X	O	O	<u>p.118</u>
				1 ADD					
				2 SUB					
				3 ADDSUB					
				4 MIN					
				5 MAX					
				6 ABS					
				7 NEGATE					
				8 MPYDIV					
				9 REMAINDER					
				10 COMPARE-GT					
				11 COMPARE-GEQ					
				12 COMPARE-EQUAL					
				13 COMPARE-					
				14 TIMER					
				15 LIMIT					

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
				16	AND				
				17	OR				
				18	XOR				
				19	ANDOR				
				20	SWITCH				
				21	BITTEST				
				22	BITSET				
				23	BITCLEAR				
				24	LOWPASSFILTER				
				25	PI_CONTORL				
				26	PI_PROCESS				
				27	UPCOUNT				
				28	DOWNCOUNT				
32	0h1E20	User function input7-A	User Input7-A	0-0xFFFF	0	X	O	O	p.118
33	0h1E21	User function input7-B	User Input7-B	0-0xFFFF	0	X	O	O	p.118
34	0h1E22	User function input7-C	User Input7-C	0-0xFFFF	0	X	O	O	p.118
35	0h1E23	User function output7	User Output7	-32767-32767	0		O	O	p.118
36	0h1E24	User function8	User Func8	0	NOP	0:NOP	X	O	p.118
				1	ADD				
				2	SUB				
				3	ADDSUB				
				4	MIN				
				5	MAX				
				6	ABS				
				7	NEGATE				
				8	MPYDIV				
				9	REMAINDER				
				10	COMPARE-GT				
				11	COMPARE-GEQ				
				12	COMPARE-EQUAL				
				13	COMPARE-NEQUAL				

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
				14	TIMER				
				15	LIMIT				
				16	AND				
				17	OR				
				18	XOR				
				19	ANDOR				
				20	SWITCH				
				21	BITTEST				
				22	BITSET				
				23	BITCLEAR				
				24	LOWPASSFILTER				
				25	PI_CONTORL				
				26	PI_PROCESS				
				27	UPCOUNT				
				28	DOWNCOUNT				
37	0h1E25	User function input8-A	User Input8-A	0-0xFFFF	0	X	O	O	<u>p.118</u>
38	0h1E26	User function input8-B	User Input8-B	0-0xFFFF	0	X	O	O	<u>p.118</u>
39	0h1E27	User function input8-C	User Input8-C	0-0xFFFF	0	X	O	O	<u>p.118</u>
40	0h1E28	User function output8	User Output8	-32767-32767	0		O	O	<u>p.118</u>
41	0h1E29	User function9	User Func9	0	NOP	0:NOP	X	O	O
				1	ADD				
				2	SUB				
				3	ADDSUB				
				4	MIN				
				5	MAX				
				6	ABS				
				7	NEGATE				
				8	MPYDIV				
				9	REMAINDER				
				10	COMPARE-GT				
				11	COMPARE-GEQ				
				12	COMPARE-EQUAL				

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Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
				13 COMPARE-NEQUAL					
				14 TIMER					
				15 LIMIT					
				16 AND					
				17 OR					
				18 XOR					
				19 ANDOR					
				20 SWITCH					
				21 BITTEST					
				22 BITSET					
				23 BITCLEAR					
				24 LOWPASSFILTER					
				25 PI_CONTORL					
				26 PI_PROCESS					
				27 UPCOUNT					
				28 DOWNCOUNT					
42	0h1E2A	User function input9-A	User Input9-A	0-0xFFFF	0	X	O	O	p.118
43	0h1E2B	User function input9-B	User Input9-B	0-0xFFFF	0	X	O	O	p.118
44	0h1E2C	User function input9-C	User Input9-C	0-0xFFFF	0	X	O	O	p.118
45	0h1E2D	User function output9	User Output9	-32767-32767	0		O	O	p.118
46	0h1E2E	User function10	User Func10	0 NOP	0:NOP	X	O	O	p.118
				1 ADD					
				2 SUB					
				3 ADDSUB					
				4 MIN					
				5 MAX					
				6 ABS					
				7 NEGATE					
				8 MPYDIV					
				9 REMAINDER					
				10 COMPARE-GT					
				11 COMPARE-GEQ					

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
				12	COMPARE-EQUAL				
				13	COMPARE-NEQUAL				
				14	TIMER				
				15	LIMIT				
				16	AND				
				17	OR				
				18	XOR				
				19	ANDOR				
				20	SWITCH				
				21	BITTEST				
				22	BITSET				
				23	BITCLEAR				
				24	LOWPASSFILTER				
				25	PI_CONTORL				
				26	PI_PROCESS				
				27	UPCOUNT				
				28	DOWNCOUNT				
47	0h1E2F	User function input10-A	User Input10-A	0-0xFFFF	0	X	O	O	<u>p.118</u>
48	0h1E30	User function input10-B	User Input10-B	0-0xFFFF	0	X	O	O	<u>p.118</u>
49	0h1E31	User function input10-C	User Input10-C	0-0xFFFF	0	X	O	O	<u>p.118</u>
50	0h1E32	User function output10	User Output10	-32767-32767	0		O	O	<u>p.118</u>
51	0h1E33	User function11	User Func11	0	NOP	0: NOP	X	O	<u>p.118</u>
				1	ADD				
				2	SUB				
				3	ADDSUB				
				4	MIN				
				5	MAX				
				6	ABS				
				7	NEGATE				

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
				8	MPYDIV				
				9	REMAINDER				
				10	COMPARE-GT				
				11	COMPARE-GEQ				
				12	COMPARE-EQUAL				
				13	COMPARE-NEQUAL				
				14	TIMER				
				15	LIMIT				
				16	AND				
				17	OR				
				18	XOR				
				19	ANDOR				
				20	SWITCH				
				21	BITTEST				
				22	BITSET				
				23	BITCLEAR				
				24	LOWPASSFILTER				
				25	PI_CONTORL				
				26	PI_PROCESS				
				27	UPCOUNT				
				28	DOWNCOUNT				
52	0h1E34	User function input11-A	User Input11-A	0-0xFFFF	0	X	O	O	p.118
53	0h1E35	User function input11-B	User Input11-B	0-0xFFFF	0	X	O	O	p.118
54	0h1E36	User function input11-C	User Input11-C	0-0xFFFF	0	X	O	O	p.118
55	0h1E37	User function output11	User Output11	-32767-32767	0		O	O	p.118
56	0h1E38	User function12	User Func12	0	0:NOP	X	O	O	p.118
				1					
				2					
				3					

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
				4	MIN				
				5	MAX				
				6	ABS				
				7	NEGATE				
				8	MPYDIV				
				9	REMAINDER				
				10	COMPARE-GT				
				11	COMPARE-GEQ				
				12	COMPARE-EQUAL				
				13	COMPARE-NEQUAL				
				14	TIMER				
				15	LIMIT				
				16	AND				
				17	OR				
				18	XOR				
				19	ANDOR				
				20	SWITCH				
				21	BITTEST				
				22	BITSET				
				23	BITCLEAR				
				24	LOWPASSFILTER				
				25	PI_CONTORL				
				26	PI_PROCESS				
				27	UPCOUNT				
				28	DOWNCOUNT				
57	0h1E39	User function input12-A	User Input12-A	0-0xFFFF	0	X	O	O	p.118
58	0h1E3A	User function input12-B	User Input12-B	0-0xFFFF	0	X	O	O	p.118
59	0h1E3B	User function input12-C	User Input12-C	0-0xFFFF	0	X	O	O	p.118
60	0h1E3C	User function output12	User Output12	-32767-32767	0		O	O	p.118

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
61	0h1E3D	User function13	User Func13	0	NOP	0: NOP	X	O	O	<u>p.118</u>
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ					
				12	COMPARE-EQUAL					
				13	COMPARE-NEQUAL					
				14	TIMER					
				15	LIMIT					
				16	AND					
				17	OR					
				18	XOR					
				19	ANDOR					
				20	SWITCH					
				21	BITTEST					
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
62	0h1E3E	User function input13-A	User Input13-A	0-0xFFFF		0	X	O	O	<u>p.118</u>
63	0h1E3F	User function input13-B	User Input13-B	0-0xFFFF		0	X	O	O	<u>p.118</u>

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
64	0h1E40	User function input13-C	User Input13-C	0-0xFFFF	0	X	O	O	<u>p.118</u>
65	0h1E41	User function output13	User Output13	-32767-32767	0		O	O	<u>p.118</u>
66	0h1E42	User function14	User Func14	0	0: NOP	X	O	O	<u>p.118</u>
				1					
				2					
				3					
				4					
				5					
				6					
				7					
				8					
				9					
				10					
				11					
				12					
				13					
				14					
				15					
				16					
				17					
				18					
				19					
				20					
				21					
				22					
				23					
				24					
				25					
				26					
				27					
				28					
67	0h1E43	User function	User	0-0xFFFF	0	X	O	O	<u>p.118</u>

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
		input14-A	Input14-A						
68	0h1E44	User function input14-B	User Input14-B	0-0xFFFF	0	X	O	O	p.118
69	0h1E45	User function input14-C	User Input14-C	0-0xFFFF	0	X	O	O	p.118
70	0h1E46	User function output14	User Output14	-32767-32767	0		O	O	p.118
71	0h1E47	User function15	User Func15	0	0:NOP	X	O	O	p.118
				1					
				2					
				3					
				4					
				5					
				6					
				7					
				8					
				9					
				10					
				11					
				12					
				13					
				14					
				15					
				16					
				17					
				18					
				19					
				20					
				21					
				22					
				23					
				24					
				25					

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
				26	PI_PROCESS				
				27	UPCOUNT				
				28	DOWNCOUNT				
72	0h1E48	User function input15-A	User Input15-A	0-0xFFFF	0	X	O	O	<u>p.118</u>
73	0h1E49	User function input15-B	User Input15-B	0-0xFFFF	0	X	O	O	<u>p.118</u>
74	0h1E4A	User function input15-C	User Input15-C	0-0xFFFF	0	X	O	O	<u>p.118</u>
75	0h1E4B	User function output15	User Output15	-32767-32767	0		O	O	<u>p.118</u>
76	0h1E4C	User function 16	User Func16	0	NOP	0:NOP	X	O	O
				1	ADD				
				2	SUB				
				3	ADDSUB				
				4	MIN				
				5	MAX				
				6	ABS				
				7	NEGATE				
				8	MPYDIV				
				9	REMAINDER				
				10	COMPARE-GT				
				11	COMPARE-GEQ				
				12	COMPARE-EQUAL				
				13	COMPARE-NEQUAL				
				14	TIMER				
				15	LIMIT				
				16	AND				
				17	OR				
				18	XOR				
				19	ANDOR				
				20	SWITCH				
				21	BITTEST				

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range		Initial Value	Property*	V/F	SL	Ref.
				22	BITSET					
				23	BITCLEAR					
				24	LOWPASSFILTER					
				25	PI_CONTORL					
				26	PI_PROCESS					
				27	UPCOUNT					
				28	DOWNCOUNT					
77	0h1E4D	User function input16-A	User Input16-A	0-0xFFFF		0	X	O	O	p.118
78	0h1E4E	User function input16-B	User Input16-B	0-0xFFFF		0	X	O	O	p.118
79	0h1E4F	User function input16-C	User Input16-C	0-0xFFFF		0	X	O	O	p.118
80	0h1E50	User function output16	User Output16	-32767–32767		0		O	O	p.118
81	0h1E51	User function 17	User Func17	0	NOP	0: NOP	X	O	O	p.118
				1	ADD					
				2	SUB					
				3	ADDSUB					
				4	MIN					
				5	MAX					
				6	ABS					
				7	NEGATE					
				8	MPYDIV					
				9	REMAINDER					
				10	COMPARE-GT					
				11	COMPARE-GEQ					
				12	COMPARE-EQUAL					
				13	COMPARE-NEQUAL					
				14	TIMER					
				15	LIMIT					
				16	AND					
17	OR									

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
				18 XOR					
				19 ANDOR					
				20 SWITCH					
				21 BITTEST					
				22 BITSET					
				23 BITCLEAR					
				24 LOWPASSFILTER					
				25 PI_CONTORL					
				26 PI_PROCESS					
				27 UPCOUNT					
				28 DOWNCOUNT					
82	0h1E52	User function input17-A	User Input17-A	0-0xFFFF	0	X	O	O	<u>p.118</u>
83	0h1E53	User function input17-B	User Input17-B	0-0xFFFF	0	X	O	O	<u>p.118</u>
84	0h1E54	User function input17-C	User Input17-C	0-0xFFFF	0	X	O	O	<u>p.118</u>
85	0h1E55	User function output17	User Output17	-32767-32767	0		O	O	<u>p.118</u>
86	0h1E56	User function 18	User Func18	0 NOP	0: NOP	X	O	O	<u>p.118</u>
				1 ADD					
				2 SUB					
				3 ADDSUB					
				4 MIN					
				5 MAX					
				6 ABS					
				7 NEGATE					
				8 MPYDIV					
				9 REMAINDER					
				10 COMPARE-GT					
				11 COMPARE-GEQ					
				12 COMPARE-EQUAL					
				13 COMPARE-NEQUAL					

Table of Functions

Code	Comm. Address	Name	LCD Display	Setting Range	Initial Value	Property*	V/F	SL	Ref.
				14	TIMER				
				15	LIMIT				
				16	AND				
				17	OR				
				18	XOR				
				19	ANDOR				
				20	SWITCH				
				21	BITTEST				
				22	BITSET				
				23	BITCLEAR				
				24	LOWPASSFILTER				
				25	PI_CONTORL				
				26	PI_PROCESS				
				27	UPCOUNT				
				28	DOWNCOUNT				
87	0h1E57	User function input18-A	User Input18-A	0-0xFFFF	0	X	O	O	<u>p.118</u>
88	0h1E58	User function input18-B	User Input18-B	0-0xFFFF	0	X	O	O	<u>p.118</u>
89	0h1E59	User function input18-C	User Input18-C	0-0xFFFF	0	X	O	O	<u>p.118</u>
90	0h1E5A	User function output18	User Output18	-32767-32767	0		O	O	<u>p.118</u>

6.13 Groups for LCD Keypad Only

6.13.1 Trip Mode (TRP Last-x)

Code	Name	LCD Display	Setting Range		Initial Value	Ref.
00	Trip type display	Trip Name(x)	-		-	-
01	Frequency reference at trip	Output Freq	-		-	-
02	Output current at trip	Output Current	-		-	-
03	Acceleration/Deceleration state at trip	Inverter State	-		-	-
04	DC section state	DCLink Voltage	-		-	-
05	NTC temperature	Temperature	-		-	-
06	Input terminal state	DI State	-		0000 0000	-
07	Output terminal state	DO State	-		000	-
08	Trip time after Power on	Trip On Time	-		0/00/00 00:00	-
09 10	Trip time after operation start	Trip Run Time	-		0/00/00 00:00	-
10	Delete trip history	Trip Delete?	0	No		
			1	Yes		

6.13.2 Config Mode (CNF)

Code	Name	LCD Display	Setting Range		Initial Value	Ref.
00	Jump code	Jump Code	1-99		42	<u>p.54</u>
01	Keypad language selection	Language Sel	0	English	0 : English	
			1	Russian		
			2	Spanish		
			3	Italian		
			4	Turkish		
02	LCD constrast adjustment	LCD Contrast	-		-	
03	Multi keypad ID	Multi KPD ID	3-99		3	<u>p.116</u>
10	Inverter S/W version	Inv S/W Ver	-		-	
11	LCD keypad S/W version	Keypad S/W Ver	-		-	
12	LCD keypad title version	KPD Title Ver	-		-	

Table of Functions

Code	Name	LCD Display	Setting Range		Initial Value	Ref.
20	Status window display item	Anytime Para	0	Frequency	0: Frequency	
21	Monitor mode display item1	Monitor Line-1	1	Speed	0: Frequency	
22	Monitor mode display item2	Monitor Line-2	2	Output Current	2: Output Current	
23	Monitor mode display item3	Monitor Line-3	3	Output Voltage	3: Output Voltage	
			4	Output Power		
			5	WHour Counter		
			6	DCLink Voltage		
			7	DI State		
			8	DO State		
			9	V1 Monitor(V)		
			10	V1 Monitor(%)		
			13	V2 Monitor(V)		
			14	V2 Monitor(%)		
			15	I2 Monitor(mA)		
			16	I2 Monitor(%)		
			17	PID Output		
			18	PID Ref Value		
			19	PID Fdb Value		
			20	Torque		
			21	Torque Limit		
			23	Speed Limit		
24	Monitor mode initialization	Mon Mode Init	0	No	0: No	
			1	Yes		
30	Option slot 1 type display	Option-1 Type	0	None	0: None	
31	Option slot 2 type display	Option-2 Type	6	Ethernet	0: None	
32	Option slot 3 type display	Option-3 Type	9	CANopen	0: None	
40	Parameter initialization	Parameter Init	0	No		
			1	All Grp		
			2	DRV Grp		
			3	BAS Grp		
			4	ADV Grp		
			5	CON Grp		
			6	IN Grp		
			7	OUT Grp		

Code	Name	LCD Display	Setting Range		Initial Value	Ref.
			8	COM Grp		
			9	APP Grp		
			12	PRT Grp		
			13	M2 Grp		
41	Display changed Parameter	Changed Para	0	View All	0:View All	
			1	View Changed		
42	Multi key item	Multi Key Sel	0	None	0:None	
			1	JOG Key		
			2	Local/Remote		
			3	UserGrp SelKey		
			4	Multi KPD		
43	Macro function item	Macro Select	0	None	0:None	
44	Trip history deletion	Erase All Trip	0	No	0:No	
			1	Yes		
45	User registration code deletion	UserGrp AllDel	0	No	0:No	
			1	Yes		
46	Read parameters	Parameter Read	0	No	0:No	
			1	Yes		
47	Write parameters	Parameter Write	0	No	0: No	
			1	Yes		
48	Save parameters	Parameter Save	0	No	0:No	
			1	Yes		
50	Hide parameter mode	View Lock Set	0-9999		Un-locked	
51	Password for hiding parameter mode	View Lock Pw	0-9999		Password	
52	Lock parameter edit	Key Lock Set	0-9999		Un-locked	
53	Password for locking parameter edit	Key Lock Pw	0-9999		Password	
60	Additional title update	Add Title Up	0	No	0:No	
			1	Yes		
61	Simple parameter setting	Easy Start On	0	No	1:Yes	
			1	Yes		
62	Power consumption initialization	WHCount Reset	0	No	0:No	
			1	Yes		
70	Accumulated inverter motion time	On-time	Year/month/day hour:minute		-	

Table of Functions

Code	Name	LCD Display	Setting Range		Initial Value	Ref.
71	Accumulated inverter operation time	Run-time	Year/month/day hour:minute		-	
72	Accumulated inverter operation time initialization	Time Reset	0	No	0:No	
			1	Yes		
74	Accumulated cooling fan operation time	Fan Time	Year/month/day hour:minute		-	
75	Reset of accumulated cooling fan operation time	Fan Time Rst	0	No	0:No	
			1	Yes		

7 Troubleshooting

This chapter explains how to troubleshoot a problem when inverter protective functions, fault trips, warning signals, or a fault occurs. If the inverter does not work normally after following the suggested troubleshooting steps, please contact the MARATHON DRIVE customer service center.

7.1 Trips and Warnings

When the inverter detects a fault, it stops the operation (trips) or sends out a warning signal. When a trip or warning occurs, detailed information is shown on the LCD display. Users can read the warning message at PRT-90. When more than 2 trips occur at roughly the same time, the LCD keypad shows the information for the fault trip that occurred first.

The fault conditions can be categorized as follows:

- **Level:** When the fault is corrected, the trip or warning signal disappears and the fault is not saved in the fault history.
- **Latch:** When the fault is corrected and a reset input signal is provided, the trip or warning signal disappears.
- **Fatal:** When the fault is corrected, the fault trip or warning signal disappears only after the user turns off the inverter, waits until the charge indicator light goes off, and turns the inverter on again. If the the inverter is still in a fault condition after powering it on again, please contact the supplier or the MARATHON DRIVE customer service center.

7.1.1 Fault Trips

Protection Functions for Output Current and Input Voltage

LCD Display	Type	Description
Overload	Latch	Displayed when the motor overload trip is activated and the actual load level exceeds the set level. Operates when PRT-20 is set to a value other than 0.
Underload	Latch	Displayed when the motor underload trip is activated and the actual load level is less than the set level. Operates when PRT-27 is set to a value other than 0.
Over Current1	Latch	Displayed when inverter output current exceeds 200% of the rated current.
Over Voltage	Latch	Displayed when internal DC circuit voltage exceeds the specified value.
Low Voltage	Level	Displayed when internal DC circuit voltage is less than the specified value.

LCD Display	Type	Description
Low Voltage ²	Latch	Displayed when internal DC circuit voltage is less than the specified value during inverter operation.
Ground Trip*	Latch	Displayed when a ground fault trip occurs on the output side of the inverter and causes the current to exceed the specified value. The specified value varies depending on inverter capacity.
E-Thermal	Latch	Displayed based on inverse time-limit thermal characteristics to prevent motor overheating. Operates when PRT-40 is set to a value other than 0.
Out Phase Open	Latch	Displayed when a 3-phase inverter output has one or more phases in an open circuit condition. Operates when bit 1 of PRT-05 is set to 1.
In Phase Open	Latch	Displayed when a 3-phase inverter input has one or more phases in an open circuit condition. Operates only when bit 2 of PRT-05 is set to 1.
Inverter OLT	Latch	Displayed when the inverter has been protected from overload and resultant overheating, based on inverse time-limit thermal characteristics. Allowable overload rates for the inverter are 150% for 1 min and 200% for 4 sec. Protection is based on inverter rated capacity, and may vary depending on the device's capacity.
No Motor Trip	Latch	Displayed when the motor is not connected during inverter operation. Operates when PRT-31 is set to 1.

* MD100G inverters rated for 4.0 kW or less do not support the ground fault trip (GFT) feature. Therefore, an over current trip (OCT) or over voltage trip (OVT) may occur when there is a low-resistance ground fault.

Protection Functions Using Abnormal Internal Circuit Conditions and External Signals

LCD Display	Type	Description
Over Heat	Latch	Displayed when the temperature of the inverter heat sink exceeds the specified value.
Over Current ²	Latch	Displayed when the DC circuit in the inverter detects a specified level of excessive, short circuit current.
External Trip	Latch	Displayed when an external fault signal is provided by the multi-function terminal. Set one of the multi-function input terminals at IN-65-71 to 4 (External Trip) to enable external trip.
BX	Level	Displayed when the inverter output is blocked by a signal provided from the multi-function terminal. Set one of the multi-function input terminals at IN-65-71 to 5 (BX) to enable input block function.
H/W-Diag	Fatal	<p>Displayed when an error is detected in the memory (EEPROM), analog-digital converter output (ADC Off Set), or CPU watchdog (Watch Dog-1, Watch Dog-2).</p> <ul style="list-style-type: none"> • EEP Err: An error in reading/writing parameters due to keypad or memory (EEPROM) fault. • ADC Off Set: An error in the current sensing circuit (U/V/W terminal, current sensor, etc.).

LCD Display	Type	Description
NTC Open	Latch	Displayed when an error is detected in the temperature sensor of the Insulated Gate Bipolar Transistor (IGBT).
Fan Trip	Latch	Displayed when an error is detected in the cooling fan. Set PRT-79 to 0 to activate fan trip (for models below 22 kW capacity).
Pre-PID Fail	Latch	Displayed when pre-PID is operating with functions set at APP-34–APP-36. A fault trip occurs when a controlled variable (PID feedback) is measured below the set value and the low feedback continues, as it is treated as a load fault.
Ext-Brake	Latch	Operates when the external brake signal is provided by the multi-function terminal. Occurs when the inverter output starting current remains below the set value at ADV-41. Set either OUT31 or OUT32 to 35 (BR Control).
Safety A(B) Err	Level	Displayed when at least one of the two safety input signals is off.

Protection Functions for Communication Options

LCD Display	Type	Description
Lost Command	Level	Displayed when a frequency or operation command error is detected during inverter operation by controllers other than the keypad (e.g., using a terminal block and a communication mode). Activate by setting PRT-12 to any value other than 0.
IO Board Trip	Latch	Displayed when the I/O board or external communication card is not connected to the inverter or there is a bad connection. Displayed when the MD10 error code continues for more than 5 sec.
ParaWrite Trip	Latch	Displayed when communication fails during parameter writing. Occurs when using an LCD keypad due to a control cable fault or a bad connection.
Option Trip-1	Latch	Displayed when a communication error is detected between the inverter and the communication board. Occurs when the communication option card is installed.

7.1.2 Warning Messages

LCD Display	Description
Over Load	Displayed when the motor is overloaded. Operates when PRT-17 is set to 1. To operate, select 5. Set the digital output terminal or relay (OUT-31 or OUT-33) to 5 (Over Load) to receive overload warning output signals.
Under Load	Displayed when the motor is underloaded. Operates when PRT-25 is set to 1. Set the digital output terminal or relay (OUT-31 or OUT-33) to 7 (Under Load) to receive underload warning output signals.
INV Over Load	Displayed when the overload time equivalent to 60% of the inverter overheat protection (inverter IOLT) level, is accumulated. Set the digital output terminal or relay (OUT-31 or OUT-33) to 6 (IOL) to receive inverter overload warning output signals.
Lost Command	Lost command warning alarm occurs even with PRT-12 set to 0. The warning alarm occurs based on the condition set at PRT-13- 15. Set the digital output terminal or relay (OUT-31 or OUT-33) to 13 (Lost Command) to receive lost command warning output signals. If the communication settings and status are not suitable for P2P, a Lost Command alarm occurs.
Fan Warning	Displayed when an error is detected from the cooling fan while PRT-79 is set to 1. Set the digital output terminal or relay (OUT-31 or OUT-33) to 8 (Fan Warning) to receive fan warning output signals.
Fan Exchange	An alarm occurs when the value set at PRT-86 is less than the value set at PRT-87. To receive fan exchange output signals, set the digital output terminal or relay (OUT-31 or OUT-33) to 38 (Fan Exchange).
CAP Exchange	An alarm occurs when the value set at PRT-63 is less than the value set at PRT-62 (the value set at PRT-61 must be 2 (Pre Diag)). To receive CAP exchange signals, set the digital output terminal or relay (OUT-31 or OUT-33) to 36 (CAP Exchange).
DB Warn %ED	Displayed when the DB resistor usage rate exceeds the set value. Set the detection level at PRT-66.
Retry Tr Tune	Tr tune error warning alarm is activated when Dr.9 is set to 4. The warning alarm occurs when the motor's rotor time constant (Tr) is either too low or too high.

7.2 Troubleshooting Fault Trips

When a fault trip or warning occurs due to a protection function, refer to the following table for possible causes and remedies.

Type	Cause	Remedy
Over Load	The load is greater than the motor's rated capacity.	Ensure that the motor and inverter have appropriate capacity ratings.
	The set value for the overload trip level (PRT-21) is too low.	Increase the set value for the overload trip level.
Under Load	There is a motor-load connection problem.	Replace the motor and inverter with models with lower capacity.
	The set value for underload level (PRT-29, PRT-30) is less than the system's minimum load.	Reduce the set value for the underload level.
Over Current1	Acc/Dec time is too short, compared to load inertia (GD2).	Increase Acc/Dec time.
	The inverter load is greater than the rated capacity.	Replace the inverter with a model that has increased capacity.
	The inverter supplied an output while the motor was idling.	Operate the inverter after the motor has stopped or use the speed search function (CON-60).
	The mechanical brake of the motor is operating too fast.	Check the mechanical brake.
Over Voltage	Deceleration time is too short for the load inertia (GD2).	Increase the acceleration time.
	A generative load occurs at the inverter output.	Use the braking unit.
	The input voltage is too high.	Determine if the input voltage is above the specified value.
Low Voltage	The input voltage is too low.	Determine if the input voltage is below the specified value.
	A load greater than the power capacity is connected to the system (e.g., a welder, direct motor connection, etc.)	Increase the power capacity.
	The magnetic contactor connected to the power source has a faulty connection.	Replace the magnetic contactor.
Low Voltage2	The input voltage has decreased during the operation.	Determine if the input voltage is above the specified value.
	An input phase-loss has occurred.	Check the input wiring.
	The power supply magnetic contactor is faulty.	Replace the magnetic contractor.
Ground Trip	A ground fault has occurred in the inverter output wiring.	Check the output wiring.

Type	Cause	Remedy
	The motor insulation is damaged.	Replace the motor.
E-Thermal	The motor has overheated.	Reduce the load or operation frequency.
	The inverter load is greater than the rated capacity.	Replace the inverter with a model that has increased capacity.
	The set value for electronic thermal protection is too low.	Set an appropriate electronic thermal level.
	The inverter has been operated at low speed for an extended duration.	Replace the motor with a model that supplies extra power to the cooling fan.
Output Phase Open	The magnetic contactor on the output side has a connection fault.	Check the magnetic contactor on the output side.
	The output wiring is faulty.	Check the output wiring.
Input Phase Open	The magnetic contactor on the input side has a connection fault.	Check the magnetic contactor on the input side.
	The input wiring is faulty.	Check the input wiring.
	The DC link capacitor needs to be replaced.	Replace the DC link capacitor. Contact the retailer or the MARATHON DRIVE customer service center.
Inverter OLT	The load is greater than the rated motor capacity.	Replace the motor and inverter with models that have increased capacity.
	The torque boost level is too high.	Reduce the torque boost level.
Over Heat	There is a problem with the cooling system.	Determine if a foreign object is obstructing the air inlet, outlet, or vent.
	The inverter cooling fan has been operated for an extended period.	Replace the cooling fan.
	The ambient temperature is too high.	Keep the ambient temperature below 50°C.
Over Current2	Output wiring is short-circuited.	Check the output wiring.
	There is a fault with the electronic semiconductor (IGBT).	Do not operate the inverter. Contact the retailer or the MARATHON DRIVE customer service center.
NTC Open	The ambient temperature is too low.	Keep the ambient temperature above -10°C.
	There is a fault with the internal temperature sensor.	Contact the retailer or the MARATHON DRIVE customer service center.
FAN Lock	A foreign object is obstructing the fan's air vent.	Remove the foreign object from the air inlet or outlet.
	The cooling fan needs to be replaced.	Replace the cooling fan.
IP54 FAN Trip	The fan connector is not connected.	Connect the fan connector.
	The fan connector needs to be replaced.	Replace the fan connector.

7.3 Troubleshooting Other Faults

When a fault other than those identified as fault trips or warnings occurs, refer to the following table for possible causes and remedies.

Type	Cause	Remedy
Parameters cannot be set.	The inverter is in operation (driving mode).	Stop the inverter to change to program mode and set the parameter.
	The parameter access is incorrect.	Check the correct parameter access level and set the parameter.
	The password is incorrect.	Check the password, disable the parameter lock and set the parameter.
	Low voltage is detected.	Check the power input to resolve the low voltage and set the parameter.
The motor does not rotate.	The frequency command source is set incorrectly.	Check the frequency command source setting.
	The operation command source is set incorrectly.	Check the operation command source setting.
	Power is not supplied to the terminal R/S/T.	Check the terminal connections R/S/T and U/V/W.
	The charge lamp is turned off.	Turn on the inverter.
	The operation command is off.	Turn on the operation command (RUN).
	The motor is locked.	Unlock the motor or lower the load level.
	The load is too high.	Operate the motor independently.
	An emergency stop signal is input.	Reset the emergency stop signal.
	The wiring for the control circuit terminal is incorrect.	Check the wiring for the control circuit terminal.
	The input option for the frequency command is incorrect.	Check the input option for the frequency command.
	The input voltage or current for the frequency command is incorrect.	Check the input voltage or current for the frequency command.
	The PNP/NPN mode is selected incorrectly.	Check the PNP/NPN mode setting.
	The frequency command value is too low.	Check the frequency command and input a value above the minimum frequency.
	The [STOP/RESET] key is pressed.	Check that the stoppage is normal, if so resume operation normally.
	Motor torque is too low.	Change the operation modes (V/F, IM, and Sensorless). If the fault remains, replace the inverter with a model with increased capacity.

Type	Cause	Remedy
The motor rotates in the opposite direction to the command.	The wiring for the motor output cable is incorrect.	Determine if the cable on the output side is wired correctly to the phase (U/V/W) of the motor.
	The signal connection between the control circuit terminal (forward/reverse rotation) of the inverter and the forward/reverse rotation signal on the control panel side is incorrect.	Check the forward/reverse rotation wiring.
The motor only rotates in one direction.	Reverse rotation prevention is selected.	Remove the reverse rotation prevention.
	The reverse rotation signal is not provided, even when a 3-wire sequence is selected.	Check the input signal associated with the 3-wire operation and adjust as necessary.
The motor is overheating.	The load is too heavy.	Reduce the load. Increase the Acc/Dec time.
		Check the motor parameters and set the correct values.
		Replace the motor and the inverter with models with appropriate capacity for the load.
	The ambient temperature of the motor is too high.	Lower the ambient temperature of the motor.
	The phase-to-phase voltage of the motor is insufficient.	Use a motor that can withstand phase-to-phase voltages surges greater than the maximum surge voltage.
		Only use motors suitable for applications with inverters. Connect the AC reactor to the inverter output (set the carrier frequency to 2 kHz).
	The motor fan has stopped or the fan is obstructed with debris.	Check the motor fan and remove any foreign objects.
The motor stops during acceleration or when connected to load.	The load is too high.	Reduce the load.
		Replace the motor and the inverter with models with capacity appropriate for the load.
The motor does not accelerate. /The acceleration time is too long.	The frequency command value is low.	Set an appropriate value.
	The load is too high.	Reduce the load and increase the acceleration time. Check the mechanical brake status.
	The acceleration time is too long.	Change the acceleration time.
	The combined values of the motor	Change the motor related parameters.

Type	Cause	Remedy
	properties and the inverter parameter are incorrect.	
	The stall prevention level during acceleration is low.	Change the stall prevention level.
	The stall prevention level during operation is low.	Change the stall prevention level.
	Starting torque is insufficient.	Change to vector control operation mode. If the fault is still not corrected, replace the inverter with a model with increased capacity.
Motor speed varies during operation.	There is a high variance in load.	Replace the motor and inverter with models with increased capacity.
	The input voltage varies.	Reduce input voltage variation.
	Motor speed variations occur at a specific frequency.	Adjust the output frequency to avoid a resonance area.
The motor rotation is different from the setting.	The V/F pattern is set incorrectly.	Set a V/F pattern that is suitable for the motor specification.
The motor deceleration time is too long even with Dynamic Braking (DB) resistor connected.	The deceleration time is set too long.	Change the setting accordingly.
	The motor torque is insufficient.	If motor parameters are normal, it is likely to be a motor capacity fault. Replace the motor with a model with increased capacity.
	The load is higher than the internal torque limit determined by the rated current of the inverter.	Replace the inverter with a model with increased capacity.
Operation is difficult in underload applications.	The carrier frequency is too high.	Reduce the carrier frequency.
	Over-excitation has occurred due to an inaccurate V/F setting at low speed.	Reduce the torque boost value to avoid over-excitation.
While the inverter is in operation, a control unit malfunctions or noise occurs.	Noise occurs due to switching inside the inverter.	Change the carrier frequency to the minimum value.
		Install a micro surge filter in the inverter output.
When the inverter is operating, the earth leakage breaker is	An earth leakage breaker will interrupt the supply if current flows to ground during inverter operation.	Connect the inverter to a ground terminal.
		Check that the ground resistance is less than 100 Ω for 200 V inverters and less than 10 Ω for 400 V inverters.

Type	Cause	Remedy
activated.		Check the capacity of the earth leakage breaker and make the appropriate connection, based on the rated current of the inverter.
		Lower the carrier frequency.
		Make the cable length between the inverter and the motor as short as possible.
The motor vibrates severely and does not rotate normally.	Phase-to-phase voltage of 3-phase power source is not balanced.	Check the input voltage and balance the voltage.
		Check and test the motor's insulation.
The motor makes humming, or loud noises.	Resonance occurs between the motor's natural frequency and the carrier frequency.	Slightly increase or decrease the carrier frequency.
	Resonance occurs between the motor's natural frequency and the inverter's output frequency.	Slightly increase or decrease the carrier frequency.
		Use the frequency jump function to avoid the frequency band where resonance occurs.
The motor vibrates/hunts.	The frequency input command is an external, analog command.	In situations of noise inflow on the analog input side that results in command interference, change the input filter time constant (IN-07).
	The wiring length between the inverter and the motor is too long.	Ensure that the total cable length between the inverter and the motor is less than 200m (50m for motors rated 3.7 kW or lower).
The motor does not come to a complete stop when the inverter output stops.	It is difficult to decelerate sufficiently, because DC braking is not operating normally.	Adjust the DC braking parameter.
		Increase the set value for the DC braking current.
		Increase the set value for the DC braking stopping time.
The output frequency does not increase to the frequency reference.	The frequency reference is within the jump frequency range.	Set the frequency reference higher than the jump frequency range.
	The frequency reference is exceeding the upper limit of the frequency command.	Set the upper limit of the frequency command higher than the frequency reference.
	Because the load is too heavy, the stall prevention function is working.	Replace the inverter with a model with increased capacity.
The cooling fan does not rotate.	The control parameter for the cooling fan is set incorrectly.	Check the control parameter setting for the cooling fan.

8 Maintenance

This chapter explains how to replace the cooling fan, the regular inspections to complete, and how to store and dispose of the product. An inverter is vulnerable to environmental conditions and faults also occur due to component wear and tear. To prevent breakdowns, please follow the maintenance recommendations in this section.

⚠ Caution

- Before you inspect the product, read all safety instructions contained in this manual.
- Before you clean the product, ensure that the power is off.
- Clean the inverter with a dry cloth. Cleaning with wet cloths, water, solvents, or detergents may result in electric shock or damage to the product.

8.1 Regular Inspection Lists

8.1.1 Daily Inspections

Inspection area	Inspection item	Inspection details	Inspection method	Judgment standard	Inspection equipment
All	Ambient environment	Is the ambient temperature and humidity within the design range, and is there any dust or foreign objects present?	Refer to 1.3 Installation Considerations on page 4 .	No icing (ambient temperature: -10 - +40) and no condensation (ambient humidity below 50%)	Thermometer, hygrometer, recorder
	Inverter	Is there any abnormal vibration or noise?	Visual inspection	No abnormality	
	Power voltage	Are the input and output voltages normal?	Measure voltages between R/ S/ T-phases in. the inverter	Refer to 9.1 Input and Output Specification on page 254 .	Digital multimeter tester

Inspection area	Inspection item	Inspection details	Inspection method	Judgment standard	Inspection equipment
			terminal block.		
Input/Output circuit	Smoothing capacitor	Is there any leakage from the inside?	Visual inspection	No abnormality	-
		Is the capacitor swollen?			
Cooling system	Cooling fan	Is there any abnormal vibration or noise?	Turn off the system and check operation by rotating the fan manually.	Fan rotates smoothly	-
Display	Measuring device	Is the display value normal?	Check the display value on the panel.	Check and manage specified values.	Voltmeter, ammeter, etc.
Motor	All	Is there any abnormal vibration or noise?	Visual inspection	No abnormality	-
		Is there any abnormal smell?	Check for overheating or damage.		

8.1.2 Annual Inspections

Inspection area	Inspection item	Inspection details	Inspection method	Judgment standard	Inspection equipment
Input/Output circuit	All	Megger test (between input/output terminals and and earth terminal)	Disconnect inverter and short R/S/T/U/V/W terminals, and then measure from each terminal to the ground terminal using a Megger.	Must be above 5 MΩ	DC 500 V Megger
		Is there anything loose in the device?	Tighten up all screws.	No abnormality	
		Is there any evidence of parts overheating?	Visual inspection		
	Cable connections	Are there any corroded cables?	Visual inspection	No abnormality	-
		Is there any damage to cable insulation?			
	Terminal block	Is there any damage?	Visual inspection	No abnormality	-
	Smoothing condenser	Measure electrostatic capacity.	Measure with capacity meter.	Rated capacity over 85%	Capacity meter
	Relay	Is there any chattering noise during operation?	Visual inspection	No abnormality	-
		Is there any damage to the contacts?	Visual inspection		
	Braking resistor	Is there any damage from resistance?	Visual inspection	No abnormality	Digital multimeter / anaog tester
		Check for	Disconnect	Must be	

Inspection area	Inspection item	Inspection details	Inspection method	Judgment standard	Inspection equipment
		disconnection.	one side and measure with a tester.	within $\pm 10\%$ of the rated value of the resistor.	
Control circuit Protection circuit	Operation check	Check for output voltage imbalance while the inverter is in operation.	Measure voltage between the inverter output terminal U/V/W.	Balance the voltage between phases: within 4V for 200 V series and within 8V for 400 V series.	Digital multimeter or DC voltmeter
		Is there an error in the display circuit after the sequence protection test?	Test the inverter output protection in both short and open circuit conditions.	The circuit must work according to the sequence.	
Cooling system	Cooling fan	Are any of the fan parts loose?	Check all connected parts and tighten all screws.	No abnormality	-
Display	Display device	Is the display value normal?	Check the command value on the display device.	Specified and managed values must match.	Voltmeter, Ammeter, etc.

8.1.3 Bi-annual Inspections

Inspection area	Inspection item	Inspection details	Inspection method	Judgment standard	Inspection equipment
Motor	Insulation resistance	Megger test (between the input, output and earth terminals).	Disconnect the cables for terminals U/V/W and test the wiring.	Must be above 5 MΩ	DC 500 V Megger

ⓘ Caution

Do not run an insulation resistance test (Megger) on the control circuit as it may result in damage to the product.

8.2 Replacing Major Components

Refer to following for information on replacing major components.

8.2.1 Exchange Cycle for Major Components

Following table shows the cycles and information for major components.

Components	Exchange standard	Symptom	Action
Cooling fan	3 years	Spinning failure	Make inquiries to the A/S center and replace it with a new product.
Main circuit electrolytic condenser	3 years	Capacity reduction	Make inquiries to the A/S center and replace it with a new product.
Main circuit relay	-	Operation failure	Make inquiries to the A/S center.

Note

The life times of major components are based on the operating rated load consecutively. The lifetime may be different according to conditions and environment.

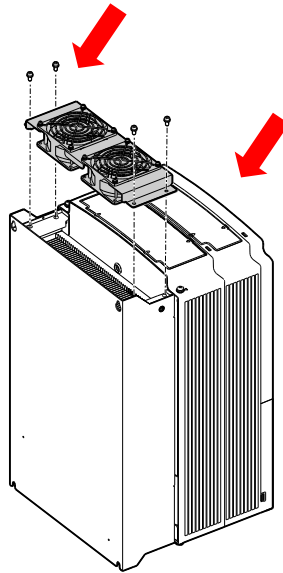
8.2.2 How to Replace the Cooling Fans

⚠ Caution

Turn off the power when replacing cooling fans.

Replace the cooling fans following the steps below:

- 1 Refer to the illustration and remove the 4 bolts securing the fan bracket.
- 2 Remove the fan bracket and disconnect the fan connector.
- 3 Connect the new fan's connector to the inverter's fan connector.
- 4 Reinsert the 4 bolts and secure the fan bracket.



8.3 Storage and Disposal

8.3.1 Storage

If you are not using the product for an extended period, store it in the following way:

- Store the product in the same environmental conditions as specified for operation (refer to [1.3 Installation Considerations](#) on page 4).
- When storing the product for a period longer than 3 months, store it between 10°C and 30°C, to prevent depletion of the electrolytic capacitor.
- Do not expose the inverter to snow, rain, fog, or dust.
- Package the inverter in a way that prevents contact with moisture. Keep the moisture level below 70% in the package by including a desiccant, such as silica gel.

8.3.2 Disposal

When disposing of the product, categorize it as general industrial waste. Recyclable materials are included in the product, so recycle them whenever possible. The packing materials and all metal parts can be recycled. Although plastic can also be recycled, it can be incinerated under controlled conditions in some regions.

ⓘ Caution

If the inverter has not been operated for a long time, capacitors lose their charging characteristics and are depleted. To prevent depletion, turn on the product once a year and allow the device to operate for 30-60 min. Run the device under no-load conditions.

9 Technical Specification

9.1 Input and Output Specification

3-Phase 400 V (30–75 kW)

Model □□□□MD100G-4□□□			0300	0370	0450	0550	0750
Applied motor	HP		40	50	60	75	100
	kW		30	37	45	55	75
Rated output	Rated capacity (kVA)		46	57	69	84	116
	Rated current (A)	Heavy load	61	75	91	110	152
		Normal load	75	91	107	142	169
	Output frequency		0-400 Hz (IM Sensorless: 0-120 Hz)				
	Output voltage (V)		3-phase 380-480V				
Rated input	Working voltage (V)		3-phase 380-480 VAC (-15% to +10%)				
	Input frequency		50-60 Hz (±5%)				
	Rated current (A)	Heavy load	56	69	85	103	143
		Normal load	69	85	100	134	160
Weight (lb /kg)			26	35	35	43	43

*MD100G inverters rated at 30 kW or more do not support I/O extensions or IP66 certification.

*The 55-75 kW inverters do not have built-in EMC since they satisfy EMC standards even without it.

9.2 Product Specification Details

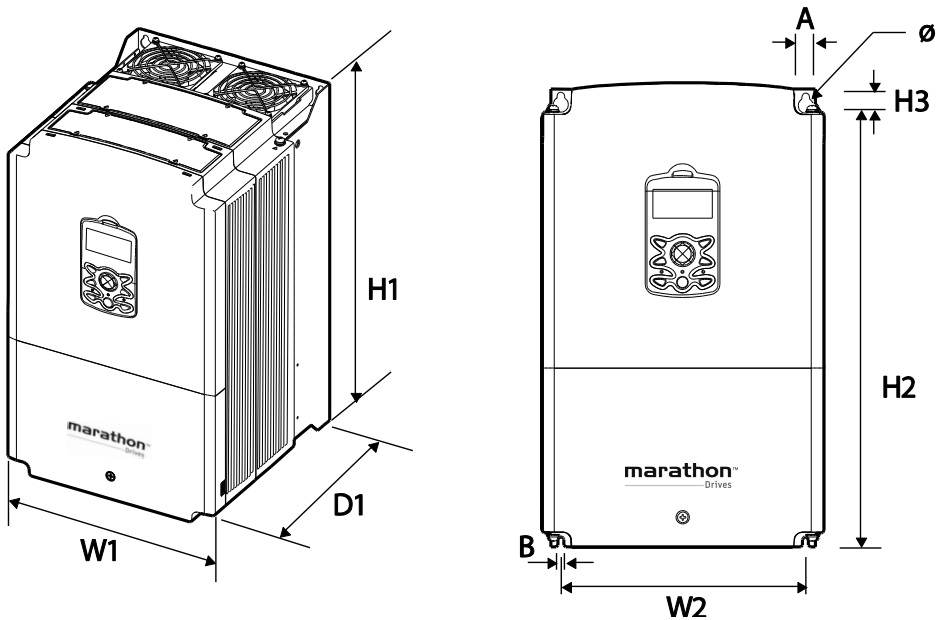
Items			Description	
Control	Control method		V/F control, slip compensation, sensorless vector	
	Frequency settings power resolution		Digital command: 0.01 Hz Analog command: 0.05 Hz (50 Hz standard)	
	Frequency accuracy		1% of maximum output frequency	
	V/F pattern		Linear, square reduction, user V/F	
	Overload capacity		Heavy load rated current: 150% 1 min, normal load rated current: 120% 1 min	
	Torque boost		Manual torque boost, automatic torque boost	
Operation	Operation type		Select key pad, terminal strip, or communication operation	
	Frequency settings		Analog type: -10–10 V, 0–10 V, 4–20 mA Digital type: key pad, pulse train input	
	Operation function		<ul style="list-style-type: none">• PID control• 3-wire operation• Frequency limit• Second function• Anti-forward and reverse direction rotation• Commercial transition• Speed search• Power braking• Leakage reduction	<ul style="list-style-type: none">• Up-down operation• DC braking• Frequency jump• Slip compensation• Automatic restart• Automatic tuning• Energy buffering• Flux braking• Fire Mode
	Input	Multi function terminal (7EA) P1-P7	Select PNP (Source) or NPN (Sink) mode. Functions can be set according to IN-65–IN-71 codes and parameter settings.	
			<ul style="list-style-type: none">• Forward direction operation• Reset• Emergency stop• Multi step speed frequency-high/med/low• DC braking during stop• Frequency increase• 3-wire• Local/remote operation mode transition• Select acc/dec/stop	<ul style="list-style-type: none">• Reverse direction operation• External trip• Jog operation• Multi step acc/dec-high/med/low• Second motor selection• Frequency reduction• Fix analog command frequency• Transtion from PID to general operation
			Pulse train	0-32 kHz, Low Level: 0-0.8V, High Level: 3.5-12 V

Items			Description	
	Output	Multi function open collector terminal	Fault output and inverter operation status output	Less than DC 24 V, 50 mA
		Multi function relay terminal		Less than (N.O., N.C.) AC250 V 1A, Less than DC 30 V, 1A
		Analog output	0-12Vdc (0-24 mA): Select frequency, output current, output voltage, DC terminal voltage and others	
		Pulse train	Maximum 32 kHz, 10-12V	
Protection function	Trip		<ul style="list-style-type: none"> • Over current trip • External signal trip • ARM short circuit current trip • Over heat trip • Input imaging trip • Ground trip • Motor over heat trip • I/O board link trip • No motor trip • Parameter writing trip • Emergency stop trip • Command loss trip • External memory error • CPU watchdog trip • Motor normal load trip 	<ul style="list-style-type: none"> • Over voltage trip • Temperature sensor trip • Inverter over heat • Option trip • Output imaging trip • Inverter overload trip • Fan trip • Pre-PID operation failure • External break trip • Low voltage trip during operation • Low voltage trip • Safety A(B) trip • Analog input error • Motor overload trip
	Alarm		Command loss trip alarm, overload alarm, normal load alarm, inverter overload alarm, fan operation alarm, resistance braking rate alarm, number of corrections on rotor tuning error	
	Instantaneous blackout		Heavy load less than 16 ms (normal load less than 8 ms): continue operation (must be within the rated input voltage and rated output range) Heavy load more than 16 ms (normal load more than 8 ms): auto restart operation	
Structure/working environment	Cooling type		Forced fan cooling structure	
	Protection structure		IP 20 (standard), UL Open & Enclosed Type 1 (option) UL Enclosed Type 1 is satisfied by conduit installation option.	
	Ambient temperature		Heavy load: -10-50°C (14-122°F), normal load: -10-40°C (14-104°F)	

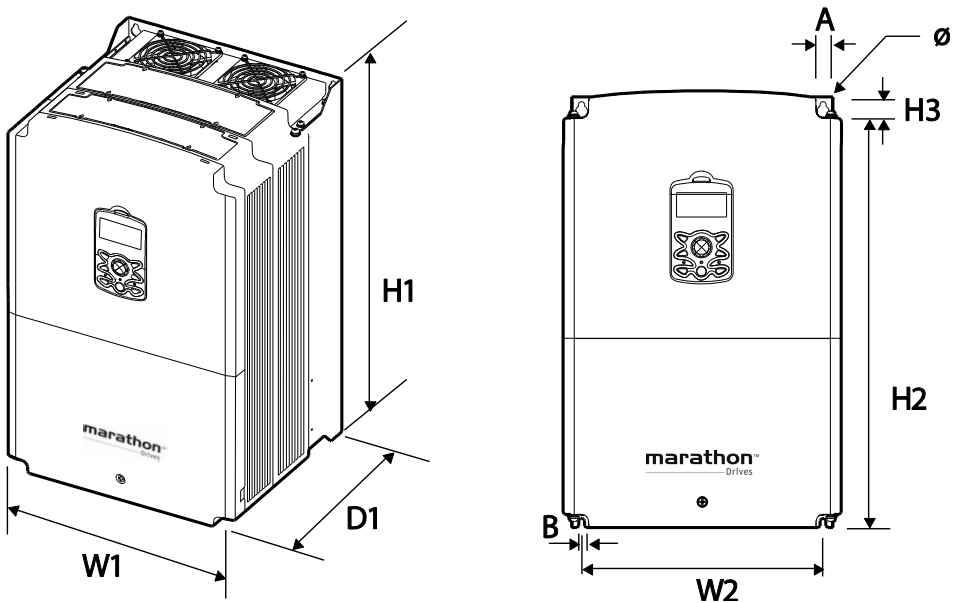
Items		Description
		No ice or frost should be present. Working under normal load at 50°C (122°F), it is recommended that less than 80% load is applied.
	Ambient humidity	Relative humidity less than 90% RH (to avoid condensation forming)
	Storage temperature.	-20°C-65°C (-4–149°F)
	Surrounding environment	Prevent contact with corrosive gases, inflammable gases, oil stains, dust, and other pollutants (Pollution Degree 3 Environment).
	Operation altitude/oscillation	No higher than 3280ft (1,000m). Less than 9.8 m/sec ² (0.6G).
	Pressure	70-106 kPa

9.3 External Dimensions (IP 20 Type)

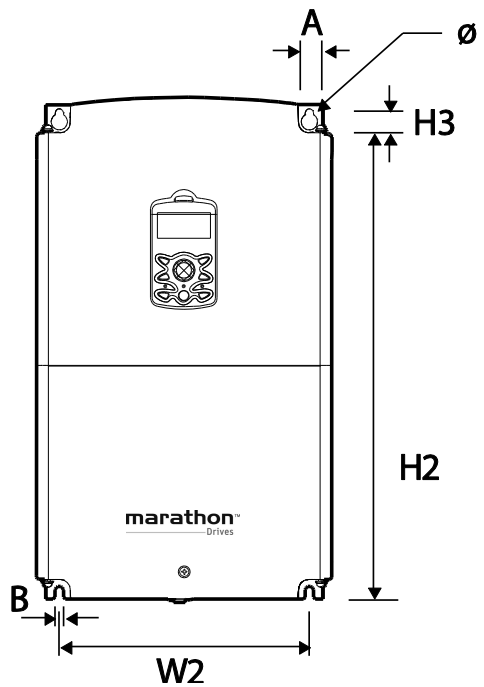
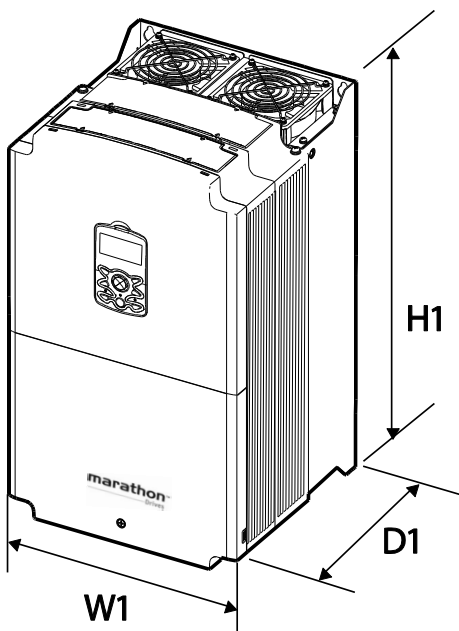
30 kW (3-Phase)



37–45 kW (3-Phase)



55–75 kW (3-Phase)



Items	W1	W2	H1	H2	H3	D1	A	B
0300MD100G-4	275 (10.8)	232	450 (17.7)	428.5	14	284 (11.2)	7 (0.28)	7 (0.28)
0370MD100G-4	325 (12.8)	282	510 (20.1)	486.5	16			
0450MD100G-4		275	550 (21.7)	524.5		309 (12.2)	9	9
0550MD100G-4								
0750MD100G-4								

Units: mm (inches)

9.4 Peripheral Devices

Compatible Circuit Breaker, Leakage Breaker and Magnetic Contactor Models (manufactured by MARATHON DRIVE)

Product(kW)	Circuit Breaker				Leakage Breaker		Magnetic Contactor	
	Model	Current (A)	Model	Current (A)	Model	Current (A)	Model	Current (A)
30 kW-4	ABS103c	125	UTS150	125	EBS 103c	125	MC-100a	105
37 kW-4	ABS203c	150		150	EBS203c	150	MC-130a	130
45 kW-4		175	UTS250	175		175	MC-150a	150
55 kW-4		225		225		225	MC-185a	185
75 kW-4	ABS403c	300	UTS400	300	EBS 403c	300	MC-225a	225

9.5 Fuse and Reactor Specifications

Product (kW)	AC Input Fuse		AC Reactor	
	Current (A)	Voltage (V)	Inductance(mH)	Current(A)
30 kW-4	125 A	600	0.29	69
37 kW-4			0.24	85
45 kW-4	160 A		0.20	100
55 kW-4	200 A		0.15	134
75 kW-4			0.13	160

⚠ Caution

Only use Class H or RK5, UL listed input fuses and UL listed circuit breakers. See the table above for the voltage and current ratings for fuses and circuit breakers.

⚠ Attention

Utiliser UNIQUEMENT des fusibles d'entrée homologués de Classe H ou RK5 UL et des disjoncteurs UL. Se reporter au tableau ci-dessus pour la tension et le courant nominal des fusibles et des disjoncteurs

9.6 Terminal Screw Specification

Input/Output Terminal Screw Specification

Product (kW)	Terminal Screw Size	Screw Torque (Kgf·cm/Nm)
30~75 kW	M8	61.2~91.8

Control Circuit Terminal Screw Specification

Terminal	Terminal Screw Size	Screw Torque (Kgf·cm/Nm)
P1~P7/CM/VR/V1/I2/AO1/AO2/ Q1/EG/24/TI/TO/SA,SB,SC/S+,S- ,SG/A1,B1,C1/A2,C2	M2.6	0.4

⚠ Caution

Apply the rated torque when tightening terminal screws. Loose screws may cause short circuits and malfunctions. Overtightening terminal screws may damage the terminals and cause short circuits and malfunctions. Use copper conductors only, rated at 600 V, 75°C for power terminal wiring, and rated at 300 V, 75°C for control terminal wiring.

⚠ Attention

Appliquer des couples de marche aux vis des bornes. Des vis desserrées peuvent provoquer des courts-circuits et des dysfonctionnements. Ne pas trop serrer la vis, car cela risque d'endommager les bornes et de provoquer des courts-circuits et des dysfonctionnements. Utiliser uniquement des fils de cuivre avec une valeur nominale de 600 V, 75 °C pour le câblage de la borne d'alimentation, et une valeur nominale de 300 V, 75 °C pour le câblage de la borne de commande.

9.7 Braking Resistor Specification

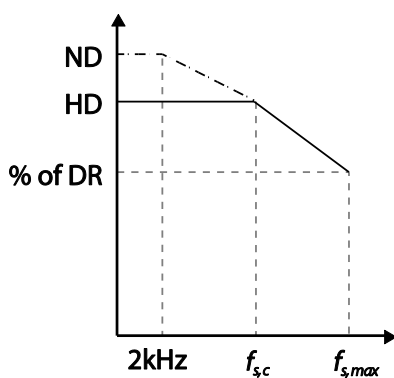
Product (kW)	Resistance (Ω)	Rated Capacity (W)
30 kW	12	5000
37 kW		
45 kW	6	10000
55 kW		
75 kW		

- The standard for braking torque is 150% and the working rate (%ED) is 5%. If the working rate is 10%, the rated capacity for braking resistance must be calculated at twice the standard.

9.8 Continuous Rated Current Derating

Derating by Carrier Frequency

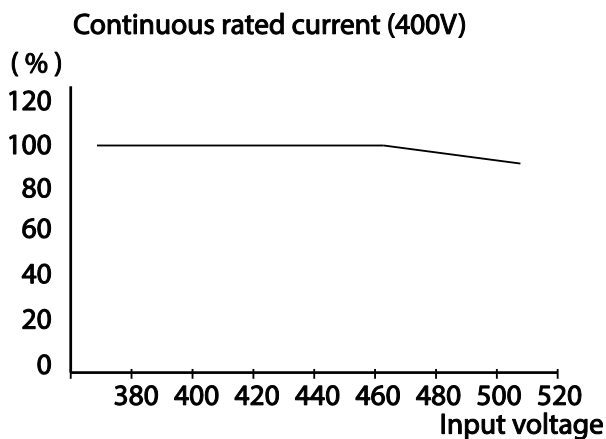
The continuous rated current of the inverter is limited based on the carrier frequency. Refer to the following graph.



Item	Unit	30 kW	37 kW	45 kW	55 kW	75 kW
$f_{s,ND}$	[kHz]	2				
$f_{s,c}$		6			4	
$f_{s,max}$		10			7	
% of DR	[%]	70				

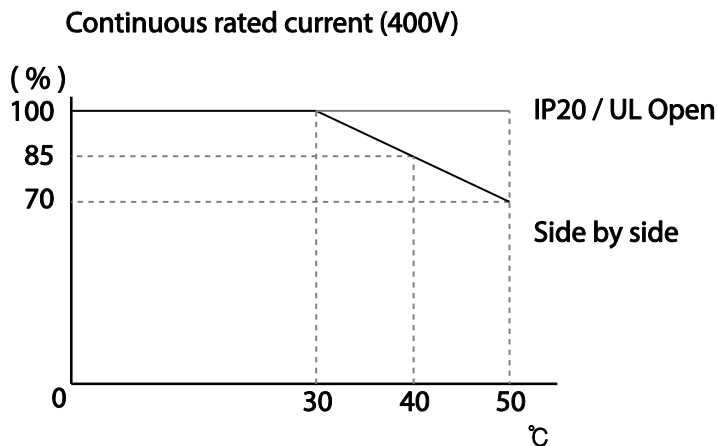
Derating by Input Voltage

The continuous rated current of the inverter is limited based on the input voltage. Refer to the following graph.



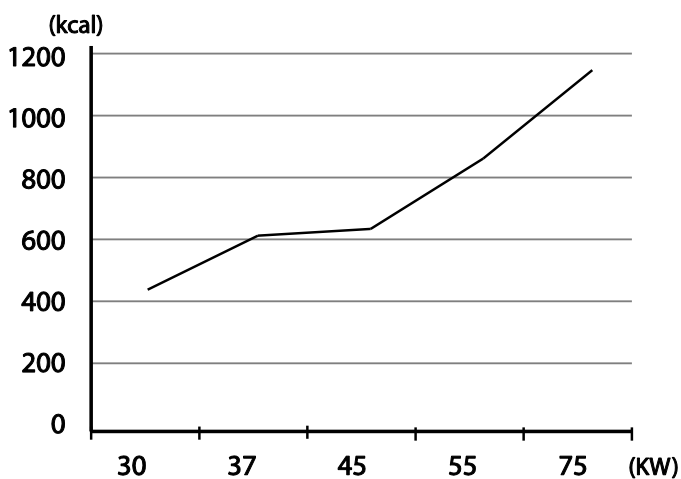
Derating by Ambient Temperature and Installation Type

The constant-rated current of the inverter is limited based on the ambient temperature and installation type. Refer to the following graph.



9.9 Heat Emission

The following graph shows the inverters' heat emission characteristics (by product capacity).



Heat emission data is based on operations with default carrier frequency settings, under normal operating conditions. For detailed information on carrier frequency.



Product Warranty

Warranty Information

Fill in this warranty information form and keep this page for future reference or when warranty service may be required.

Product Name	Marathon Drive	Date of Installation	
Model Name	MD100G	Warranty Period	
Customer Info	Name (or company)		
	Address		
	Contact Info.		
Retailer Info	Name		
	Address		
	Contact info.		

Warranty Period

The product warranty covers product malfunctions, under normal operating conditions, for 12 months from the date sale, subject to Regal Australia standard terms and conditions of sale

Warranty Service Information

During the product warranty period, warranty service (free of charge) is provided for product malfunctions caused under normal operating conditions. For warranty service, contact an official MARATHON DRIVE agent or service center.

Non-Warranty Service

A service fee will be incurred for malfunctions in the following cases:

- intentional abuse or negligence
- power supply problems or from other appliances being connected to the product
- acts of nature (fire, flood, earthquake, gas accidents etc.)
- modifications or repair by unauthorized persons
- missing authentic MARATHON DRIVE rating plates
- expired warranty period

Visit Our Website

Visit us at <http://www.regalaustralia.com.au> for detailed service information.

EC DECLARATION OF CONFORMITY

We, the undersigned,

Representative: Regal Beloit Australia Pty Ltd
Address: 19 Corporate Rd, Rowville
Victoria 3178, Australia
Manufacturer: LSIS Co., Ltd.
Address: 181, Samsung-ri, Mokchon-Eup,
Chonan, Chungnam, 330-845,
Korea

Certify and declare under our sole responsibility that the following apparatus:

Type of Equipment: Inverter (Power Conversion Equipment)
Model Name: MDLV100G series
Trade Mark: Marathon Drive

Conforms with the essential requirements of the directives:

2006/95/EC Directive of the European Parliament and of the Council on the harmonisation of the laws of Member States relating to Electrical Equipment designed for use within certain voltage limits

2004/108/EC Directive of the European Parliament and of the Council on the approximation of the laws of the Member States relating to electromagnetic compatibility

Based on the following specifications applied:

EN 61800-3:2004

EN 61800-5-1:2007

and therefore complies with the essential requirements and provisions of the 2006/95/CE and 2004/108/CE Directives.

Place: Chonan, Chungnam,
Korea



(Signature /Date)

Mr. In Sik Choi / General Manager

(Full name / Position)

EMI / RFI POWER LINE FILTERS

LSis inverters, S100 series

marathon™ **VMC**
Drives vector motor control

RFI FILTERS

THE LS RANGE OF POWER LINE FILTERS **FEP (Standard)** SERIES, HAVE BEEN SPECIFICALLY DESIGNED WITH HIGH FREQUENCY **LSIS INVERTERS**. THE USE OF LS FILTERS, WITH THE INSTALLATION ADVICE OVERLEAF, HELP TO ENSURE TROUBLE FREE USE ALONG SIDE SENSITIVE DEVICES AND COMPLIANCE TO CONDUCTED EMISSION AND IMMUNITY STANDARDS TO EN 50081.

CAUTION

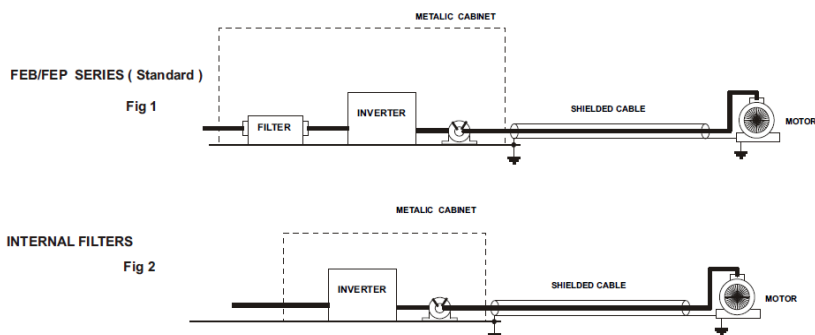
IN CASE OF A LEAKAGE CURRENT PROTECTIVE DEVICES IS USED ON POWER SUPPLY, IT MAY BE FAULT AT POWER-ON OR OFF.
IN AVOID THIS CASE, THE SENSE CURRENT OF PROTECTIVE DEVICE SHOULD BE LARGER

RECOMMENDED INSTALLATION INSTRUCTIONS

To conform to the **EMC** directive, it is necessary that these instructions be followed as closely as possible. Follow the usual safety procedures when working with electrical equipment. All electrical connections to the filter, inverter and motor must be made by a qualified electrical technician.

- 1-) Check the filter rating label to ensure that the current, voltage rating and part number are correct.
- 2-) For best results the filter should be fitted as closely as possible to the incoming mains supply of the wiring enclosure, usually directly after the enclosures circuit breaker or supply switch.
- 3-) The back panel of the wiring cabinet of board should be prepared for the mounting dimensions of the filter. Care should be taken to remove any paint etc... from the mounting holes and face area of the panel to ensure the best possible earthing of the filter.
- 4-) Mount the filter securely.
- 5-) Connect the mains supply to the filter terminals marked **LINE**, connect any earth cables to the earth stud provided. Connect the filter terminals marked **LOAD** to the mains input of the inverter using short lengths of appropriate gauge cable.
- 6-) Connect the motor and fit the ferrite core (output chokes) as close to the inverter as possible. Armoured or screened cable should be used with the 3 phase conductors only threaded twice through the center of the ferrite core. The earth conductor should be securely earthed at both inverter and motor ends. The screen should be connected to the enclosure body via and earthed cable gland.
- 7-) Connect any control cables as instructed in the inverter instructions manual.

IT IS IMPORTANT THAT ALL LEAD LENGTHS ARE KEPT AS SHORT AS POSSIBLE AND THAT INCOMING MAINS AND OUTGOING MOTOR CABLES ARE KEPT WELL SEPARATED.



PR0065

UL mark



The UL mark applies to products in the United States and Canada. This mark indicates that UL has tested and evaluated the products and determined that the products satisfy the UL standards for product safety. If a product received UL certification, this means that all components inside the product had been certified for UL standards as well.

Suitable for Installation in a compartment Handling Conditioned Air

CE mark



The CE mark indicates that the products carrying this mark comply with European safety and environmental regulations. European standards include the Machinery Directive for machine manufacturers, the Low Voltage Directive for electronics manufacturers and the EMC guidelines for safe noise control.

Low Voltage Directive

We have confirmed that our products comply with the Low Voltage Directive

(EN 61800-5-1).

EMC Directive

The Directive defines the requirements for immunity and emissions of electrical equipment used within the European Union. The EMC product standard (EN 61800-3) covers requirements stated for drives.

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