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

* LSLV-H100 is the official name for the H100 series inverters.

* The H100 series software may be updated without prior notice for better performance. To check the latest software, visit our website at http://www.lsis.com.

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.

- Supply earthing system: TT, TN, not suitable for corner-earthed systems

⚠ 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.

ⓘ 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. LSLV-H100 is suitable for use in a circuit capable of delivering not more than 100kA RMS at the drive's maximum rated voltage, depending on the selected MCCB. RMS symmetrical amperes for recommended MCCB are the following table.

Working Voltage	TD125NU	TD125HU	TS250NU	TS250HU	TS400NU	TS400HU
240V(50/60Hz)	50kA	100kA	50kA	100kA	50kA	100kA
480V(50/60Hz)	35kA	65kA	35kA	65kA	35kA	65kA

Quick Reference Table

The following table contains situations frequently encountered by users while working with inverters. Refer to the typical and practical situations in the table to quickly and easily locate answers to your questions.

Situation	Reference
I want to configure the inverter to start operating as soon as the power source is applied.	p.14
I want to configure the motor's parameters.	p.239
Something seems to be wrong with the inverter or the motor.	p.367, p.559
What is auto tuning?	p.239
What are the recommended wiring lengths?	p.40
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I want to apply PID control on my system.	p.178
What are the factory default settings for P1–P7 multi-function terminals?	p.38
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I want to change the inverter's operation frequency using a potentiometer.	p.94
I want to install a frequency meter using an analog terminal.	p.38
I want to display the supply current to motor.	p.56
I want to operate the inverter using a multi-step speed configuration.	p.109
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1 Preparing the Installation

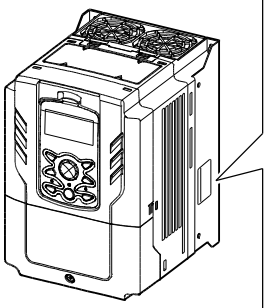
This chapter provides details on product identification, part names, correct installation and cable specifications. To install the inverter correctly and safely, carefully read and follow the instructions.

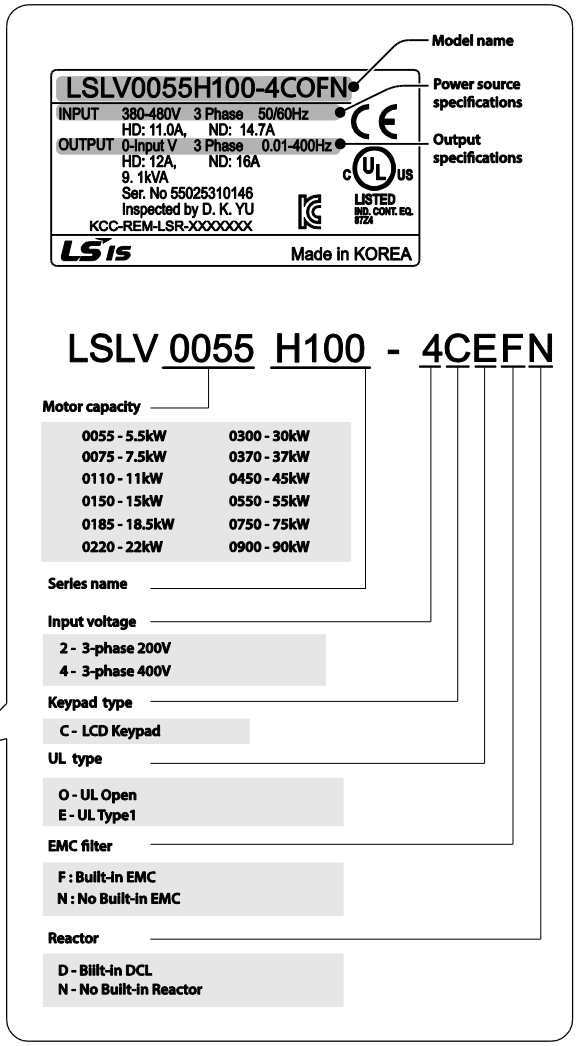
1.1 Product Identification

The H100 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. Check the rating plate before installing the product and make sure that the product meets your requirements. For more detailed product specifications, refer to *11.1 Input and Output Specifications* on page *578*.

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.





Note

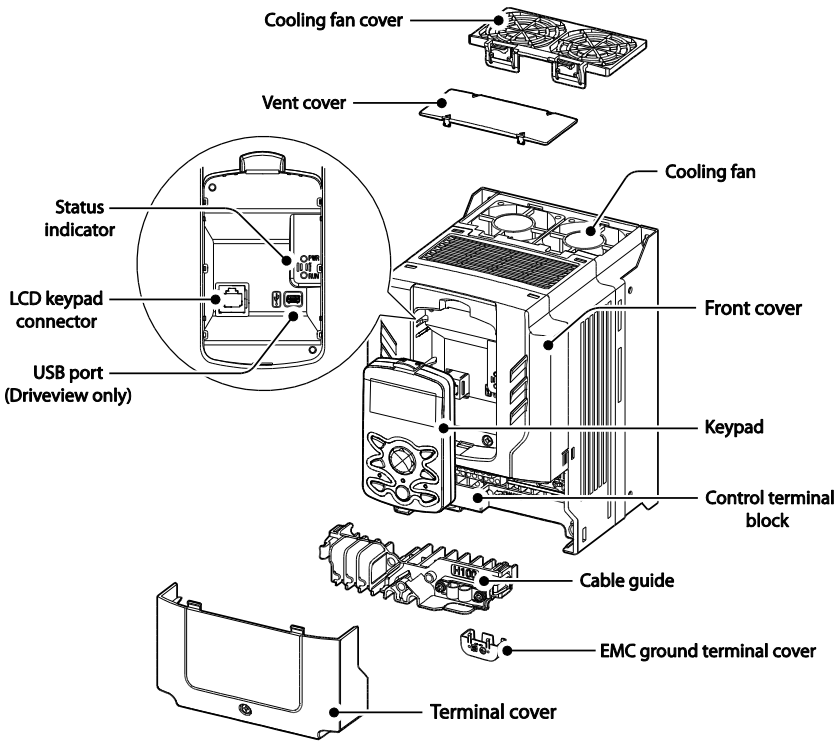
The H100 75/90 kW, 400 V inverters satisfy the EMC standard EN61800-3 without installation of

optional EMC filters.

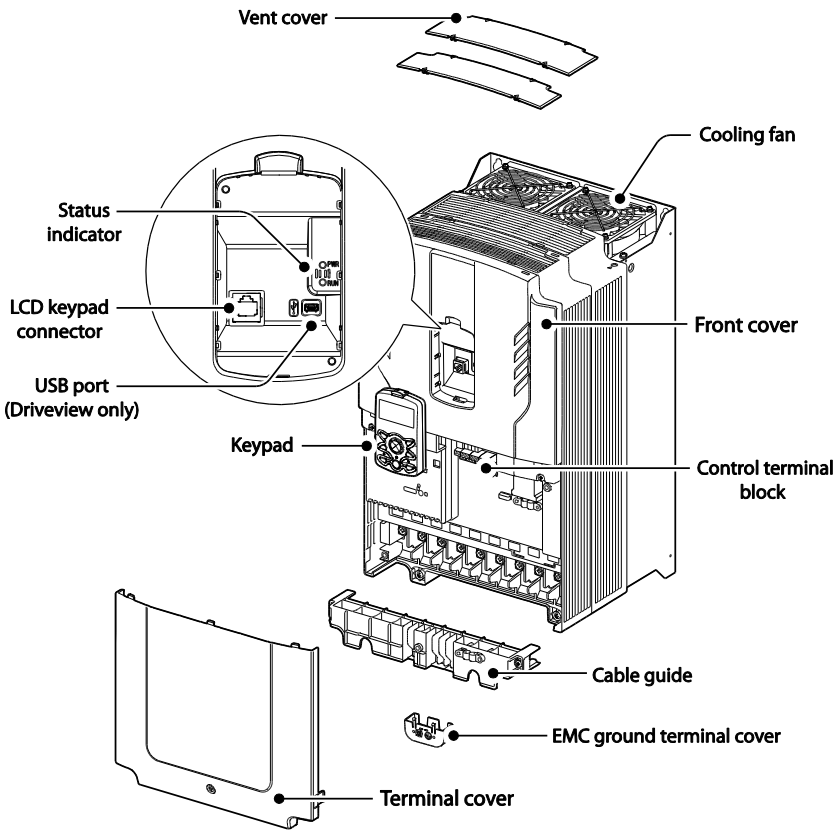
1.2 Part Names

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

5.5–30 kW (3-Phase)



37–90 kW (3-Phase)

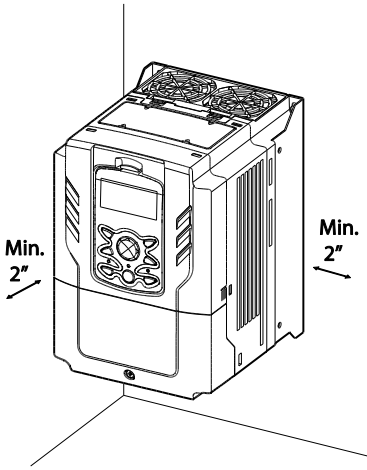


1.3 Installation Considerations

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*	-10 ℃–50 ℃ (40 ℃ and above, 2.5% / ℃ Current Derating search. 50 ℃ 75% of the rated current of the drive if possible)
Ambient Humidity	90% relative humidity (no condensation)
Storage Temperature	- 4–149 °F (-20–65 ℃)
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 0.6 G (5.9 m/sec^2)
Air Pressure	70 –106 kPa

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



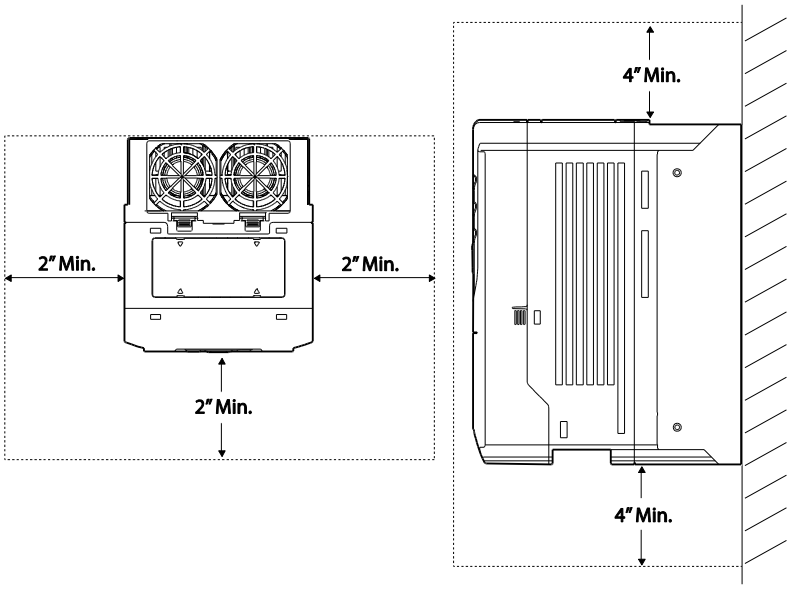
Caution

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

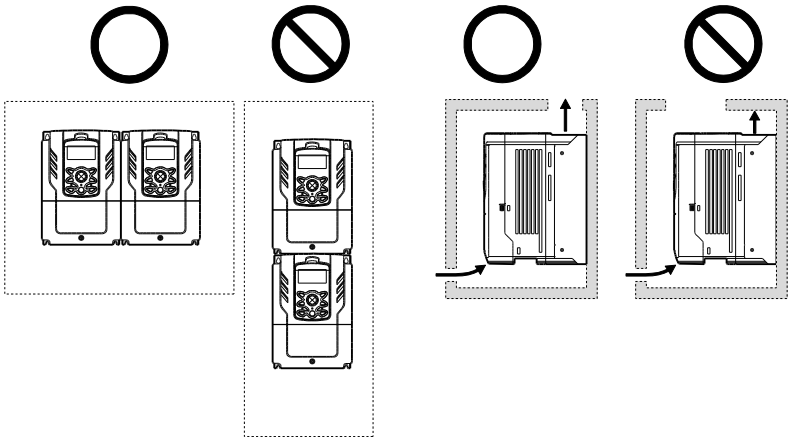
1.4 Selecting and Preparing a Site for Installation

When selecting an installation location consider the following points:

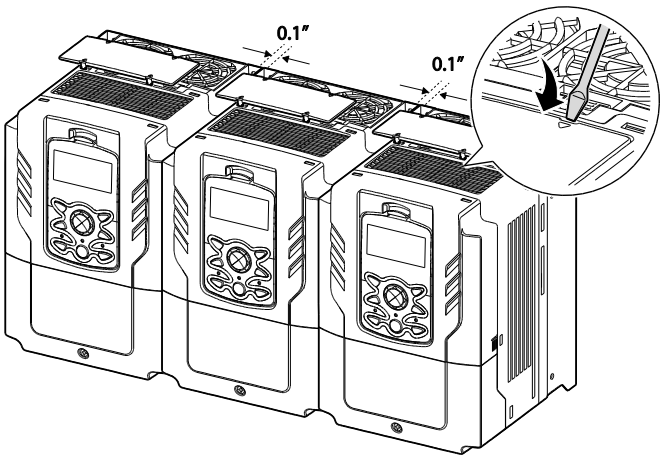
- The inverter must be installed on a wall that can support the inverter's weight.
- The location must be free from vibration. Vibration can adversely affect the operation of the inverter.
- The inverter can become very hot during operation. Install the inverter on a surface that is fire-resistant or 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 in one location, arrange them side-by-side and remove the vent covers. Use a flat head screwdriver to remove the vent covers. Only the H100 inverters rated for up to 30 kW may be installed side-by-side.



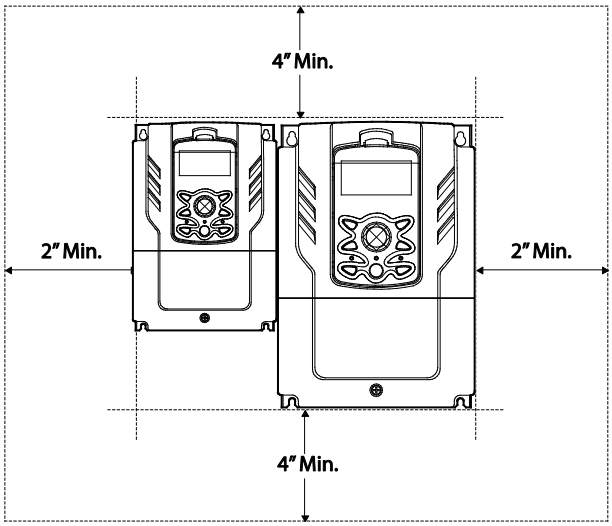
Note

- The vent covers must be removed for side-by-side installations.
- Side-by-side installation cannot be used for the H100 inverters rated for 37 kW and above.
- For the H100 inverters rated for 37 kW and above, if the installation site satisfies the UL Open Type requirements and there is no danger of foreign objects getting inside the inverter and causing trouble, the vent cover may be removed to improve cooling efficiency.

메모 [박지훈1]: cause -> causing

- If you are installing multiple inverters of different ratings, provide sufficient clearance to meet the clearance specifications of the larger inverter.The H100 inverters rated for up to 30 kW may be installed side-by-side.

메모 [박지훈2]: 문구 교체



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 ℃ for power terminal wiring.
- Use copper cables rated for 300 V, 75 ℃ for control terminal wiring.
- The inverters in the range between 15 and 90 kW must be grounded conveniently with fixed connections.
- The inverters in the range between 5,5kW and 11kW must be grounded with and industrial connector according to IEC 60309.
- The minimum size of the protective earthing conductor shall comply with the local safety regulations for high protective earthing conductor current equipment.
- Only one conductor per terminal should be simultaneously connected

Ground Cable and Power Cable Specifications

Load (kW)		Ground Wire		Input/Output Power Wire			
		mm^2	AWG	mm^2		AWG	
				R/S/T	U/V/W	R/S/T	U/V/W
3-Phase 200 V	5.5	10	10	4	4	12	12
	7.5			6	6	10	10
	11			10	10	8	8
	15	14	6	16	16	6	6
	18.5			25	22	4	4
3-Phase 400 V	5.5	4	12	2.5	2.5	14	14
	7.5			4	2.5	12	14
	11			4	4	12	12
	15	16	9	6	6	10	10
	18.5			16	10	6	8

Load (kW)		Ground Wire		Input/Output Power Wire			
	22	14	6	16	10	6	8
	30			25	16	4	6
	37	25	4	25	25	4	4
	45			25	25	4	4
	55			50	50	1/0	1/0
	75	38	2	70	70	1/0	1/0
	90			70	70	1/0	1/0

Signal (Control) Cable Specifications

Terminals	Wire thickness [1]	
	mm^2	AWG
P1–P7/CM/VR/V1/I2/24/TI	0.33–1.25	16–22
AO1/AO2/CM/Q1/EG	0.33–2.0	14–22
A1/B1/C1/A2/C2/A3/C3/A4/C4/A5/C5	0.33–2.0	14–22
S+,S-,SG	0.75	18

Use STP (shielded twisted-pair) cables for signal wiring.

2 Installing the Inverter

This chapter describes the physical and electrical installation of the H100 series inverters, including mounting and wiring of the product. Refer to the flowchart and basic configuration diagram provided below to understand the procedures and installation instructions to be followed to install the product correctly.

Installation Flowchart

The following 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.

Product Identification (*p.1*)

↓

Select the Installation Location (*p.5*)

↓

Mounting the Inverter (*p.17*)

↓

Wiring the Ground Connection (*p.27*)

↓

Power and Signal Wiring (*p.28*)

↓

Post-Installation Checks (*p.48*)

↓

Turning on the Inverter

↓

Parameter Configuration (*p.63*)

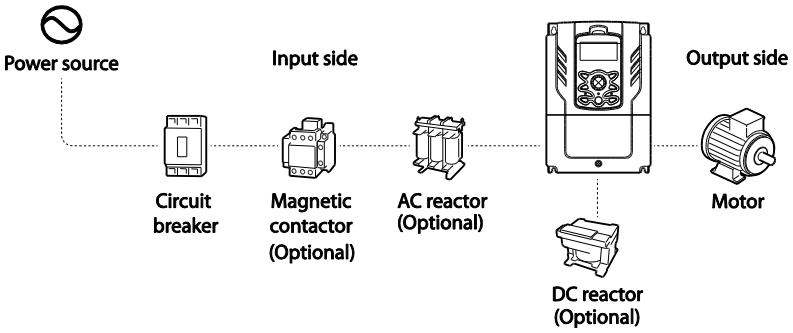
↓

Testing (*p.51*)

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 *11.4 Peripheral Devices* on page *587*.



Caution

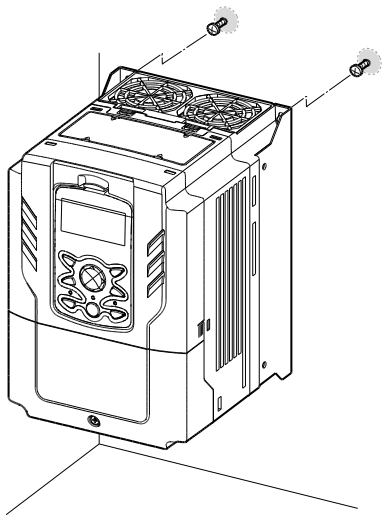
- Figures in this manual are shown with covers or circuit breakers removed to show a more detailed view of the installation arrangements. Install covers and circuit breakers before operating the inverter. Operate the product according to the instructions in this manual.
- Do not start or stop the inverter 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 32.8 ft (10 m) from the power source if the input power exceeds 600 kVA. Refer to *11.5 Fuse and Reactors Specifications* on page *588* and carefully select a reactor that meets the requirements.

2.1 Mounting the Inverter

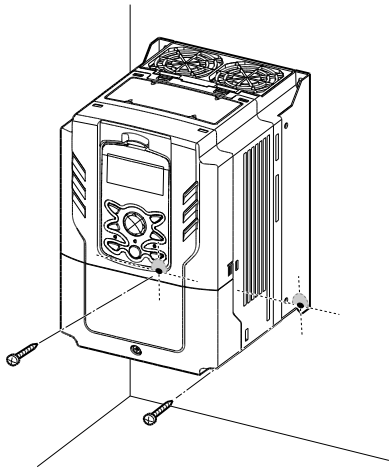
Mount the inverter on a wall or inside a panel following the procedures provided below. Before installation, ensure that there is sufficient space to meet the clearance specifications, and that there are no obstacles impeding the cooling fan's air flow.

Select a wall or panel suitable to support the installation. Refer to *11.3 External Dimensions (IP 20 Type)* on page 585 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 upper mounting bolts.

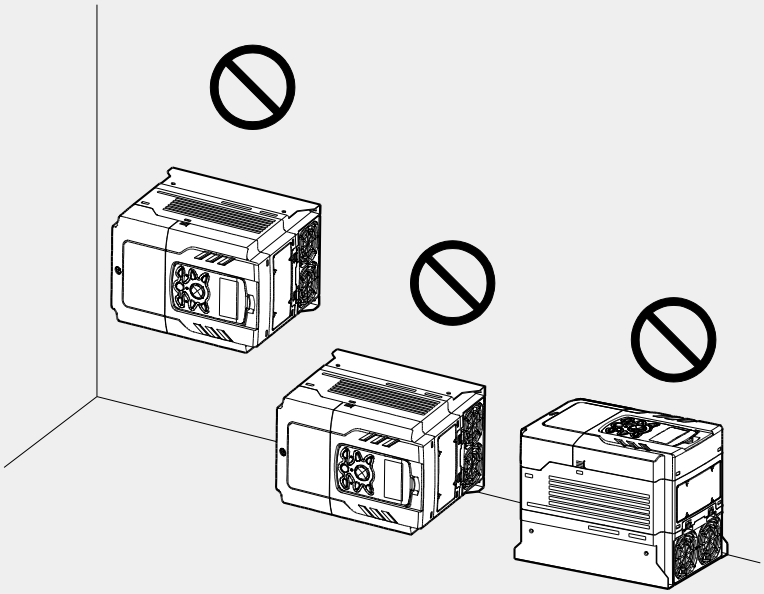


4 Install the two lower mounting bolts. Ensure that the inverter is placed flat on the mounting surface, and that the installation surface can securely support the weight of the inverter.



ⓘ 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 Enabling the RTC (Real-Time Clock) Battery

The H100 series inverter comes from the factory with a CR2032 lithium-manganese battery pre-installed on the I/O PCB. The battery powers the inverter's built-in RTC. The battery is installed with a protective insulation strip to prevent battery discharge; remove this protective film before installing and using the inverter.

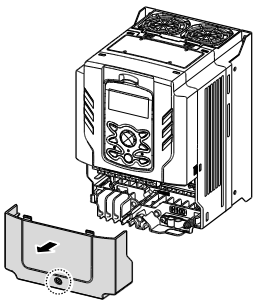
⚠ Caution

ESD (Electrostatic discharge) from the human body may damage sensitive electronic components on the PCB. Therefore, be extremely careful not to touch the PCB or the components on the PCB with bare hands while you work on the I/O PCB.

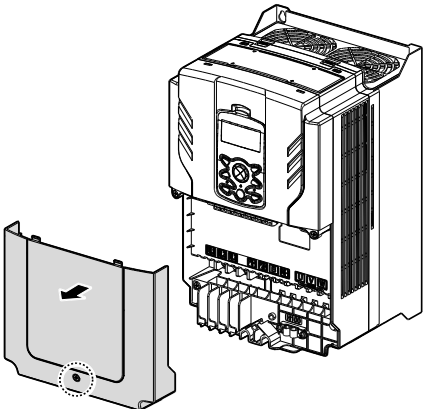
To prevent damage to the PCB from ESD, touch a metal object with your hands to discharge any electricity before working on the PCB, or wear an anti-static wrist strap and ground it on a metal object.

Follow the instructions below to remove the protective insulation strip and enable the RTC feature on the H100 series inverters.

1. Turn off the inverter and make sure that DC link voltage has dropped to a safe level.
2. Loosen the screw on the power cover then remove the power cover.

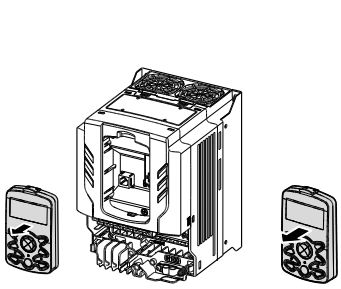


5.5–30 kW Models

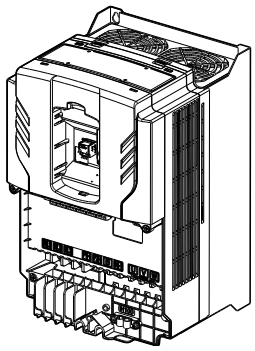


37–90 kW Models

3 Remove the keypad from the inverter body.

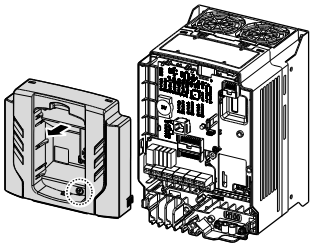


5.5–30 kW Models

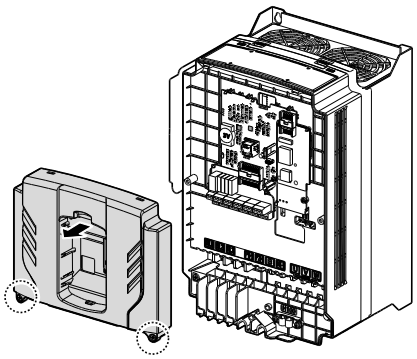


37–90 kW Models

4 Loosen the screws securing the front cover, and remove the front cover by lifting it. The main PCB is exposed.

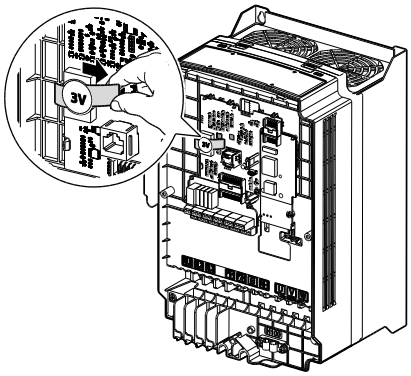


5.5–30 kW Models



37–90 kW Models

5 Locate the RTC battery holder on the I/O PCB, and remove the protective insulation strip by gently pulling it.



5.5–90 kW Models

6 Reattach the front cover, the power cover, and the keypad back onto the inverter body

7 For detailed information on the RTC battery, refer to the battery specifications on page *573*.

Caution

Ensure that the inverter is turned off and DC link voltage has dropped to a safe level before opening the terminal cover and installing the RTC battery.

2.3 Cable Wiring

Open the terminal cover, remove the cable guides, 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 clippings, 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 a short circuit or inverter failure. Refer to page 589.
- Do not place heavy objects on top of electric cables. Heavy objects may damage the cable and result in electric shock.
- Use cables with the largest cross-sectional area, appropriate for power terminal wiring, to ensure that voltage drops do not exceed 2%.
- Use copper cables rated at 600 V, 75 ℃ for power terminal wiring.
- Use copper cables rated at 300 V, 75 ℃ for control terminal wiring.
- 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 terminal 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.
- The accessible connections and parts listed below are of protective class 0. It means that the protection of these circuits relies only upon basic insulation and becomes hazardous in the event of a failure of the basic insulation. Therefore, devices connected to these circuits must provide electrical-shock protection as if the device was connected to supply mains voltage. In addition, during installation these parts must be considered, in relation with electrical-shock, as supply mains voltage circuits.

  [Class 0 circuits]

  ➔ MULTI FUNCTION INPUT : P1-P7, CM

  ➔ ANALOG INPUT : VR, V1, I2, TI

  ➔ ANALOG OUTPUT : AO1, AO2, TO

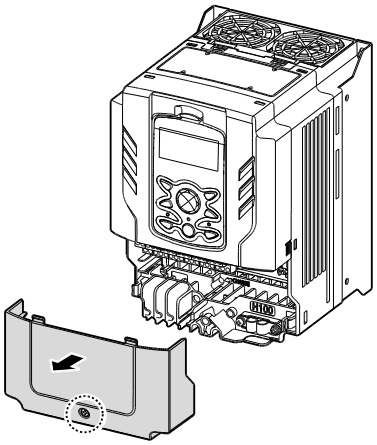
- CONTACT : Q1, EG, 24,A1, C1, B1, A2~5, C2~5, S+, S-, SG

Step 1 Terminal Cover and Cable Guide

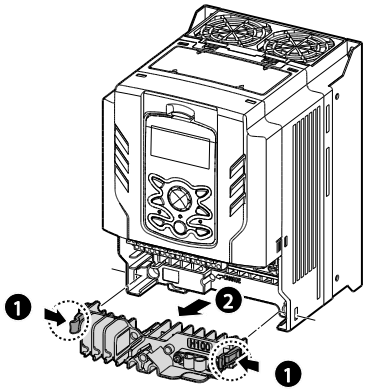
The terminal cover and cable guide must be removed to install cables. Refer to the following procedures to remove the covers and cable guide. The steps to remove these parts may vary depending on the inverter model.

5.5–30 kW / 35–90 kW (3-Phase)

1 Loosen the bolt that secures the terminal cover. Then remove the cover by lifting it from the bottom and away from the front.



2 Push and hold the levers on both sides of the cable guide (❶) and then remove the cable guide by pulling it directly away from the front of the inverter (❷). In some models where the cable guide is secured by a bolt, remove the bolt first.

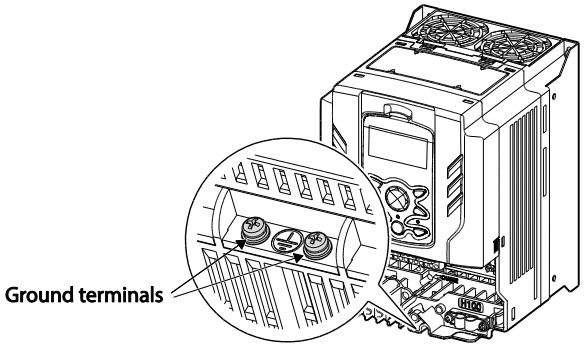


3 Connect the cables to the power terminals and the control terminals. For cable specifications, refer to *1.5 Cable Selection* on page *10*.

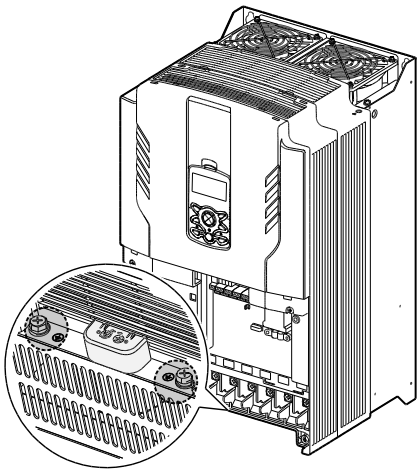
Step 2 Ground Connection

Remove the terminal cover(s) and cable guide. 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 *10* to find the appropriate cable specification for your installation.



5.5–30 kW (3-Phase)



37–90 kW (3-Phase)

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

Note

- 200 V products require Class 3 grounding. Resistance to ground must be ≤ 100 Ω.
- 400 V products require Special Class 3 grounding. Resistance to ground must be ≤ 10 Ω.

⚠ 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.
This product can cause a D.C current in the protective earthing condcutor. If a RCD or monitoring (RCM) device is used for protection, only RCD or RCM of Type B is allowed on supply side of this product.

Step 3 Power Terminal Wiring

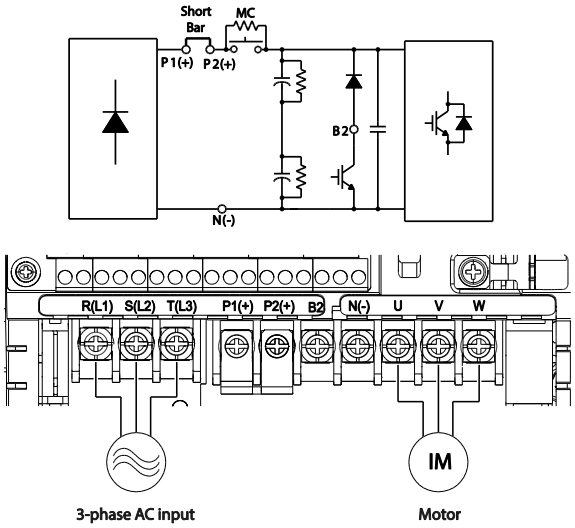
The following illustration shows the terminal layout on the power terminal block. Refer to the detailed descriptions to understand the function and location of each terminal before making wiring connections. Ensure that the cables selected meet or exceed the

specifications in *1.5 Cable Selection* on page *10* before installing them.

ⓘ Caution

- Apply rated torques to the terminal screws. Loose screws may cause short circuits and malfunctions. Tightening the screw too much may damage the terminals and cause short circuits and malfuctions.
- Use copper wires only with 600 V, 75 ℃ rating for the power terminal wiring, and 300 V, 75 ℃ rating for the control terminal wiring.
- Power supply wirings must be connected to the R, S, and T terminals. Connecting them to the U, V, W terminals causes internal damages to the inverter. Motor should be connected to the U, V, and W Terminals. Arrangement of the phase sequence is not necessary.

5.5–30 kW (3-Phase)



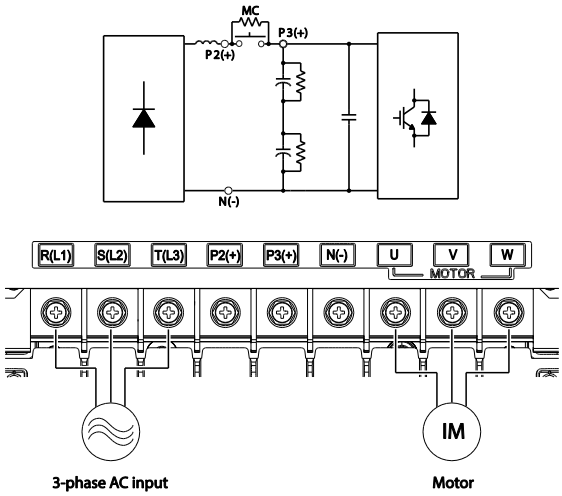
Power Terminal Labels and Descriptions

Terminal Labels	Name	Description
R(L1)/S(L2)/T(L3)	AC power input terminal	Mains supply AC power connections.
P1+	+ DC link terminal	+ DC voltage terminal. Used for connecting an external reactor.
P2+	+ DC link terminal	Used for DC power inverter DC (+) connection.
N-	- DC link terminal	- DC voltage terminal. Used for a DC power inverter DC (-) connection.
P2+/B	Brake resistor terminals	Brake resistor wiring connection.
U/V/W	Motor output terminals	3-phase induction motor wiring connections.

Note

Apply a DC input to the P2 (+) and N (-) terminals to operate the inverter on DC current input.

37–90 kW (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+	+ DC link terminal	+ DC voltage terminal. Used for connecting an external reactor.
P3+	+ DC link terminal	Used for a DC power inverter DC (+) connection.
N-	- DC link terminal	- DC voltage terminal. Used for a DC power inverter DC (-) connection.
U/V/W	Motor output terminals	3-phase induction motor wiring connections.

Note

- Apply a DC input to the P2 (+) and N (-) terminals to operate the inverter on DC current input.
- 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 492 ft (150 m). For inverters < = 3.7 kW capacity, ensure that the total cable length does not exceed 165 ft (50 m).
- 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:
- Voltage Drop (V) = [√3 X cable resistance (mΩ/m) X cable length (m) X 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	< 165 ft (50 m)	< 330 ft (100 m)	> 330 ft (100 m)
Allowed Carrier Frequency	<15 kHz	<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.

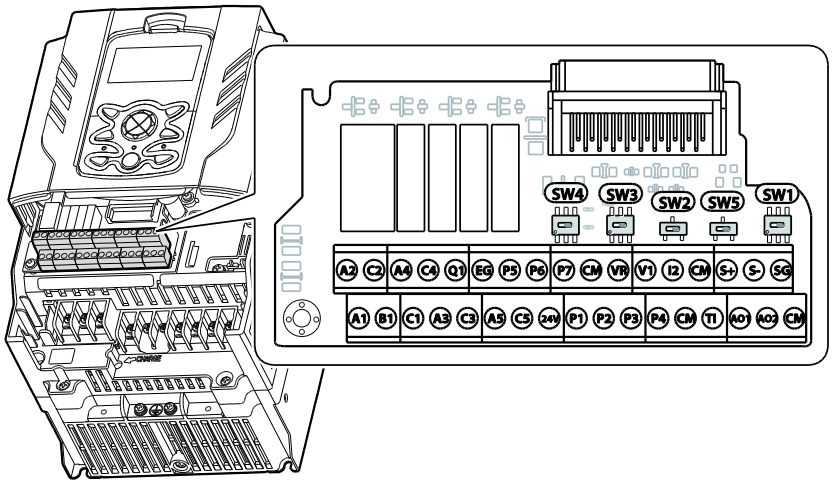
ⓘ Caution

- 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 *10* before installing control terminal wiring and ensure that the cables used meet the required specifications.

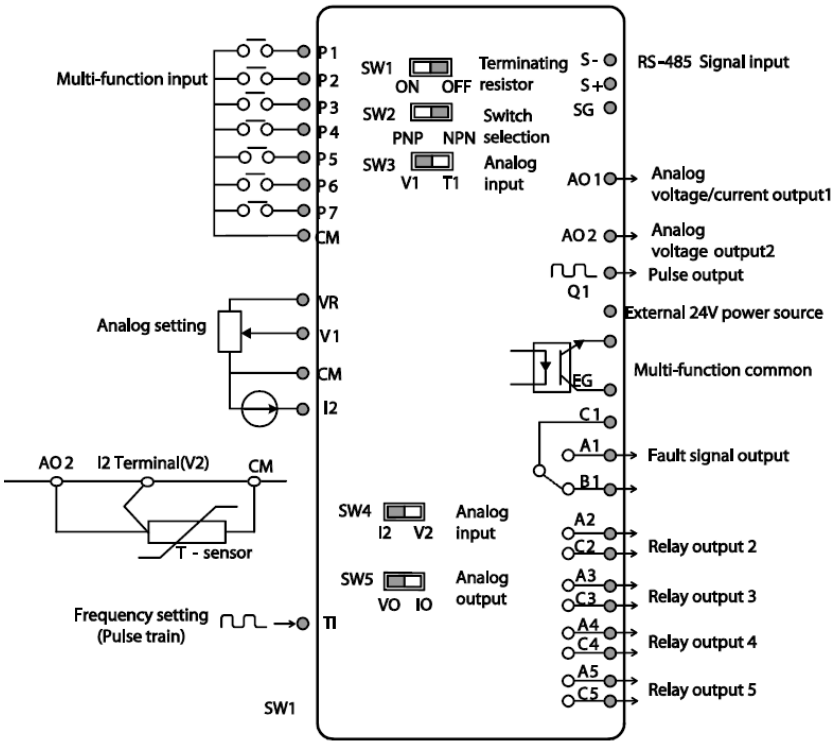


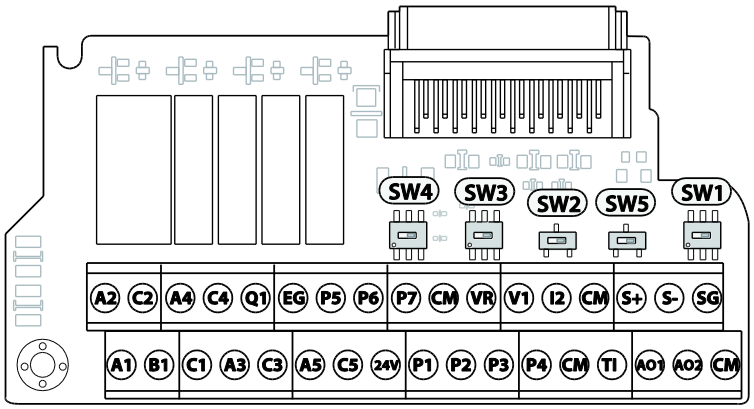
Switch Symbols and Description

Switch	Description	Factory Default
SW1	Terminating Resistor selection switch (Left: On, Right: Off)	Right: OFF
SW2	NPN/PNP mode selection switch (Left: PNP, Right: NPN)	Right: NPN
SW3	V1/T1 (PTC) mode selection switch (Left: V1, Right: T1)	Left: V1
SW4	analog voltage/current input terminal selection switch (Left: I2, Right: V2)	Left: I2
SW5	analog voltage/current output terminal selection switch	Left: VO

Switch	Description	Factory Default
	(Left: VO, Right: IO)	

Input and Output Control Terminal Block Wiring Diagram





Input Terminal Labels and Descriptions

Function	Label	Name	Description
Multi-function terminal configuration	P1–P5	Multi-function Input 1-7	Configurable for multi-function input terminals. Factory default terminals and setup are as follows : P1: Fx P2: Rx P3: BX P4: RST P5: Speed-L P6: Speed-M P7: Speed-H
	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. Maximum Voltage Output: 12 V Maximum Current Output: 12 mA Potentiometer : 1–10k Ω
	V1	Voltage input for	Used to setup or modify a frequency

Function	Label	Name	Description
		frequency reference input	reference via analog voltage input terminal. Unipolar: 0–10 V(12 V Max) Bipolar: -10–10 V(±12 V Max)
	V2/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 (SW4). Input current: 0–20 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. Low Level: 0–0.8 V, High Level: 3.5–12 V

Output/Communication Terminal Labels and Descriptions

Function	Label	Name	Description
Analog output	AO	Voltage/Current Output	Used to send inverter output information to external devices: output frequency, output current, output voltage, or a DC voltage. Operate switch (SW5) to select the signal output type (voltage or current) at the AO terminal. Output Signal Specifications: Output voltage: 0–10 V Maximum output voltage/current: 12 V/10 mA Output current: 0–20 mA Maximum output current: 24 mA Factory default output: Frequency
Terminal Contacts	Q1	Multi-function (Open Collector) Pulse Output	Selects a multi-function output signal or pulse output, output frequency, output current, output voltage, DC voltage by selecting one of the output. DC 26 V, 50 mA or less

Function	Label	Name	Description
			Pulse output terminal Output frequency: 0–32 kHz Output voltage: 0–12 V
	EG	Common	Common ground contact for an open collector (with external power source)
	24	24 V power source	-Maximum output current: 100 mA -Do not use this terminal for any purpose other than supplying power to a PNP mode circuit configuration (e.g. supplying power to other external devices).
	A1/C1/B1	Fault signal output	Sends out alarm signals when the inverter's safety features are activated. (N.O.: AC250 V ≤2 A , DC 30 V ≤3 A N.C.: AC250 V ≤1 A , DC 30 V ≤ 1 A) 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) Factory default: Frequency
	A2/C2 A3/C3 A4/C4 A5/C5	Multi-function relay output A contact	Defined in the inverter signal features such as output via the multi-function output terminal. (AC 250 V≤ 5 A, DC 30 V≤ 5 A).
	S+/S-/SG	RS-485 signal line	Used to send or receive RS-485 signals. Refer to 0 *RS-485 Communication Features* on page *374* for more details.

Note

- While making wiring connections at the control terminals ensure that the total cable length does not exceed 165 ft (50 m).
- Ensure that the length of any safety related wiring does not exceed 100 ft (30 m).
- Ensure that the cable length between the keypad and the inverter does not exceed 10 ft (3.04 m). Cable connections longer than 10 ft (3.04 m) may cause signal errors.
- Use ferrite material to protect signal cables from electro-magnetic interference.

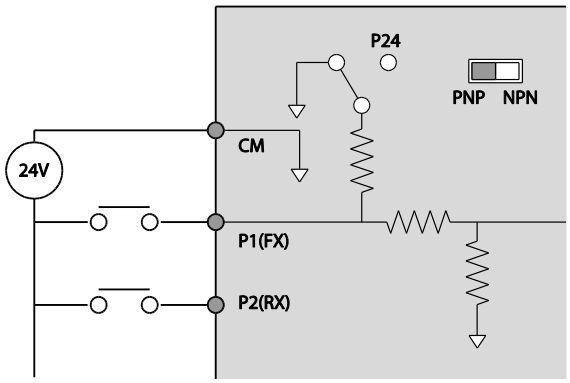
- Take care when supporting cables using cable ties, to apply the cable ties no closer than 6 inches from the inverter. This provides sufficient access to fully close the terminal cover.

Step 5 PNP/NPN Mode Selection

The H100 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 (SW2) on the control board. Refer to the following information for detailed applications.

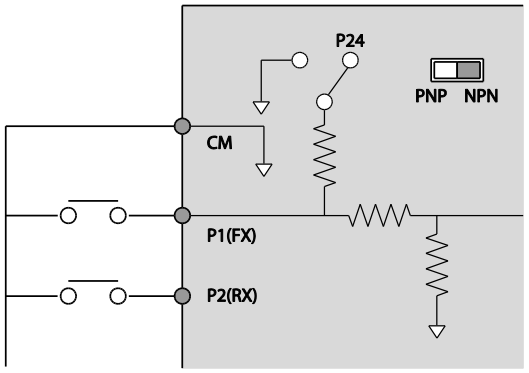
PNP Mode (Source)

Select PNP using the PNP/NPN selection switch (SW2). Note that the factory default setting is NPN mode. CM is is the common ground terminal for all analog inputs at the terminal, and P24 is 24 V internal source. If you are using an external 24 V source, build a circuit that connects the external source (-) and the CM terminal.



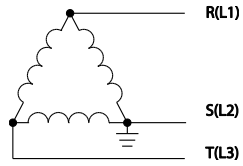
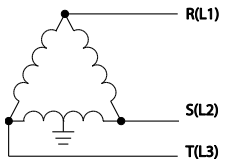
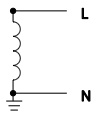
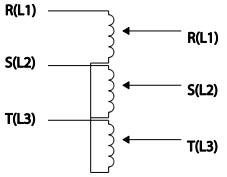
NPN Mode (Sink)

Select NPN using the PNP/NPN selection switch (SW2). Note that the factory default setting is NPN mode. CM is is the common ground terminal for all analog inputs at the terminal, and P24 is 24 V internal source.



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

H100, 400 V5.5–55 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.

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

⚠ Danger

- Do not activate the EMC filter if the inverter uses a power source with an asymmetrical grounding structure(corner-earthed systems), 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.

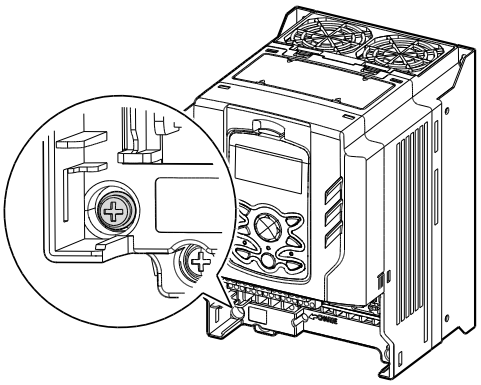
Before using the inverter, confirm the power supply's grounding system. Disable the EMC filter if the power source has an asymmetrical grounding connection.

Disabling the Built-in EMC Filter for 5.5–30 kW (3–Phase) Inverters

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.

If the EMC filter is required in the future, reverse the steps and replace the plastic bolt with the metal bolt to enable the EMC filter.

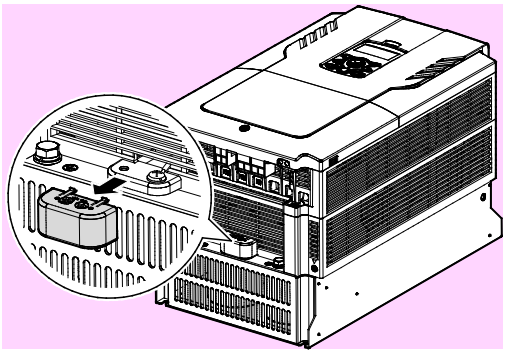
Steel bolt	Plastic bolt
EMC ON	EMC OFF



Disabling the Built-in EMC Filter for 37–55 kW (3–Phase) Inverters

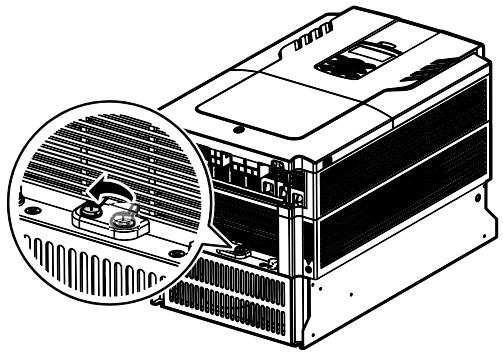
Follow the instructions listed below to disable the EMC filters for the H100 inverters rated for 37–55 kW.

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



메모 **[박지훈3]:** 그림 교체

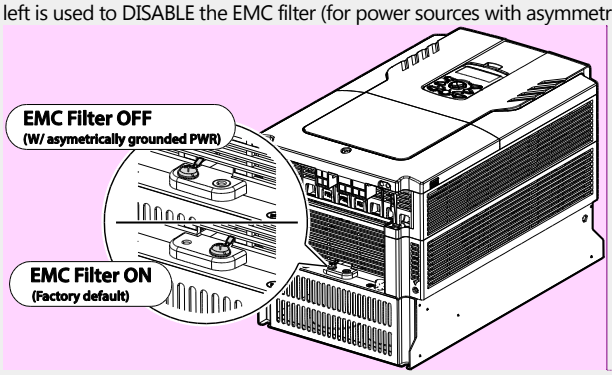
2 Remove the EMC ground cable from the right terminal (EMC filter-ON / factory default), and connect it to the left terminal (EMC filter-OFF / for power sources with asymmetrical grounding).



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).



메모 [박지훈4]: 그림 교체

Step 7 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.

2.4 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?	p.5	
	Does the environment meet the inverter's operating conditions?	p.6	
	Does the power source match the inverter's rated input?	p.578	
	Is the inverter's rated output sufficient to supply the equipment? (Degraded performance will result in certain circumstances. Refer to *11.8 Inverter Continuous Rated Current Derating* on page 591 for details.	p.578	
Power Terminal Wiring	Is a circuit breaker installed on the input side of the inverter?	p.16	
	Is the circuit breaker correctly rated?	p. 587	
	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.)	p.28	
	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.)	p.28	
	Are the cables used in the power terminal connections correctly rated?	p.10	
	Is the inverter grounded correctly?	p.27	
	Are the power terminal screws and the ground terminal screws tightened to their specified torques?	p.28	
	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)?	p.16	

Items	Check Point	Ref.	Result
	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.)	p.28	
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?	p.35	
	Are the control cables properly wired?	p.35	
	Are the control terminal screws tightened to their specified torques?	p.20	
	Is the total cable length of all control wiring < 165 ft (100 m)?	p.40	
	Is the total length of safety wiring < 100 ft (30 m)?	p.40	
Miscellaneous	Are optional cards connected correctly?	-	
	Is there any debris left inside the inverter?	p.20	
	Are any cables contacting adjacent terminals, creating a potential short circuit risk?	-	
	Are the control terminal connections separated from the power terminal connections?	-	
	Have the capacitors been replaced if they have been in use for > 2 years?	-	
	Has a fuse been installed for the power source?	p.588	
	Are the connections to the motor separated from other connections?	-	

Note

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

2.5 Test Run

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

1 Turn on the power supply to the inverter. Ensure that the keypad display light is on.

2 Select the command source.

3 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 (SW4) 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 (SW4) set to 'current', and does the reference change according to the input current?

4 Set the acceleration and deceleration time.

5 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.

Verifying the Motor Rotation

1 On the keypad, set DRV-07 to '1 (Keypad)'.

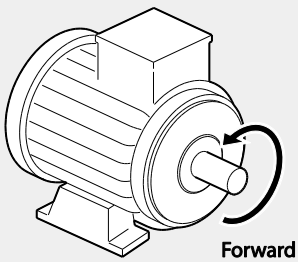
2 Set a frequency reference.

3 If the inverter is in OFF mode, press the [AUTO] key twice on the keypad to operate the inverter in the forward (Fx) direction.

4 If the inver ter is operating in AUTO mode, press the [AUTO] key once on the keypad to

operate the inverter in the forward (Fx) direction.

5 Observe the motor's rotation from the load side and ensure that the motor rotates counterclockwise (forward).



Forward operation

ⓘ 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 accidently exceed the motor's rated capacity.

3 Learning to Perform Basic Operations

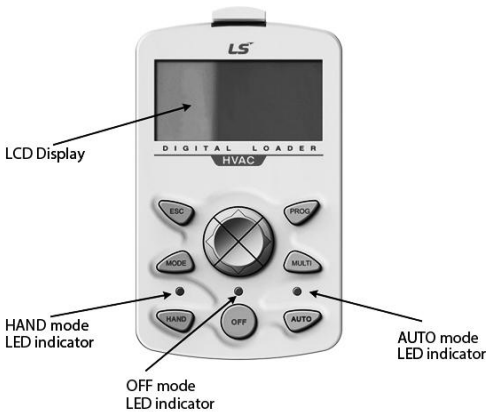
This chapter describes the keypad layout and functions. It also introduces parameter groups and codes required to perform basic operations. The chapter also outlines the correct operation of the inverter before advancing to more complex applications. Examples are provided to demonstrate how the inverter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

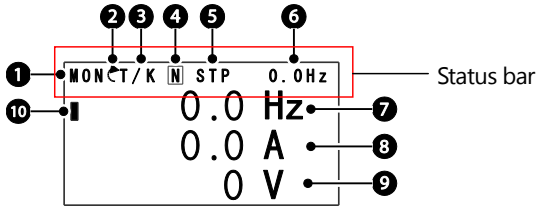
The following table lists the names and functions of the keypad's operation keys.



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	Used to cancel an input during parameter setup. 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.
	[HAND] Key	Used to switch to HAND (local/manual) operation mode.
	[OFF] Key	Used to switch to OFF (standby) mode or to reset the inverter faults.
	[AUTO] Key	Used to switch to AUTO (remote) operation mode.

3.1.2 About the Display

Monitor mode display

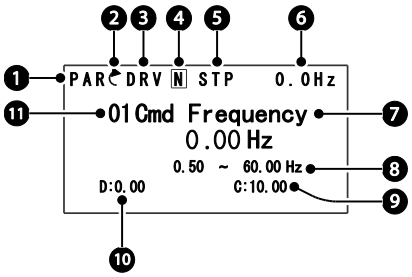


The following table lists display icons and their names/functions.

No.	Name	Description
1	Operation mode	Displays one of the the following inverter modes: Mon: Monitor mode PAR: Parameter mode U&M: User defined and Macro mode TRP: Trip mode CNF: Config mode
2	Rotational direction	Displays the motor's rotational direction: - Fx or Rx.
3	Command Source / Frequency reference	Displays a combination of a command source and a frequency reference. Command source K: Keypad O: Optional Fieldbus module A: Application option E: Time event R: Built-in RS-485 communication T: Terminal block Frequency reference source K: Keypad V: V1 terminal I: I2 terminal P: Pulse terminal U: Up operation frequency (Up-down operation) D: Down operation frequency (Up-down operation) S: Stop operation frequency (Up-down operation)

No.	Name	Description
		O: Optional Fieldbus module J: Jog frequency R: Built-in RS-485 frequency 1–7: Multi-step frequency
4	Multi-function key (UserGrp SelKey) configuration	The multi function key (the [MULTI] key) on the keypad is used to register or delete User group parameters in Parameter mode.
5	Operating status	Displays one of the following operation states: STP: Stop FWD: Forward operation REV: Reverse operation ↻: Forward command given ↺: Reverse command given DC: DC output WAN: Warning STL: Stall SPS: Speed search OSS: S/W over current protection is on OSH: H/W overcurrent protection TUN: Auto tuning PHT: Pre-heat FIR: Fire mode operation SLP: Sleep mode operation LTS: Load tuning CAP: Capacity diagnostics PCL: Pump clean
6	Status display item	Status bar display item
7	Monitor mode item 1	Monitor mode display item 1
8	Monitor mode item 2	Monitor mode display item 2
9	Monitor mode item 3	Monitor mode display item 3
10	Monitor mode cursor	Used to highlight currently selected items.

Parameter edit mode display



The following table lists display icons and their names/functions.

No.	Name	Description
1	Operation mode	Displays one of the the following inverter modes: Mon: Monitor mode PAR: Parameter mode U&M: User defined and Macro mode TRP: Trip mode CNF: Config mode
2	Rotational direction	Displays the motor's rotational direction: - Fx or Rx.
3	Parameter group	Displays one of the following parameter group names: DRV: Drive group BAS: Basic group ADV: Advanced group CON: Control group IN: Input terminal group OUT: Output terminal group COM: Communication group PID: PID group EPI: External PID group AP1: Application 1 group AP2: Application 2 group AP3: Application 3 group PRT: Protection function group M2: 2nd motor group

No.	Name	Description
4	Multi-function key (UserGrp SelKey)configuration	Used to register or delete User group parameters in Parameter mode.
5	Operating status	Displays one of the following operation states: STP: Stop FWD: Forward operation REV: Reverse operation ↻: Forward command given ↺: Reverse command given DC: DC output WAN: Warning STL: Stall SPS: Speed search OSS: S/W over current protection is on OSH: H/W overcurrent protection TUN: Auto tuning PHT: Pre-heat FIR: Fire mode operation SLP: Sleep mode operation LTS: Load tuning CAP: Capacity diagnostics PCL: Pump clean
6	Display item	Displays the value of a monitor display item selected at CNF-20 (Anytime Para).
7	Parameter value	Displays the parameter value of currently selected code.
8	Setting range	Displays the value range for the selected parameter.
9	Set value	Displays the currently set value for the code.
10	Default	Displays the factory default value for the code.
11	Code no. and name	Displays the number and name of the currently selected code.

3.1.3 Display Modes

The H100 inverter uses 5 modes to monitor or configure different functions. The parameters in Parameter mode and User & Macro mode are divided into smaller groups of relevant functions.

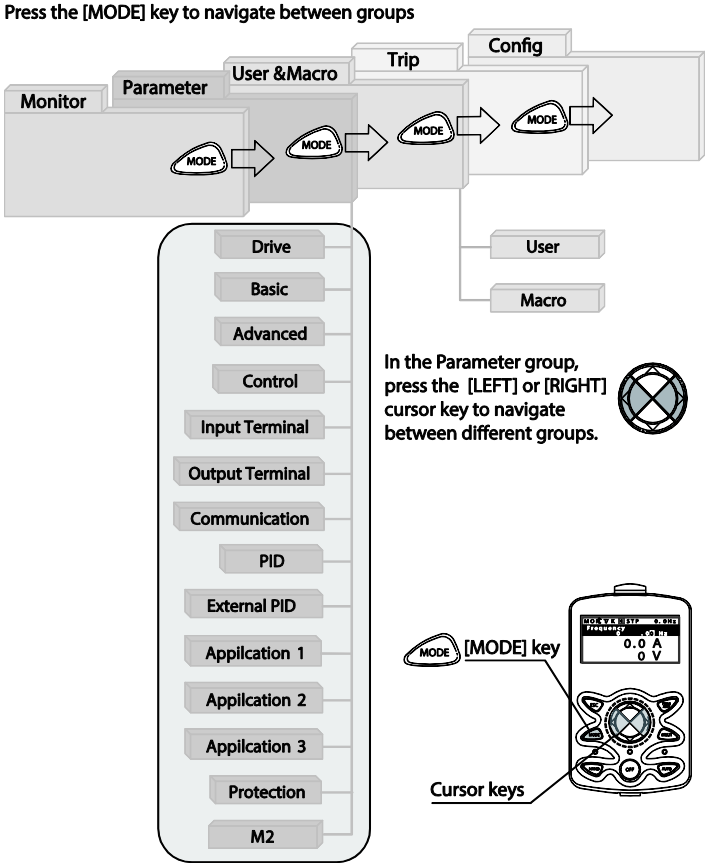


Table of Display Modes

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.
User & Macro mode	U&M	Used to define User groups and Macro groups. These user-definable groups allow specific functions of the inverter to be grouped and managed in separate groups. This mode is not displayed when you navigate through the modes if no user groups or Macro groups have been defined.
Trip mode	TRP	Used to monitor the inverter's fault trip information, including the prevous 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 jog operation, motor capacity evaluation, and torque boost.
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.
PID process	PID	Configures the PID control-related features.
EPID process	EPI	Configures the external PID control-related features.
Application 1	AP1	Configures the Sleep Boost, SoftFill, and Multiple motor control (MMC) features related to the PID control.
Application 2	AP2	Configures the HVAC features by setting the features such as load tuning, pump cleaning, and pay back counter.
Application 3	AP3	Configures the time event-related features.

Function Group Name	Keypad Display	Description
Protection	PRT	Configures motor and inverter protection features.
Motor 2 (Secondary motor)	M2	Configures the secondary motor-related features.

User & Macro Mode

Function Group Name	Keypad Display	Description
User	USR	Used to put the frequently accessed function parameters together into a group. User parameter groups can be configured using the multi-function key on the keypad.
Macro	MCx	Provides different factory-preset groups of functions based on the type of load. Groups MC1, MC2, or MC3 is displayed when the user selects the type of desired load. Macro groups can be selected in CNF mode.

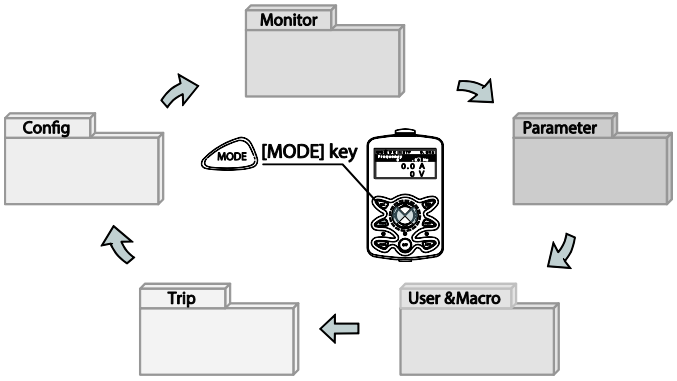
3.2 Learning to Use the Keypad

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 detaled information on the codes in each function group, refer to 8 *Table of Functions* on page *440*. 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 & Macro mode and Trip mode are not displayed when all the inverter settings are set to the factory default (User & Macro 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).



3.2.2 Operation Modes

The inverter is operable only when it is in HAND or AUTO mode. HAND mode is for local control using the keypad, while AUTO mode is for remote control via communication. On the other hand, the inverter stops operating when it is in OFF mode. Select one of the modes (HAND / AUTO / OFF) to operate the inverter or stop the operation.

Follow the examples below to learn how to switch between operation modes.

Operating the Inverter in HAND mode

1 Turn on the inverter. The inverter enters OFF mode and the OFF LED turns on.

2 Move to Parameter mode and set DRV-07 (frequency reference) to '0 (keypad)'.

3 Press the [HAND] key to enter HAND mode (local control mode). HAND mode LED turns on (the OFF LED turns off) and the inverter begins to operate.

4 Press the [OFF] key to stop the inverter operation. The inverter stops operating and the OFF LED turns on.

Operating the inverter in AUTO Mode

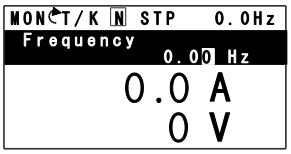
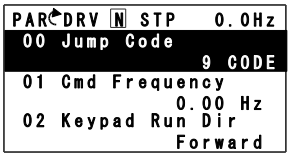
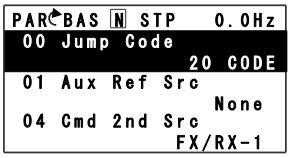
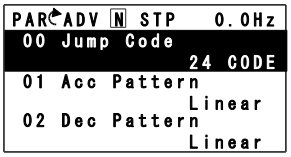
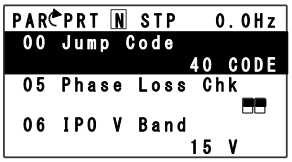
1. In OFF mode (when the OFF LED is on), move to Parameter mode and configure the command source at DRV-07 (frequecy reference source).
2. Press the [AUTO] key to enter AUTO mode. In AUTO mode, the inverter operates based on the input from the command source set at DRV-07. For example, if DRV-07 (frequency reference source) is set to '0 (Keypad)', the frequency reference is set, and the run command is set to 'ON', the inverter starts operating as soon as the [AUTO] key on the keypad is pressed.
3. Press the [Auto] key again to stop the inverter operation using the keypad. In AUTO mode, the inverter begins or stops operating when the [AUTO] key is pressed.

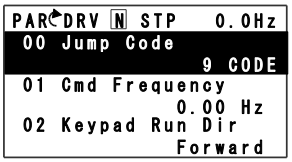
Note

- You can stop the inverter operation by pressing the [OFF] key when the command source is set to 'Keypad.' In this case, however, the inverter enters OFF mode from AUTO mode.
- If the network communication is set as the command source, the inverter is operable only in AUTO mode. For example, if the run command is set to 'ON' via the network communication and the inverter is in OFF mode, the [AUTO] key must be pressed to start the inverter operation.
- The inverter is operable only in HAND and AUTO modes, but the Fire mode functions operate even when the inverter is in OFF mode.

3.2.3 Switching between Groups in Parameter Display Mode

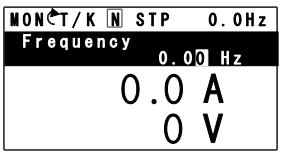
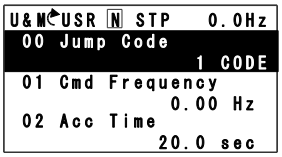
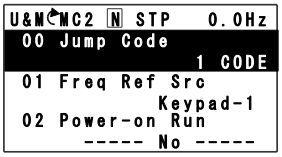
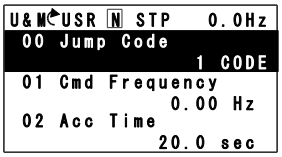
After entering Parameter mode from Monitor mode, press the [Right] key to move to the next code. Press the [Left] key to go back to the previous code.

	The keypad OFF LED is turned OFF, and the keypad displays Monitor mode. • Press the [Mode] key to change the mode.
	Parameter mode is displayed. • The Drive group is currently selected. • Press the [Right] key.
	• The Basic group is selected. • Press the [Right] key.
	• The Advanced group is selected. • Press the [Right] key 9 times.
	• The Protection group is selected. • Press the [Right] key.

	• The Drive group is selected again.

3.2.4 Switching between Groups in User & Macro Mode

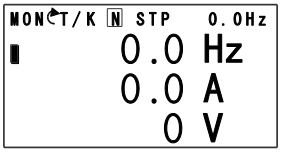
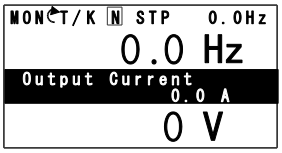
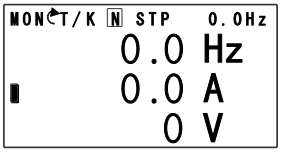
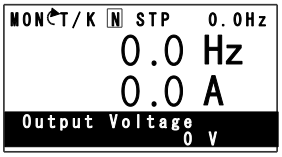
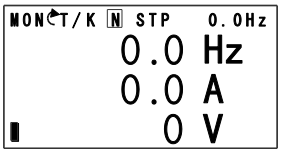
User & Macro mode is accessible only when the user codes are registered or when the macro features are selected. Refer to *8.16 Macro Groups* on page *539* for details about user code registration or macro group selection. After registering the user codes, or selecting a macro group, follow the examples below to access the User & Macro group.

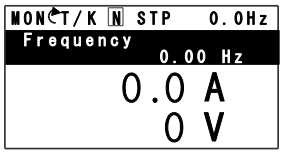
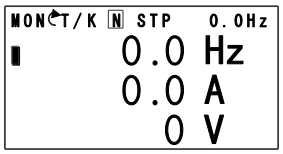
	• Monitor mode is displayed on the keypad. • Press the [MODE] key twice.
	• User (USR) group in User & Macro mode is displayed. • Press the [Right] key.
	• The Macro (MC2) group in User & Macro mode is displayed. • Press the [Right] key.
	• User (USR) group in User & Macro mode is displayed again.

3.2.5 Navigating through the Codes (Functions)

Code Navigation in Monitor mode

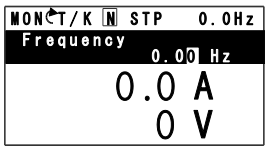
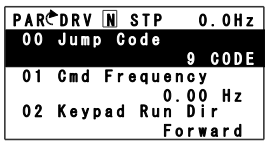
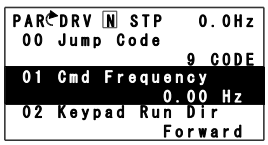
The display items in Monitor mode are available only when the inverter is in AUTO mode. In Monitor mode, press the [Up] or [Down] key to move the cursor up or down. Different values, such as the operating frequency, the output current, or voltage are displayed according to the cursor position. The cursor does not move up or down in HAND mode or in OFF mode.

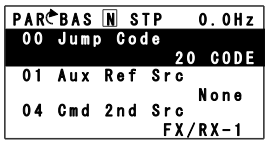
	• In AUTO mode, the cursor appears to the left of the frequency information. • Press the [Down] key.
	• Information about the second item in Monitor mode (Output Current) is displayed. • Wait for 2 seconds until the information on the display disappears.
	• Information about the second item in Monitor mode (Output Current) disappears and the cursor reappears to the left of the second item. • Press the [Down] key.
	• Information about the third item in Monitor mode (Output Voltage) is displayed. • Wait for 2 seconds until the information on the display disappears.
	• Information about the third item in Monitor mode (Output Voltage) disappears and the cursor appears to the left of the third item. • Press the [Up] key twice.

	• Information about the first item in Monitor mode (Frequency) is displayed. • Wait for 2 seconds until the information on the display disappears.
	• Information about the first item in Monitor mode (Frequency) disappears and the cursor appears to the left of the first item. • Press the [Up] or [Down] key to move to a desired item and view the information.

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 [Up] or [Down] key to move to the desired functions.

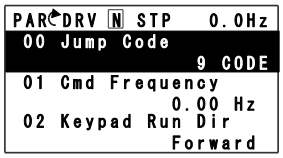
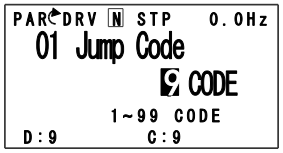
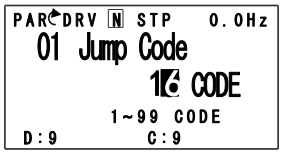
	• Display turns on when the inverter is powered on. Monitoring mode is displayed. • Press the [MODE] key.
	• Drive group (DRV) in Parameter mode is displayed. The first code in the Drive group (DRV 00 Jump Code) is currently selected. • If any other group is displayed, press the [MODE] key until the Drive group is displayed, or press the [ESC] key.
	• Press the [Down] key to move to the second code (DRV 01) of the Drive group. • Press the [Right] key to move to the next function group.

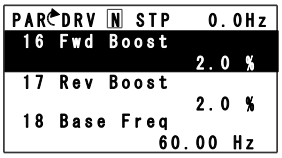
	• The Basic group (BAS) is displayed. • Press the [Up] or [Down] key to move to the desired codes and configure the inverter functions.

3.2.6 Navigating Directly to Different Codes

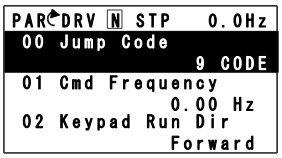
Parameter mode, User & Macro mode, and Config mode allow direct jumps to specific codes. The code used for this feature is called the Jump Code. The Jump Code is the first code of each mode. The Jump Code feature is convenient when navigating for a code in a function group that has many codes.

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

	• The Drive group (DRV) is displayed in Parameter mode. Make sure that the fist code in the Drive group (DRV 00 Jump Code) is currently selected. • Press the [PROG/ENT] key.
	• The Code input screen is displayed and the cursor flashes. A flashing cursor indicates that it is waiting for user input. • Press the [Up] key to increase the number to 16, and then press the [PROG/ENT] key to jump to code DRV-16.
	• DRV-16 (Fwd boost) is displayed. • Press the [MODE] key to view the options available and use the [Up] or [Down] key to move to a desired option.



- Press the [PROG/ENT] key to save the selection.
- The setting is saved and the code is displayed again.

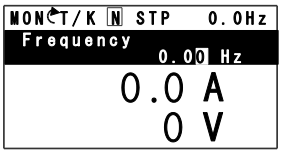


- Press the ESC key to go back to the initial code of the Drive group (DRV-00).

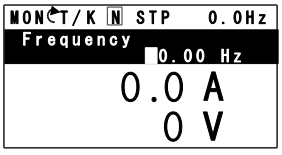
3.2.7 Parameter Settings available in Monitor Mode

The H100 inverter allows basic parameters, such as the frequency reference, to be modified in Monitor mode. When the inverter is in Hand or OFF mode, the frequency reference can be entered directly from the monitor screen. When the inverter is in AUTO mode, press the [PROG/ENT] key to access the input screen for a frequency reference.

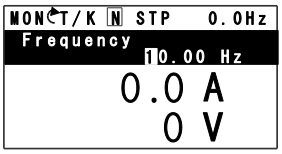
Parameter setting in HAND/OFF mode



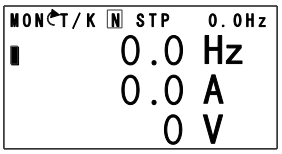
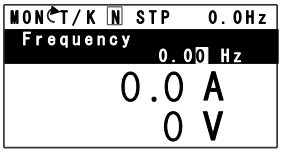
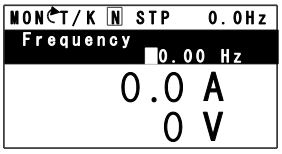
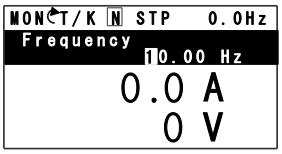
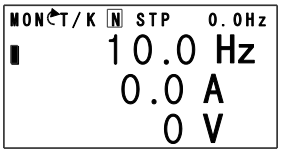
- Ensure that the cursor is at the frequency reference item. If not, move the cursor to the frequency reference item.
- When the cursor is at the frequency reference item, detailed information is displayed and the cursor flashes at the input line. A flashing cursor indicates that it is waiting for user input.



- Press the [Left] or [Right] key to change places.

	• Press the [Up] or [Down] keys to increase or decrease the numbers, and then press the [Prog/ENT] key to save the change.

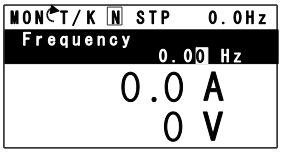
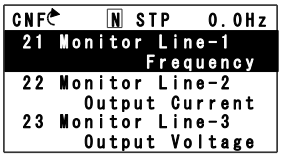
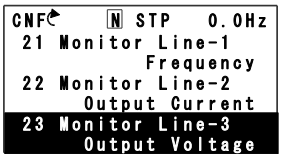
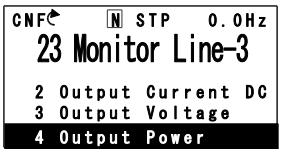
Parameter setting in AUTO mode

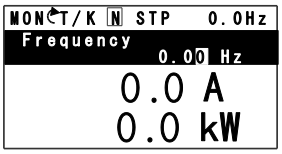
	• Ensure that the cursor is at the frequency reference item. If not, move the cursor to the frequency reference item. • While the cursor is at the frequency reference monitor item, press the [PROG/ENT] key to edit the frequency reference.
	• Detailed information is displayed and the cursor flashes at the input line. A flashing cursor indicates that it is waiting for user input.
	• Press the [Left] or [Right] key to move the cursor.
	• Press the [Up] or [Down] key to increase or decrease the numbers. • When you are done changing the frequency reference, press [PROG/ENT] key to finish setting the parameters.
	• The newly entered frequency reference is displayed.

3.2.8 Setting the Monitor Display Items

In Monitor mode, 3 different items may be monitored at once. Certain monitor items, such as the frequency reference, are selectable. The display items to be displayed on the screen can be selected by the user in the Config (CNF) mode. However, in HAND mode or in OFF mode, the first display item is permanently fixed as the frequency reference. On the top-right corner of the keypad display's status bar, another frequency item is displayed. This item refers to the frequency reference when the inverter is not operating and the output frequency when the inverter is operating.

The following example shows how to configure the display items in HAND mode.

	• Monitor mode is displayed on the keypad. The output frequency, output current, and output voltage are displayed (factory default).
	• Go to the Config (CNF) mode. In the Config mode, codes CNF-21–23 are used to select the three monitoring display items. The currently selected display item and its setting are highlighted.
	• To view the available display items and change the setting for the third monitoring display item, press the [Down] key to move to CNF-23 and press the [PROG/ENT] key. • The currently selected display item for CNF-23 (Monitor Line–3) is 'Output Voltage.'
	• Press the [Up] or [Down] key to view the available display items. • Move to '4 Output Power' and press the [PROG/ENT] key to change the setting.

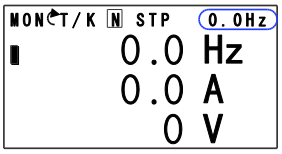
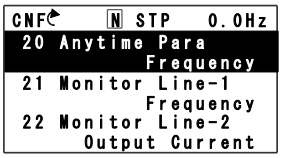
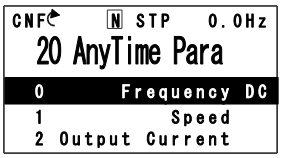
	• Press the [MODE] key to go back to Monitor mode. The third display item has been changed to the inverter output power (kW).

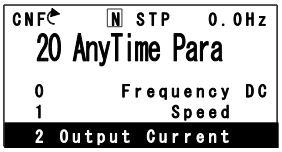
3.2.9 Selecting the Status Bar Display Items

On the top-right corner of the display, there is a monitoring display item. This monitoring item is displayed as long as the inverter is turned on, regardless of the mode the inverter is operating in. Configure this monitoring item to display the type of information that suits your needs.

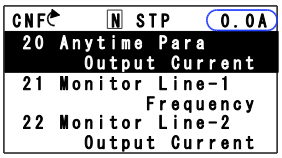
This item can be configured only when the inverter is operating in AUTO mode. In HAND or OFF mode, this monitoring item displays frequency reference only.

The following example shows how to configure this monitoring item in AUTO mode.

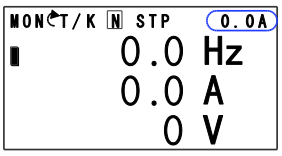
	• Monitor mode is displayed. • On the top-right edge of the display, the frequency reference is displayed (factory default).
	• Enter Config mode and go to CNF-20 to select the items to display.
	• Press the [PROG/ENT] key. The currently selected item is highlighted.



- Press the [Down] key twice to move to '2 (Output Current)', and then press the [PROG/ENT] key to select it.



- The currently selected item is highlighted at CNF- 20 (the display item is changed from 'Frequency' to 'Output Current').

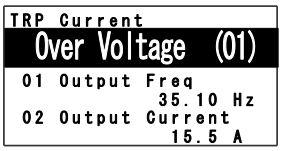
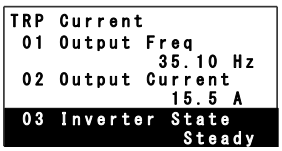
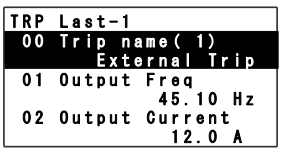
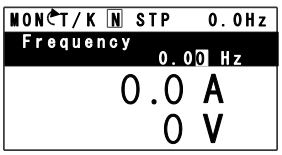


- Press the [MODE] key to return to Monitor mode.

3.3 Fault Monitoring

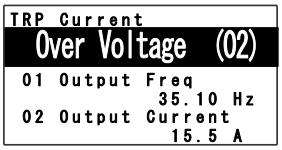
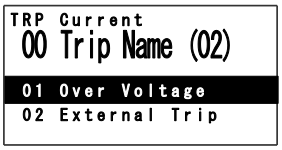
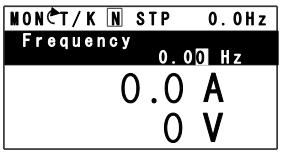
3.3.1 Monitoring Faults during Inverter Operation

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

	• If a fault trip occurs during inverter operation, the inverter enters Trip mode automatically and displays the type of fault trip that occurred.
	• Press the [Down] key to view the information on the inverter at the time of fault, including the output frequency, output current, and operation type.
	• If there were any fault trips that occurred previously, press the [Right] key to display the fault trip information at the times of previous fault trips.
	• 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.

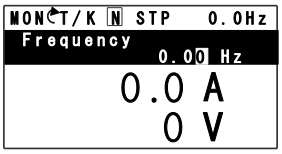
3.3.2 Monitoring Multiple Fault Trips

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

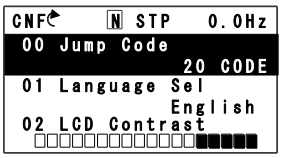
	• If multiple fault trips occur at the same time, the number of fault trips occurred is displayed on the right side of the fault trip type. • Press the [PROG/ENT] key to view the list of all the fault trips.
	• The list of all the fault trips is displayed. • Press the [Down] key to view the types of fault trips that occurred. • Press the [Right] key to display the fault trip information.
	• 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.

3.4 Parameter Initialization

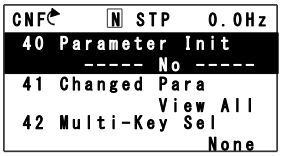
The following example demonstrates how to revert all the parameter settings back to the factory default (Parameter Initialization). Parameter initialization may be performed for separate groups in Parameter mode as well.



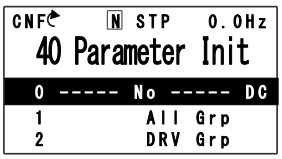
- Monitor mode is displayed.



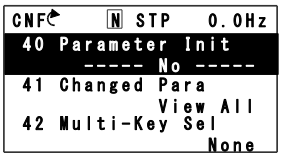
- Press the [MODE] key to move to the Config (CNF) mode.



- Press the [Down] key to go to CNF-40 (Parameter Init).
- Press the [PROG/ENT] key to configure the parameter initialization options.



- In the list of options, select '1(All Grp),' and then press the [PROG/ENT] key to perform parameter initialization.



- The parameter initialization option is displayed again when the initialization is complete.

4 Learning Basic Features

This chapter describes the basic features of the H100 inverter. Check the reference page in the table to see the detailed description for each of the advanced features.

Basic Tasks	Description	Ref.
Operation mode selection (HAND / AUTO / OFF)	Used to select the operation mode.	p.85
Frequency reference source configuration for the keypad	Configures the inverter to allow you to setup or modify a frequency reference using the Keypad.	p.93
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.94 p.104
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.101
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.105
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.107
Frequency control using analog inputs	Enables the user to hold a frequency using analog inputs at terminals.	p.108
Motor operation display options	Configures the display of motor operation values. Motor operation is displayed either in frequency (Hz) or speed (rpm).	p.108
Multi-step speed (frequency) configuration	Configures multi-step frequency operations by receiving an input at the terminals defined for each step frequency.	p.109
Command source configuration for keypad	Command source configuration for keypad buttons.	p.111

Basic Tasks	Description	Ref.
buttons		
Command source configuration for terminal block inputs	Configures the inverter to accept inputs at the FX/RX terminals.	p.113
Command source configuration for RS-485 communication	Configures the inverter to accept communication signals from upper level controllers, such as PLCs or PCs.	p.115
Motor rotation control	Configures the inverter to limit a motor's rotation direction.	p.115
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.117
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.120
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.121
Acc/Dec time configuration based on the frequency reference	Configures acceleration and deceleration times for a motor based on a defined frequency reference.	p.124
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.125
Acc/Dec time transition speed (frequency) configuration	Enables modification of acceleration and deceleration gradients without configuring the multi-functional terminals.	p.126

Basic Tasks	Description	Ref.
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.129
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.131
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.133
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.134
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.136
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.138
Automatic torque boost	Automatic configuration of the inverter that provides"auto tuning" that produces a momentary torque boost. This configuration is for loads that require a large amount of starting torque, such as elevators or lifts.	p.139
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.141
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.142
Start after DC braking	Configures the inverter to perform DC braking before	p.142

Basic Tasks	Description	Ref.
	the motor starts rotating again. This configuration is used when the motor will be rotating before the voltage is supplied from the inverter.	
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.143
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.145
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.146
Power braking	Configures the inverter to provide optimal, motor deceleration, without tripping over-voltage protection.	p.147
Start/maximum frequency configuration	Configures the frequency reference limits by defining a start frequency and a maximum frequency.	p.149
Upper/lower frequency limit configuration	Configures the frequency reference limits by defining an upper limit and a lower limit.	p.149
Frequency jump	Configures the inverter to avoid running a motor in mechanically resonating frequencies.	p.153
2nd Operation Configuration	Used to configure the 2nd operation mode and switch between operation modes according to your requirements.	p.154
Multi-function input terminal control configuration	Enables the user to improve the responsiveness of the multi-function input terminals.	p.156

4.1 Switching between the Operation Modes (HAND / AUTO / OFF)

The H100 series inverters have two operation modes–the HAND and AUTO modes. HAND mode is used for local control using the keypad. AUTO mode is used for remote control using the terminal inputs or networks commands (the keypad may still be used in AUTO mode if the command source is set as 'keypad').

HAND Mode Operation

Follow the instructions listed below to operate the inverter in HAND mode.

1. On the keypad, use the [Up], [Down], [Left], or [Right] keys to set the frequency reference.
2. Press the [HAND] key. The HAND LED turns on and the inverter starts operating in HAND mode.
3. Press the [OFF] key. The OFF LED turns on and the inverter stops operating.

AUTO Mode Operation

Follow the instructions listed below to operate the inverter in AUTO mode.

1 Press the [AUTO] key to switch to AUTO mode.

2 Operate the inverter using the terminal block input, commands via communication, or keypad input.

3 Press the [OFF] key. The OFF LED turns on and the inverter stops operating.

Mode Keys and LED Status

Keys / LED	Description
	Used to enter the HAND operation mode.
	Used to enter the OFF mode (standby mode) or to reset fault trips.
	Used to enter the AUTO operation mode or to start or stop inverter operation in AUTO mode.
HAND LED	Turns on green (steady) during HAND mode operation.
OFF LED	Turns on red (steady) while the inverter is in OFF mode (standby), and flashes then a fault trip occurs. The LED turns on red (steady) again when the fault trip condition is released.
AUTO LED	Turns on green (steady) when the inverter operates in Auto mode, and flashes green when the inverter is in AUTO mode, but is not operating.

Basic HAND/AUTO/OFF Mode Operations

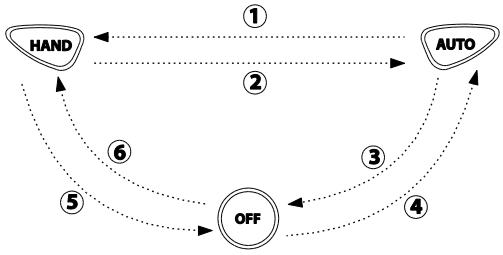
Mode	Description
HAND Mode (Locally controlled operation mode)	In HAND mode, operation is available only by the keypad input. In Monitor mode, the currently set frequency reference is displayed at all times. Also, in HAND mode: • The first monitoring item is used to adjust the frequency with the up/down and left/right keys. The set frequency is refelected in DRV-02 (HAND Cmd Freq). • The motor's rotation direction can be set at DRV-02 (Keypad Run Dir). • Terminal block functions do not operate (with the exception of BX, External Trip, and multi-step acc/dec operation related terminal functions). • Fire mode commands take the highest priority (if any are given). • The following advanced features are not available: - PID / EPID control - Flow compensation - Pump clean - Load tuning - Motor preheating - Time scheduling - PowerOn resume - Multiple motor control • Inverter monitoring and protection features are available in HAND mode.
OFF Mode (Standby)	In OFF mode, the inverter operation stops. Pressing the OFF key during HAND/AUTO mode operations will cause the OFF LED to turn on. Then, the inverter stops operating or decelerates and stops, according to the deceleration options set by the user. Also, in AUTO mode: • Terminal block functions do not operate (with the exception of BX, External Trip and multi-step acc/dec operation related terminal functions). • Fire mode commands take the highest priority (if any are given).
AUTO Mode (Remotely controlled operation	In AUTO mode, the inverter operates based on the command from the command source set at DRV-06 (Cmd Source), with the frequency reference from the source set at DRV-07 (Freq Ref Src).

Mode	Description
mode)	

Function Codes related to HAND/AUTO/OFF Operation Modes

<table>
<tr><th>Codes / Functions</th><th>Description</th></tr>
<tr><td>DRV-01
Cmd Frequency</td><td>Frequency reference in AUTO mode when DRV-07 is set to' KeyPad'.</td></tr>
<tr><td>DRV-02
KeyPad Run Dir</td><td>Rotation direction of the keypad command in the HAND or AUTO mode.
<table>
<tr><td colspan="2">Settings</td><td>Description</td></tr>
<tr><td>0</td><td>Forward</td><td>Fx operation</td></tr>
<tr><td>1</td><td>Reverse</td><td>Rx operation</td></tr>
</table></td></tr>
<tr><td>DRV-25
HAND Cmd Freq</td><td>Frequency displayed at the monitor display item (Monitor Line-1) when the HAND key is pressed in other modes (default frequency reference for HAND mode).</td></tr>
<tr><td>OUT-31–36
Relay 1–5</td><td>Set AUTO State (36) to ensure that the inverter is in AUTO mode.</td></tr>
<tr><td>OUT-31–36
Relay 1–5</td><td>Set HANDState (37) to ensure that the inverter is in HAND mode.</td></tr>
</table>

Switching between the HAND/AUTO/OFF Modes



<table>
<tr><th>Mode</th><th>Description</th></tr>
<tr><td>①AUTO→HAND</td><td>Press the HAND key in AUTO mode to switch to HAND mode. The inverter operates as follows based on the setting at DRV-26 (Hand Ref Mode).
<table>
<tr><td colspan="2">Settings</td><td>Description</td></tr>
<tr><td>0</td><td>Hand Parameter</td><td>The inverter operates based on the operation direction set at DRV-02 (Keypad Run Dir) and the frequency reference set at DRV-25 (HAND Cmd Freq).</td></tr>
<tr><td>1</td><td>Follow</td><td>The inverter takes over the operation direction and the</td></tr>
</table></td></tr>
</table>

Mode	Description
	Auto: frequency reference from the settings for AUTO mode and keeps performing the same operation. If the inverter was stopped in AUTO mode, the operation direction is set as Fx and the frequency reference is set as 0 (no inverter output).
②HAND→AUTO	Press the AUTO key in HAND mode to switch to AUTO mode. The inverter operates based on the command source and frequency reference settings set at DRV-06 and DRV-07. If DRV-06 (Cmd Source) is set to 'keypad' press the AUTO key once again to start inverter operation.
③AUTO→OFF	Press the OFF key in AUTO mode to stop the inverter operation (the inverter enters OFF mode).
④OFF→AUTO	Press the AUTO key in OFF mode to switch to AUTO mode. The inverter operates based onf the command source and frequency reference settings set at DRV-06 and DRV-07. If DRV-06 (Cmd Source) is set to 'keypad' press the AUTO key once again to start inverter operation.
⑤HAND→OFF	Press the OFF key in HAND mode to stop the inverter operation (the inverter enters OFF mode).
⑥OFF→HAND	Press the HAND key in OFF mode to switch to HAND mode. The inverter operates based on the operation direction set at DRV-02 (Keypad Run Dir) and the frequency reference set at DRV-25 (HAND Cmd Freq).

Operation Mode at Power Recovery

If a power interruption occurs during inverter operation in the OFF or HAND mode, the inverter halts the operation with low voltage fault trip. Then, when the power is recovered, the inverter turns on in OFF mode.

If the inverter was operating in AUTO mode at the time of the low voltage trip following the power interruption, the inverter turns on in AUTO mode, and the operation may vary depending on the inverter's 'PowerOn Resume' and 'Power-on run' settings.

Note

- To operate the inverter using the keypad in AUTO mode, set DRV-06 (CMD Source) to 'KeyPad' and press the AUTO key to enter AUTO mode. Then, press the AUTO key on the keypad once again to start the inverter operation.
- If a fault trip occurs during an operation in the AUTO or HAND mode, the inverter can be

reset by pressing the OFF key. After the reset, the fault trip is released and the inverter enters OFF mode.

- If a fault trip occurs during an operation in the AUTO or HAND mode, the inverter can be reset using the reset signal from the multi-function input terminal as well. In this case, the inverter turns back on in AUTO mode after the fault trip is released.

⚠ Caution

Use caution when the inverter is set to operate in AUTO mode by commands over communication, and if COM-96 (PowerOn Resume) is set to 'yes', as the motor will begin rotating when the inverter starts up, without additional run commands.

4.2 Setting Frequency Reference

The H100 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	7	Frequency reference source	Freq Ref Src	0	KeyPad-1	0–9	-
				1	KeyPad-2		
				2	V1		
				4	V2		
				5	I2		
				6	Int 485		
				7	Field Bus		
				9	Pulse		

4.2.1 Keypad as the Source (KeyPad-1 setting)

You can modify frequency reference by using the keypad and apply changes by pressing the [ENT/PROG] key. To use the keypad as a frequency reference input source, go to DRV-07 (Frequency refernce source) and change the parameter value to '0 (Keypad-1)'. Input the frequency reference for an operation at DRV-01 (Frequency reference).

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	01	Frequency reference	Cmd Frequency	0.00		0.00, Low Freq– High Freq*	Hz
	07	Frequency reference source	Freq Ref Src	0	KeyPad-1	0–9	-

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

4.2.2 Keypad as the Source (KeyPad-2 setting)

You can use the [UP] and [DOWN] cursor 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 DRV-07 (Frequency reference source) and change the parameter value to '1 (Keypad-2)'. This allows frequency reference values to be increased or decreased by pressing the [UP] and [DOWN] cursor keys.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	07	Frequency reference source	Freq Ref Src	1	KeyPad-2	0–9	-
	01	Frequency reference		0.00		0.00, Low Freq– High Freq*	Hz

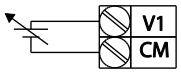
*You cannot set a frequency reference that exceeds the Max. Frequency, as configured with DRV-20.

4.2.3 V1 Terminal as the Source

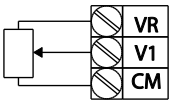
You can set and modify a frequency reference by setting voltage inputs when using the V1 terminal. Use voltage inputs ranging from 0–10 V (unipolar) for forward only operation. Use voltage inputs ranging from -10 to +10 V (bipolar) for both directions, where negative voltage inputs are used in reverse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

4.2.3.1 Setting a Frequency Reference for 0–10 V Input

Set IN-06 (V1 Polarity) to '0 (unipolar)'. 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]



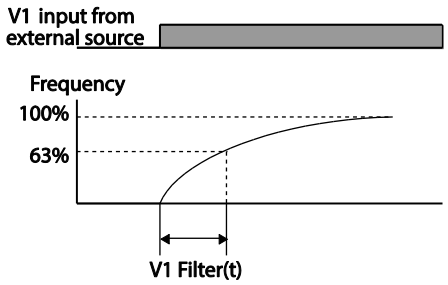
[Internal source (VR) application]

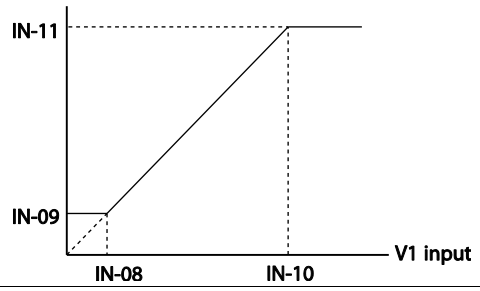
Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	07	Frequency reference source	Freq Ref Src	2	V1	0–9	-
IN	01	Frequency at maximum analog input	Freq at 100%	Maximum frequency		0.00–Max. Frequency	Hz
	05	V1 input monitor	V1 Monitor[V]	0.00		0.00–12.00	V
	06	V1 polarity options	V1 Polarity	0	Unipolar	0–1	-
	07	V1 input filter time constant	V1 Filter	10		0–10000	msec
	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	%

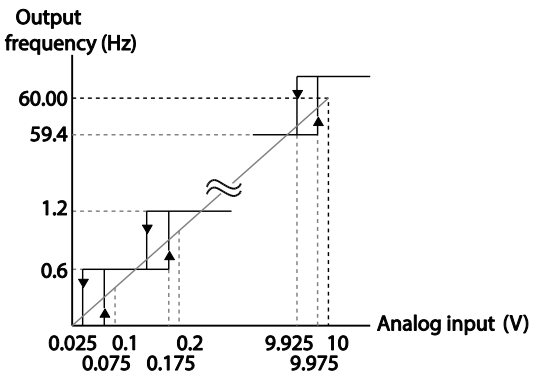
Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
	10	V1 maximum input voltage	V1 Volt x2	10.00		0 .00– 12.00	V
	11	V1 output at maximum voltage (%)	V1 Perc y2	100.00		0–100	%
	16	Rotation direction options	V1 Inverting	0	No	0–1	-
	17	V1 Quantizing level	V1 Quantizing	0.04		0.00*, 0.04–10.00	%

* Quantizing is disabled if '0' is selected.

0–10 V Input Voltage Setting Details

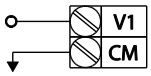
Code	Description
IN-01 Freq at 100%	Configures the frequency reference at the maximum input voltage when a potentiometer is connected to the control terminal block. A frequency set with code IN-01 becomes the maximum frequency only if the value set in code IN-11 (or IN-15) is 100 (%). • Set code IN-01 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 30.00 Hz (50% of the default maximum frequency–60 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	V1 Filter may be used when there are large variations between reference frequencies. Variations can be mitigated by increasing the time constant, but this requires an increased response time. 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.  [V1 Filter]
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
	Frequency reference 
IN-16 V1 Inverting	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.
IN-17 V1 Quantizing	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). 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. 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 (60 Hz), the output frequency will increase or decrease by 0.6 Hz per 0.1 V difference. 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. As a result, the output frequency will be different at acceleration and deceleration, mitigating the effect of analog input changes over the output frequency. (ripple)

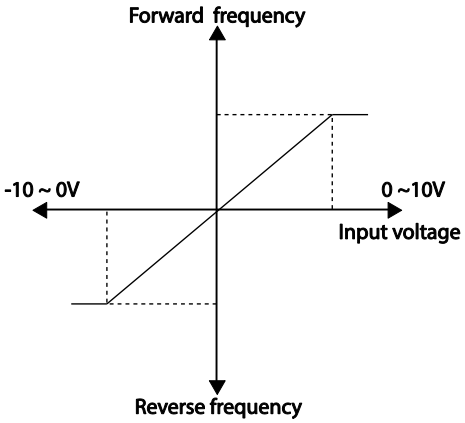
Code	Description
	 [V1 Quantizing]

4.2.3.2 Setting a Frequency Reference for -10–+10 V Input

Set DRV-07 (Frequency reference source) to '2 (V1)', and then set IN- 06 (V1 Polarity) to '1 (bipolar)'. 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	0–9	-
IN	01	Frequency at maximum analog input	Freq at 100%	60.00		0– Max Frequency	Hz
	05	V1 input monitor	V1 Monitor	0.00		-12.00–12.00 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

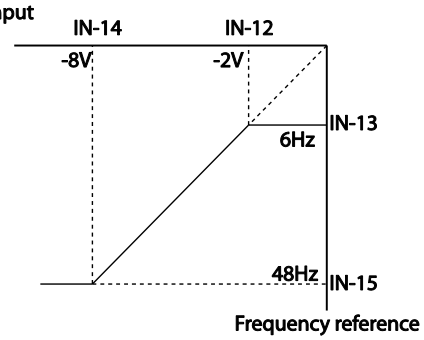
Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
	13	V1 output at minimum voltage (%)	V1- Perc y1	0.00	-100.00–0.00%	%
	14	V1 maximum input voltage	V1- Volt x2	-10.00	-12.00 –0.00 V	V
	15	V1 output at maximum voltage (%)	V1- Perc y2	-100.00	-100.00–0.00%	%

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	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.

Code	Description
	V1 input  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 96.

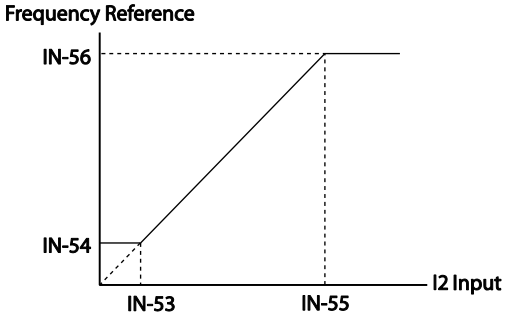
4.2.3.3 Setting a Reference Frequency using Input Current (I2)

You can set and modify a frequency reference using input current at the I2 terminal after selecting current input at SW4. Set DRV-07 (Frequency reference source) to '5 (I2)' and apply 0–20 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	0–9	-
IN	01	Frequency at maximum analog input	Freq at 100%	60.00		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		0.00*, 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-55 is set to 100%). • If IN-01 is set to 40.00, 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 (60 Hz) and IN-53–55, 20 mA input current (max) to I2 will produce a frequency reference of 30.00 Hz (50% of 60 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.  [Gradient and off-set configuration based on output frequency]

4.2.4 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 DRV-07 (Frequency reference source) to 4 (V2) and apply 0–12 V 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 (DRV-07 is set to '5').

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	07	Frequency reference source	Freq Ref Src	4	V2	0–9	-
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	msec
	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.

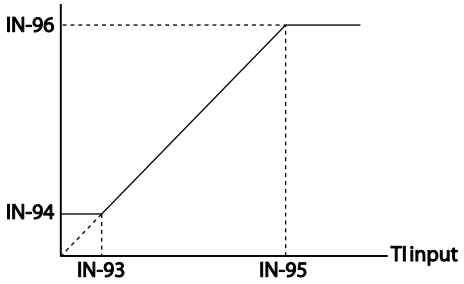
4.2.5 Setting a Frequency with TI Pulse Input

Set a frequency reference by setting the Frq (Frequency reference source) code (code 07) in DRV group to 9 (Pulse) and provide 0–32.00 kHz pulse frequency to TI terminal.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	07	Frequency reference source	Freq Ref Src	9	Pulse	0–9	-
	01	Frequency at maximum analog input	Freq at 100%	60.00		0.00–Maximum frequency	Hz
	91	Pulse input display	TI Monitor	0.00		0.00–50.00	kHz
	92	TI input filter time constant	TI Filter	10		0–9999	msec
	93	TI input minimum pulse	TI Pls x1	0.00		0.00–32.00	kHz
IN	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. • 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 TI 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. Frequency reference 
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 97)

4.2.6 Setting a Frequency Reference via RS-485 Communication

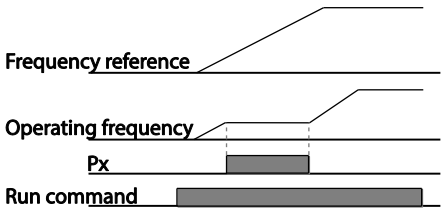
Control the inverter with upper-level controllers, such as PCs or PLCs, via RS-485 communication. Set the Frq (Frequency reference source) code (code 07) in the DRV group to 6 (Int 485) and use the RS-485 signal input terminals (S+/S-/SG) for communication. Refer to 7 RS-485 Communication features on page 374.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	07	Frequency reference source	Freq Ref Src	6	Int 485	0–9	-
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	-
				2	LS Inv 485		
				4	BACnet		
				5	Metasys-N2		
	03	Integrated communication speed	Int485 BaudR	3	9600 bps	0–8	-
	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		

4.3 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	0–9	-
				1	Keypad-2		
				2	V1		
				4	V2		
				5	I2		
				6	Int 485		
				7	Fied Bus		
				9	Pulse		
IN	65–71	Px terminal configuration	Px Define(Px: P1–P7)	23	Analog Hold	0–52	-



4.4 Changing the Displayed Units (Hz↔Rpm)

You can change the units used to display the operational speed of the inverter by setting DRV- 21 (Speed unit selection) to 0 (Hz Display) or 1 (Rpm Display).

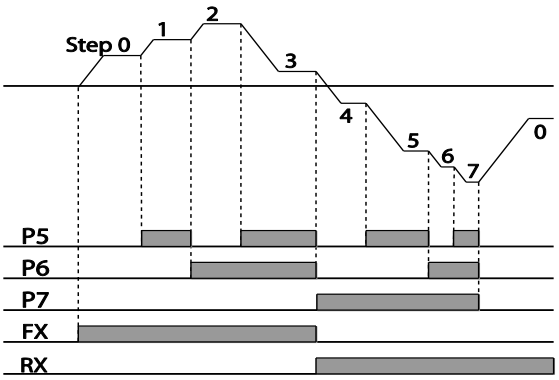
Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	21	Speed unit selection	Hz/Rpm Sel	0	Hz Display	0–1	-
				1	Rpm Display		

4.5 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 at DRV-07. 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. The inverter operates according to the frequencies set with BAS-50–56 (multi-step frequency 1–7) and the binary command combinations.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
BAS	50–56	Multi-step frequency 1–7	Step Freq - 1–7	-		0.00, Low Freq– High Freq*	Hz
IN	65–71	Px terminal configuration	Px Define(Px: P1–P7)	7	Speed-L	0–52	-
				8	Speed-M		-
				9	Speed-H		-
	89	Multi-step command delay time	InCheck Time	1		1–5000	ms

Multi-step Frequency Setting Details

<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td>BAS Group 50–56</td><td>Configure multi-step frequency 1–7.</td></tr>
<tr><td>IN-65–71 Px Define</td><td>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). Provided that terminals P5, P6, and P7 have been set to Speed-L, Speed-M and Speed-H respectively, the following multi-step operation will be available.
 

[An example of a multi-step operation]

<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></td></tr>
<tr><td>IN-89 InCheck Time</td><td>Set a time interval for the inverter to check for additional terminal block inputs after receiving an input signal.
After adjusting IN-89 to 100 ms and an input signal is received at P6, the inverter will search for inputs at other terminals for 100 ms, before</td></tr>
</table>

Code	Description
	proceeding to accelerate or decelerate based on the configuration at P6.

4.6 Command Source Configuration

Various devices can be selected as command input devices for the H100 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	0–5	-
				1	Fx/Rx-1		
				2	Fx/Rx-2		
				3	Int 485		
				4	Field Bus		
				5	Time Event		

4.6.1 The Keypad as a Command Input Device

To use the keypad as the command source, press the [AUTO] key to enter AUTO mode. Set DRV-06 to '0 (Keypad)' to select the keypad as the command source and set the operation direction at DRV-02 (Keypad Run Dir).

Since the keypad is now the command source, operation starts when the AUTO key is pressed, and it stops when the AUTO key is pressed again.

The OFF key may be used to stop the operation as well, but the inverter operation mode will be changed to OFF mode.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	06	Command source	Cmd Source	0	KeyPad	0–5	-

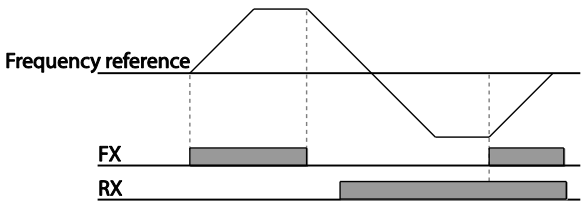
4.6.2 Terminal Block as a Command Input Device (Fwd/Rev run commands)

Multi-function terminals can be selected as a command input device. This is configured by setting DRV-06 (command source) in the Drive 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
IN	02	Operation direction for Keypad	Keypad Run Dir	0	Reverse	0–1	-
				1	Forward		
DRV	06	Command source	Cmd Source	1	Fx/Rx-1	0–5	-
IN	65–71	Px terminal configuration	Px Define(Px: P1– P7)	1	Fx	0–52	-
				2	Rx		

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

Code	Description
DRV-06Cmd 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.



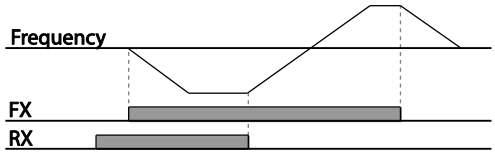
4.6.3 Terminal Block as a Command Input Device (Run and Rotation Direction Commands)

Multi-function terminals can be selected as a command input device. This is configured by setting DRV-06 (command source) in the Drive group to 2(Fx/Rx-2). Select 2 terminals for run and rotation direction commands, and then select the relevant codes (2 of the 5 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	0–5	-
IN	65–71	Px terminal configuration	Px Define (Px: P1 – P7)	1	Fx	0–52	-
				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).



4.6.4 RS-485 Communication as a Command Input Device

Internal RS-485 communication can be selected as a command input device by setting DRV-06 (command source) in the Drive 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 RS-485 signal input terminals at the terminal block. For more details, refer to *7 RS-485 Communication Features* on page *374*.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	06	Command source	Cmd Source	3	Int 485	0–5	-
COM	01	Integrated communication inverter ID	Int485 St ID	1		1–250	-
	02	Integrated communication protocol	Int485 Proto	0	ModBus RTU	0–5	-
	03	Integrated communication speed	Int485 BaudR	3	9600 bps	0–8	-
	04	Integrated communication frame setup	Int485 Mode	0	D8 / PN / S1	0–3	-

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 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	Run Prevent	0	None	0–2	-

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
		options		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.

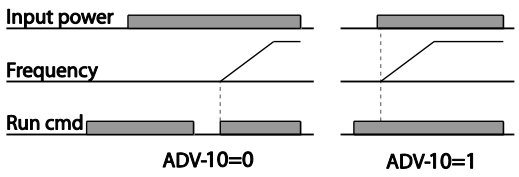
4.8 Power-on Run

A power-on run feature can be setup to start an inverter operation after powering up based on the run commands by terminal inputs or communication (if they are configured). In AUTO mode, the inverter starts operating at power-on when the following conditions are met.

Terminal block input as the command source

(If they have been configured). To enable power-on run, set DRV-06 (command source) to '1 (Fx/Rx-1)' or '2 (Fx/Rx-2)' in the Drive group and ADV-10 to '1' in the Advanced 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	0–5	-
ADV	10	Power-on run	Power-on Run	1	Yes	0–1	-



Communication as the command source

To enable power-on resume, set COM-96 (PowerOn Resume) to 'YES', and set DRV-06 to '3 (Int 485)' or '4 (Field Bus).' If the power input to the inverter is cut off due to a power interruption, the inverter memorizes the run command, frequency reference, and the acc/dec time settings at the time of power interruption. If COM-96 (PowerOn Resume) is set to 'Yes', the inverter starts operating based on these settings as soon as the power supply resumes.

Group	Code	Name	LCD Display	Settings		Setting Range	Unit
DRV	06	Command source	Cmd Source	3	Int 485	0 - 5	-
				4	Field Bus		
COM	96	Power-on resume	PowerOn Resume	0	No	0 - 1	-
				1	Yes		

Note

- To prevent a repeat fault trip from occurring, set CON-71 (speed search options) bit 4 the same as bit 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

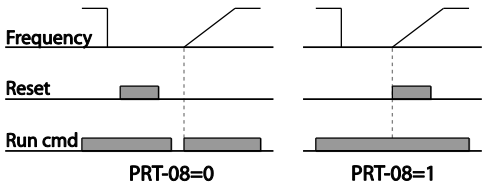
Use caution when operating the inverter with Power-on Run enabled as the motor will begin rotating when the inverter starts up.

4.9 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. In PRT-08, bit 1 sets the option for all the fault trips, other than low voltage trips, and bit 2 sets the option for low voltage trips. PRT-10 sets the delay time for restart (the time for the inverter to wait before it restarts).

The number of auto-restarts (PRT-09) refers to the number of times the inverter will try restarting its operation. If fault trips occur again after restart, the retry number counts down each time the inverter restarts until the number becomes '0.' Once the inverter restarts successfully after the initial fault trip, the inverter does not restart until the next fault trip occurs. The number of auto-restarts set at PRT-09 that decreased after a restart reverts to the original setting value if successful operation continues for certain period of time.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	06	Command source	Cmd Source	1	Fx/Rx-1	0–5	-
	08	Reset restart setup	RST Restart	00		00–11	Bit
PRT	09	No. of auto restart	Retry Number	6		0–10	-
	10	Auto restart delay time	Retry Delay	5.0		0.1–600.0	sec



Note

- To prevent a repeat fault trip from occurring, set CON-71 (speed search options) bit 2 the same as bit 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

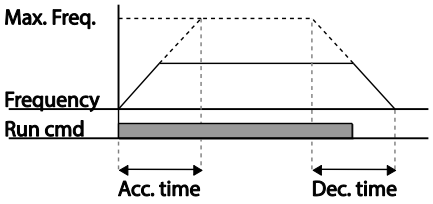
Acc/Dec time values can be set based on maximum frequency, not on inverter operation frequency. To set Acc/Dec time values based on maximum frequency, set BAS- 08 (Acc/Dec reference) in the Basic group to '0 (Max Freq)'.

Acceleration time set at DRV-03 (Acceleration time) 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 DRV-04 (Deceleration time) 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	60.00		40.00–400.00	Hz
BAS	08	Acc/Dec reference	Ramp T	0	Max Freq	0–1	-

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
		frequency	Mode				
	09	Time scale	Time scale	1	0.1 sec	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 60.00 Hz, the Acc/Dec times are set to 5 seconds, and the frequency reference for operation is set at 30 Hz (half of 60 Hz), the time required to reach 30 Hz therefore is 2.5 seconds (half of 5 seconds). 
BAS-09 Time scale	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. Configuration / Description: 0 – 0.01 sec – Sets 0.01 second as the minimum unit. 1 – 0.1 sec – Sets 0.1 second as the minimum unit. 2 – 1 sec – Sets 1 second as the minimum unit.

Caution

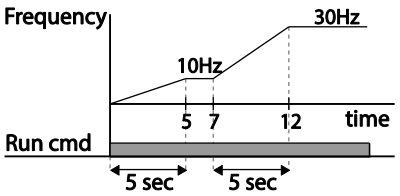
Note that the range of maximum time values may change automatically when the units are changed. If for example, the acceleration time is set at 6000 seconds, a time scale change from 1 second to 0.01 second will result in a modified acceleration time of 60.00 seconds.

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	Settings		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

<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td>BAS-08 Ramp T Mode</td><td>
Set the parameter value to 1 (Delta Freq) to set Acc/Dec times based on Maximum frequency.
<table>
<tr><td colspan="2">Configuration</td><td>Description</td></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>
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).


</td></tr>
</table>

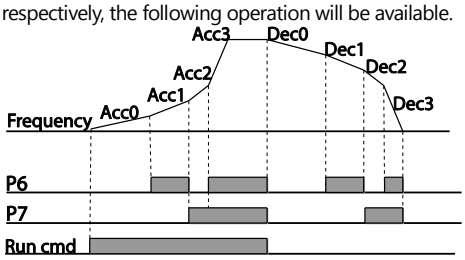
4.10.3 Multi-step Acc/Dec Time Configuration

Acc/Dec times can be configured via a multi-function terminal by setting the ACC (acceleration time) and DEC (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	70–83	Multi-step acceleration/Deceleration time1–7	Acc Time 1–7	x.xx		0.0–600.0	sec
			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	0–52	-
				12	XCEL-M		
				13	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 Configuration: 11 XCEL-L — Acc/Dec command-L; 12 XCEL-M — Acc/Dec command-M; 13 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

<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td></td><td>BAS-70–82 and BAS-71–83.
If, for example, the P6 and P7 terminals are set as XCEL-L and XCEL-M 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>
[Multi-function terminal P6, P7 configuration]</td></tr>
<tr><td>IN-89 In Check Time</td><td>Set the time for the inverter to check for other terminal block inputs. If IN-89 is set to 100 ms and a signal is supplied to the P6 terminal, the inverter searches for other inputs over the next 100 ms. When the time expires, the Acc/Dec time will be set based on the input received at P6</td></tr>
</table>

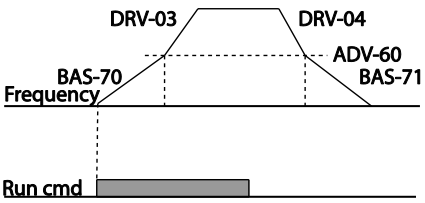
4.10.4 Configuring Acc/Dec Time Switch Frequency

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	Acc Time-1	20.0	0.0–600.0	sec

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
	71	Multi-step deceleration time1	Dec Time-1	20.0	0.0–600.0	sec
ADV	60	Acc/Dec time switch frequency	Xcel Change Fr	30.00	0–Maximum frequency	Hz

Acc/Dec Time Switch Frequency Setting Details

Code	Description
ADV-60 Xcel Change Fr	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 gradient level configured for the accelerration and deceleration times (set at DRV-03 and DRV-04) will be used. 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. The 'Xcel Change Fr' parameter is applied only when ADV-24 (Freq Limit Mode) is set to 'NO'. 

4.11 Acc/Dec Pattern Configuration

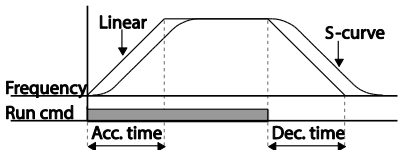
Acc/Dec gradient level patterns can be configured to enhance and smooth the inverter's acceleration and deceleration curves. Linear pattern features a linear increase or decrease to the output frequency, at a fixed rate. For an S-curve pattern a smoother and more gradual increase or decrease of output 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	%

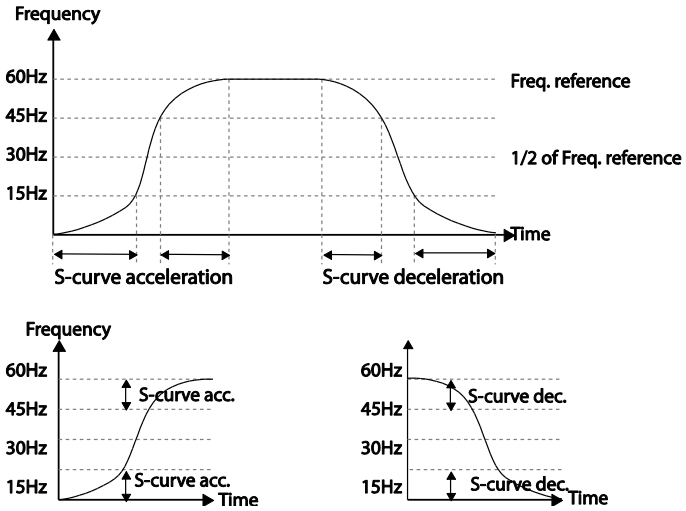
Acc/Dec Pattern Setting Details

Code	Description
ADV-03 Acc S Start	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. If the frequency reference and maximum frequency are set at 60 Hz and ADV-03 is set to 50%, ADV-03 configures acceleration up to 30 Hz (half of 60 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.
ADV-04 Acc S End	Sets the gradient level as acceleration ends when using an S-curve

Code	Description
	Acc/Dec pattern. ADV-03 defines S-curve gradient level as a percentage, above half of total acceleration. If the frequency reference and the maximum frequency are set at 60 Hz and ADV-04 is set to 50%, setting ADV-04 configures acceleration to increase from 30 Hz (half of 60 Hz) to 60 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 45–60 Hz frequency range.
ADV-05 Dec S Start – ADV-06 Dec S End	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.



[Acceleration / deceleration pattern configuration]



[Acceleration / deceleration S-curve parrten 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

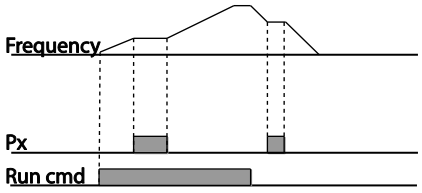
Note that actual Acc/Dec times become greater than user defined Acc/Dec times when S-curve Acc/Dec patterns are in use.

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)	14	XCEL Stop	0–52	-



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 of torque boost used during low frequency operations can also be adjusted.

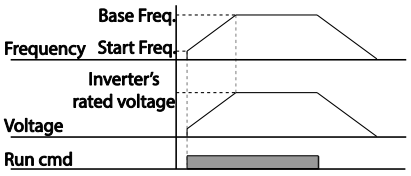
4.13.1 Linear V/F Pattern Operation

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 partcularly useful when a constant torque load is applied.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
IN	09	Control mode	Control Mode	0	V/F	0–1	-
	18	Base frequency	Base Freq	60.00		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	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).

Code	Description
	

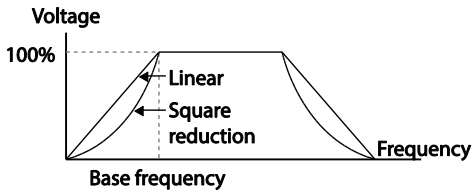
4.13.2 Square Reduction V/FPattern Operation

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 '2 (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.


Voltage
100%
Linear
Square
reduction
Frequency
Base frequency

4.13.3 User V/F Pattern Operation

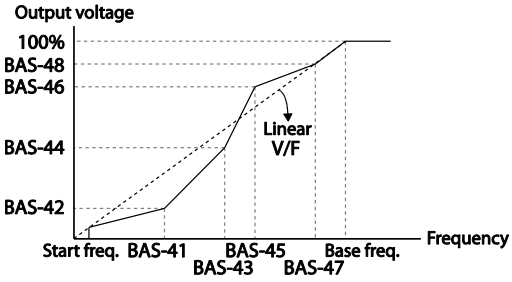
The H100 inverter allows the configuration of user-defined V/F patterns to suit the load characteristics of special motors.

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 Frequency 1	User Freq 1	15.00		0–Maximum frequency	Hz
	42	User Voltage 1	User Volt 1	25		0–100%	%
	43	User Frequency 2	User Freq 2	30.00		0–Maximum frequency	Hz
	44	User Voltage 2	User Volt 2	50		0–100%	%
	45	User Frequency 3	User Freq 3	45.00		0–Maximum frequency	Hz
	46	User Voltage 3	User Volt 3	75		0–100%	%
	47	User Frequency 4	User Freq 4	Maximum frequency		0–Maximum frequency	Hz
	48	User Voltage 4	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 x) for start and maximum frequencies. Voltages can also be set to correspond with each frequency, and for each user voltage (User Volt x).

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

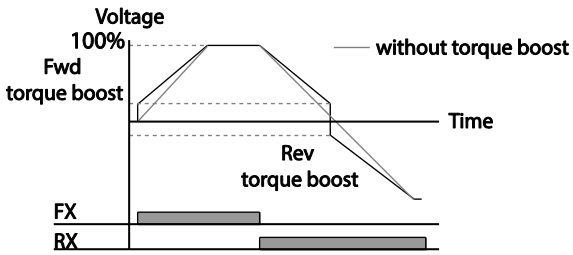
4.14.1 Manual Torque Boost

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

Set DRV-15 to 'Auto 1' or 'Auto 2' to select the type of torque boost. While manual torque boost adjusts the inverter output based on the setting values regardless of the type of load used in the operation, 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. Refer to *5.21 Auto Tuning* on page *239*.

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
DRV	15	torque boost mode	Torque Boost	1	Auto 1	0–2	-
BAS	20	auto tuning	Auto Tuning	3	Rs+Lsigma	0–3	-

4.14.3 Auto Torque Boost 2 (No Motor Parameter Tuning Required)

By adjusting the auto torque boost voltage gain set at DRV-15 (ATB Volt Gain), automatic torque boost may be operated without tuning the motor-related parameter values. The DRV-15 (ATB Volt Gain) value is used to adjust the amount of compensation required for each load. It prevents stalls or overcurrent fault trips at start up.

Group	Code	Name	LCD Display	Settings		Setting Range	Unit
DRV	15	Torque boost mode	Torque Boost	2	Auto 2	0–2	-
CON	21	Auto torque boost	ATB Filt Gain	10		1 - 9999	msec

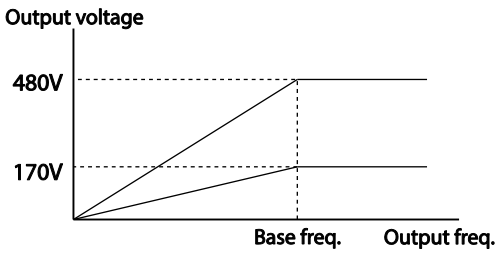
		filter gain				
CON	22	Auto torque boost voltage gain	ATB Volt Gain	100.0	0 - 300.0	%

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

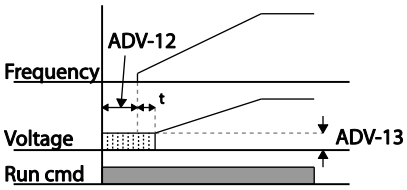
Acceleration start is a general acceleration mode. If there are no extra settings applied, the motor accelerates directly to the frequency reference when the command is input.

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

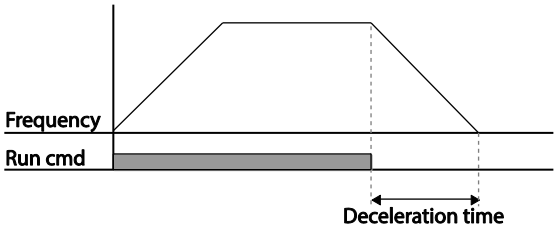
4.17 Stop Mode Setting

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	-


Frequency
Run cmd
Deceleration time

4.17.2 Stop After DC Braking

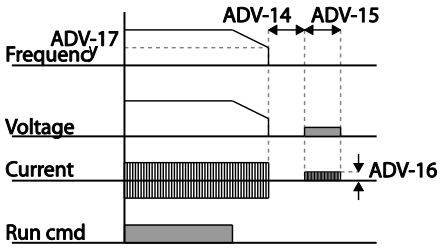
When the operation frequency reaches the set value during deceleration (DC braking frequency) the inverter stops the motor by supplying DC power to the motor. With a stop command input, the inverter begins decelerating the motor. When the frequency reaches the DC braking frequency set at ADV-17, the 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	1 DC Brake	0–4	-
	14	Output block time before braking	DC-Block Time	0.00	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	0.00–60.00	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

Code	Description
	instead.



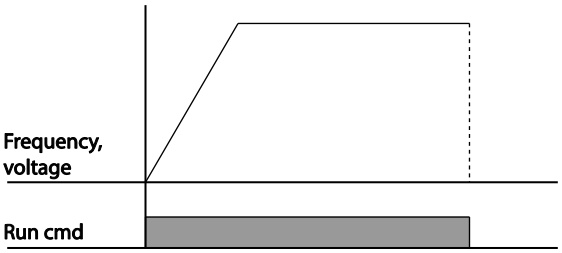
Caution

- 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 bit 3 of PRT-50 (stall prevention and flux braking) and ADV-08 (braking options) 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	60.00	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 in input a frequency reference using the keypad.

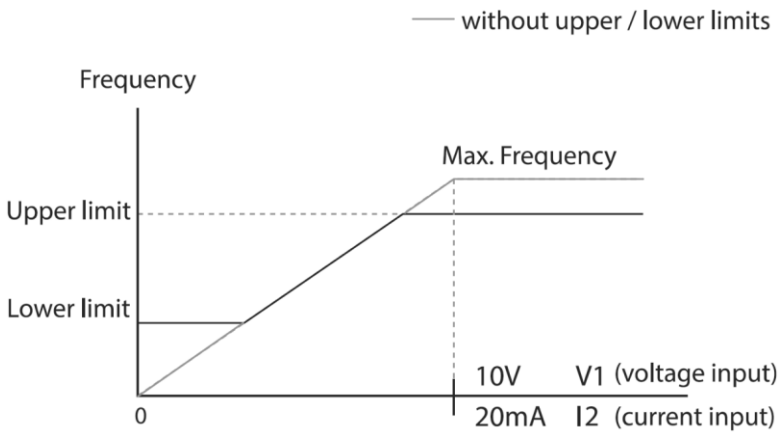
4.18.2 Frequency Limit Using Upper and Lower Limit Frequency Values

Group	Code	Name	LCD Display	Parameter Setting		Setting Range	Unit
ADV	24	Frequency limit	Freq Limit	0	No	0–1	-
	25	Frequency lower	Freq Limit	0.50		0.0–maximum	Hz

Group	Code	Name	LCD Display	Parameter Setting	Setting Range	Unit
		limit value	Lo		frequency	
	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).
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.



Caution

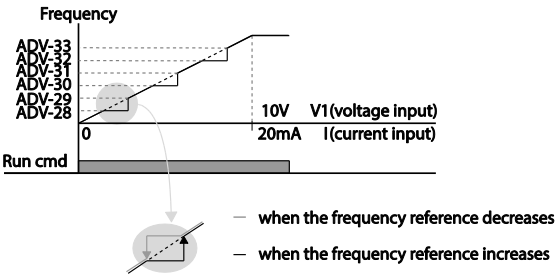
- When ADV-24 (Freq Limt) is set to 'Yes,' the frequency set at ADV-25 (Freq Limit Lo) is the minimum frequency (Low Freq). If ADV-24 (Freq Limit) is set to 'No,' the frequency set at DRV-19 (Start Freq) becomes the minimum frequency.
- When ADV-24 (Freq Limt) is set to 'Yes,' the frequency set at ADV-26 (Freq Limit Hi) is the maximum frequency (High Freq). If ADV-24 (Freq Limit) is set to 'No,' the frequency set at DRV-20 (Max Freq) becomes the maximum frequency.

4.18.3 Frequency Jump

Use frequency jump to avoid mechanical resonance frequencies. The inverter will avoid identified ranges during acceleration and deceleration. 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	0–1	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 swiching 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	0–5	-
	07	Frequency reference source	Freq Ref Src	2	V1	0–9	-
BAS	04	2nd Command source	Cmd 2nd Src	0	Keypad	0–5	-
	05	2nd Frequency reference source	Freq 2nd Src	0	KeyPad-1	0–9	-
IN	65–71	Px terminal configuration	Px Define (Px: P1–P7)	17	2nd Source	0–52	-

2nd Operation Mode Setting Details

Code	Description

Code	Description
BAS-04 Cmd 2nd Src BAS-05 Freq 2nd Src	If signals are provided to the multi-function terminal set as the 2nd command source (2nd Source), the operation can be performed using the set values from BAS-04-05 instead of the set values from the DRV-7 and DRV-01. The 2nd command source settings cannot be changed while operating with the 1st 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	msec
	86	Multi-function input terminal Off filter	DI Off Delay	3	0–10000	msec
	87	Multi-function input terminal selection	DI NC/NO Sel	000 0000*	-	-
	90	Multi-function input terminal status	DI Status	000 0000*	-	-

* From the last bit to the first, the bits are for multi-purpose input 1–7 (the last bit is for input 1, and the first bit for input 7).

Multi-function Input Terminal Control Setting Details

<table>
<tr><th>Code</th><th>Description</th></tr>
<tr><td>IN-85 DI On Delay, IN-86 DI Off Delay</td><td>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.</td></tr>
<tr><td>IN-87 DI NC/NO Sel</td><td>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>Keypad</td><td> </td><td> </td></tr>
</table></td></tr>
<tr><td>IN-90 DI Status</td><td>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>Keypad</td><td> </td><td> </td></tr>
</table></td></tr>
</table>