Chapter 3: Keypad Operation and Quick Start

Chapter 3

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Learning to Perform Basic Operations

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

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.

About the Display

The following table lists display part names and their functions.

No.	Name	Function
1	7-Segment Display	Displays current operational status and parameter information.
2	SET Indicator	LED flashes during parameter configuration and when the ESC key operates as the multi-function key.
3	RUN Indicator	LED turns on (steady) during an operation, and flashes during acceleration or deceleration.
4	FWD Indicator	LED turns on (steady) during forward operation.
5	REV Indicator	LED turns on (steady) during reverse operation.

The table below lists the way that the keypad displays characters (letters and numbers).

0	0	A	A	K	K	U	U
1	1	b	B	L	L	v	V
2	2	C	C	n	M	w	W
3	3	d	D	n	N	X	X
4	4	E	E	O	O	y	Y
5	5	F	F	P	P	Z	Z
6	6	G	G	q	Q	-	-
7	7	H	H	r	R	-	-
8	8	I	I	S	S	-	-
9	9	J	J	t	T	-	-

Operation Keys

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

Key	Name	Description
RUN	[RUN] key	Used to run the drive (inputs a RUN command).
STOP RESET	[STOP/RESET] key	STOP: stops the drive. RESET: resets the drive following fault or failure condition.
∧ ∨	Up Arrow key/ Down Arrow key	Switch between codes, or to increase or decrease parameter values.
MODE SHIFT	[MODE/SHIFT] key	Moves between groups or moves to the digit on the left when setting the parameter. Press the MODE/SHIFT key once again on the maximum number of digits to move to the minimum number of digits.
ENT	[ENTER] key	Switches from the selected state of parameter to the input state. Edits parameter and applies change. Accesses the operation information screen during failure on the failure screen.
MIN MAX	Potentiometer dial	Used to set the operation frequency when Pr. Code frq=4 (V0).
MODE SHIFT + ∨	ESC	Use the MODE/SHIFT key plus either arrow key to escape and make no change.

Caution: Install a separate emergency stop switch in the circuit. The [STOP/RESET] key on the keypad works only when the drive has been configured to accept an input from the keypad.

Control Menu

The ACG control menu uses the following Parameter Groups for configuration. Groups with an asterisk only display when certain parameters/options are configured. See description for details.

Group	Display	Description
Operation	-	Configures basic parameters for drive operation. These include reference frequencies and acceleration or deceleration times. This group is only available on the Drive LED keypad.
Drive	dr	Configures parameters for basic operations. These include jog operation, motor capacity evaluation, torque boost, and other keypad related parameters.
Basic	bA	Configures basic parameters, including motor-related parameters and multi-step frequencies.
Advanced	Ad	Configure acceleration or deceleration patterns and to setup frequency limits.
Control	Cn	Configures sensorless vector related features.
Input Terminal	In	Configures input terminal–related features, including digital multi–functional inputs and analog inputs.
Output Terminal	OU	Configures output terminal related features such as relays and analog outputs.
Communication	Cm	Configures communication features for RS-485 or other communication options.
Application	AP	Configures PID control related sequences and operations.
Protection	Pr	Configures motor or drive protection features.
Motor 2 (Secondary Motor)*	m2	Configures secondary motor related features.
**The secondary motor (M2) group displays when one of the multi-function input terminals (In.65–In.69) has been set to 26 (Secondary motor).*		

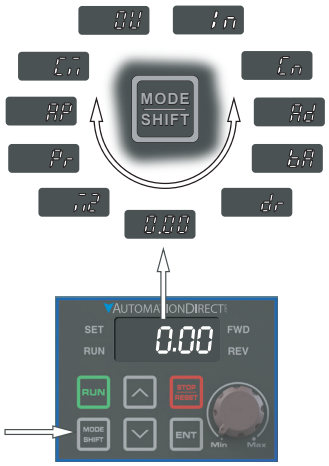
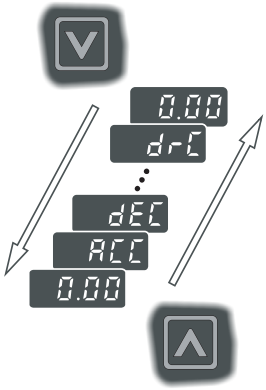
Learning to Use the Keypad

The keypad enables movement between parameter group and parameter numbers. It also enables users to select and configure functions. At the parameter number level, you can set parameter values and configure specific functions. See Chapter 4: AC Drive Parameters for detailed information.

Confirm the correct values (or the correct range of the values), and then follow the examples below to configure the drive with the keypad.

Parameter Group and Number Selection

Follow the examples below to learn how to switch between parameter groups and parameter numbers.

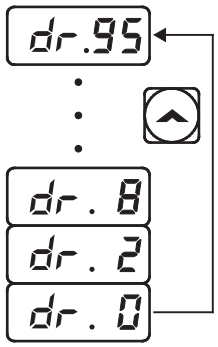
Step	Instruction	Keypad Display
1	Move to the parameter group you want using the MODE key. Press the MODE key for longer than 1 second to move in the opposite direction.	
2	Move up and down through the codes using the Up and Down arrow keys until you locate the code that you require.	
3	Press the [ENT] key to save the change.	

NOTE: Certain parameter groups and numbers have "parameter dependencies". These parameters will only display when other parameters are configured to the applicable settings. See Chapter 4: AC Drive Parameters for all parameter dependencies.

As an example, if Ad.24 (Frequency Limit) is set to 0 (No), the next codes, Ad.25 (Freq Limit Lo) and Ad.26 (Freq Limit Hi), will not be displayed. If you set code Ad.24 to 1 (Yes) and enable the frequency limit feature, codes Ad.25 and 26 will appear to allow the maximum and minimum frequency limitations to be set up.

Navigating Directly to Parameter Numbers using the Jump Code

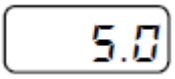
An alternative to using the up/down arrows to navigate to the parameter number is to use the parameter "Jump Code". Parameter number zero (xx.0) is the jump code for each group. The following example details navigating directly to dr.95 using the parameter dr.0 (jump code parameter):



Step	Action	Keypad Display
1	Ensure that you are currently at the first code of the Drive group (dr.0).	dr.0
2	Press the [ENT] key. (Number '9' will flash.)	9
3	Press the Down Arrow key to display '5.'	5
4	Press the [MODE] key to move to the 10s' place. The cursor will move to the left and '05' will be displayed. This time, the number '0' will be flashing.	05
5	Press the Up Arrow key to increase the number from '0' to '9.'	95
6	Press the [ENT] key. Code dr.95 is displayed.	dr.95

Setting Parameter Values

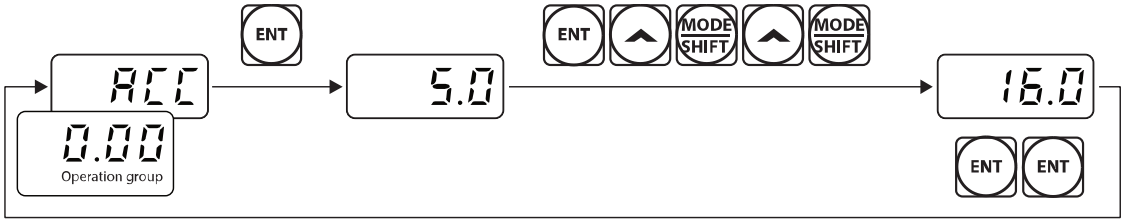
After navigating to the specific parameter number, follow the instructions below to set the parameter values. Setting the parameter value will change the drive functionality by configuring speed references, features, alarm limits, etc.

Step	Instruction	Keypad Display
1	Navigate to a specific parameter group and number, and then press the [ENT] key. The first number on the right side of the display will flash.	
2	Move to the place value to edit using the [MODE] key, then press the Up Arrow or Down Arrow key to adjust the value. Then press the [ENT] key to confirm it. Press the [MODE] key for longer than 1 second to move to the left place value. The selected value will flash on the display.	
3	Press the [ENT] key again to save the change.	-

NOTE: A flashing number on the display indicates that the keypad is waiting for an input from the user. Changes will be saved when the [ENT] key is pressed while the number is flashing. The setting change will be canceled if you press any other key. Each parameter's values have default features and ranges specified. Refer to Chapter 4: AC Drive Parameters for information about the features and ranges before setting or modifying parameter values.

Actual Application Examples

Acceleration Time Configuration

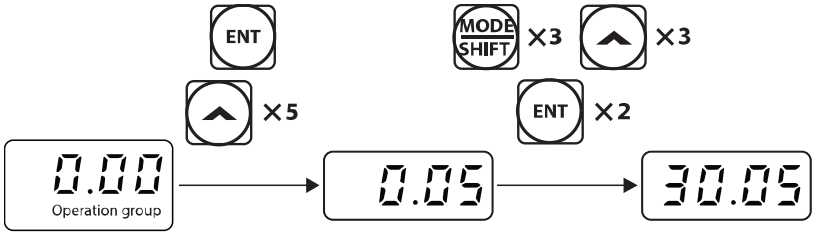


The following is an example demonstrating how to modify the ACC (Acceleration time) parameter value (from 5.0 to 16.0) from the Operation group.

Step	Action	Keypad Display
1	Select the first code of the Operation group to display code 0.00 (Command Frequency).	0.00
2	Press the Up arrow key. The display will change to the second code in the Operation group, the acceleration time (ACC) code.	ACC
3	Press the [ENT] key. The number 5.0 will be displayed with the "0" flashing. This indicates that the current acceleration time is set to 5.0 seconds. The flashing value is ready to be modified by using the keypad.	5.0
4	Press the [MODE] key to change the place value.	5.0
5	To make the target value "16.0", press the Up arrow key to change the ones place value to "6".	6.0
6	Press the [MODE' key to move to the tens' place value. "0" in the tens place from "06.0" will flash.	06.0
7	To make the target value "16.0", press the Up arrow key to change the tens place value to "1", then press the [ENT] key. The selected value will flash on the display.	16.0
8	Press the [ENT] key again to save the changes. "ACC" will be displayed. The change to the cceleration time setup has been completed.	ACC

Frequency Reference Configuration

The following is an example to demonstrate configuring a frequency reference of 30.05 (Hz) from the first parameter in the Operation group (0.00).

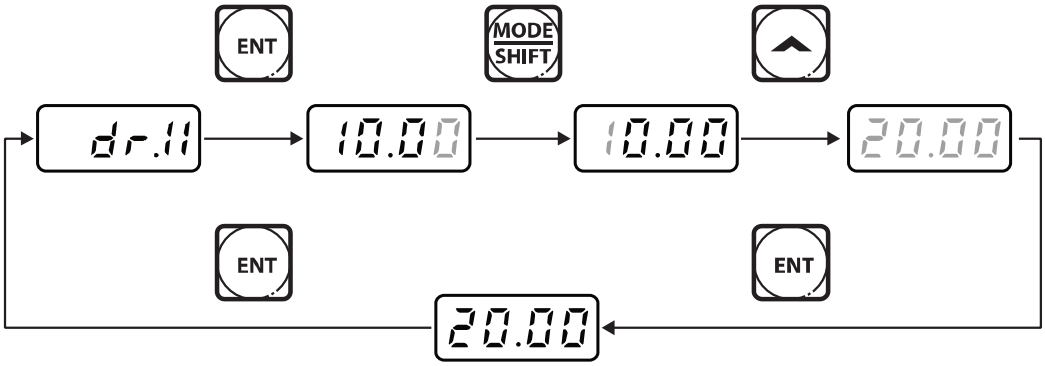


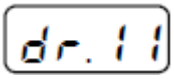
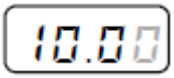
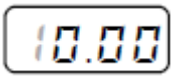
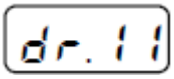
Step	Action	Keypad Display
1	Select the first code of the Operation group to display code 0.00 (Command Frequency).	0.00
2	Press the [ENT] key. The default value "0.00" will be displayed and "0" in the second decimal place will flash.	0.00
3	Press the [MODE] key 3 times to move to the tens place value. "0" in the tens place will flash.	00.00
4	To make the target value "30.05", press the Up arrow key to change the tens place value to "3".	30.00
5	Press the [MODE] key 2 times. The "0" key in the second decimal place will flash.	30.00
6	To make the target value "30.05", press the Up arrow key to change the second decimal place value to "5", and then press the [ENT] key. The selected value will flash on the display.	30.05
7	Press the [ENT] key again to save the changes. Flashing stops. The frequency reference has been configured to 30.05 Hz.	30.05

Note: A flashing number on the display indicates that the keypad is waiting for an input from the user. Changes are saved when the [ENT] key is pressed while the value is flashing. Changes will be canceled if any other key is pressed. The ACG drive keypad display can show up to 4 digits. However, 5-digit figures can be used and are accessed by pressing the Left or Right arrow key, to allow keypad input.

Jog Frequency Configuration

The following example demonstrates how to configure Jog Frequency by modifying Drive Group parameter 11 (dr. 11) from 10.00(Hz) to 20.00(Hz). You can configure the parameters in any other group in exactly the same way.

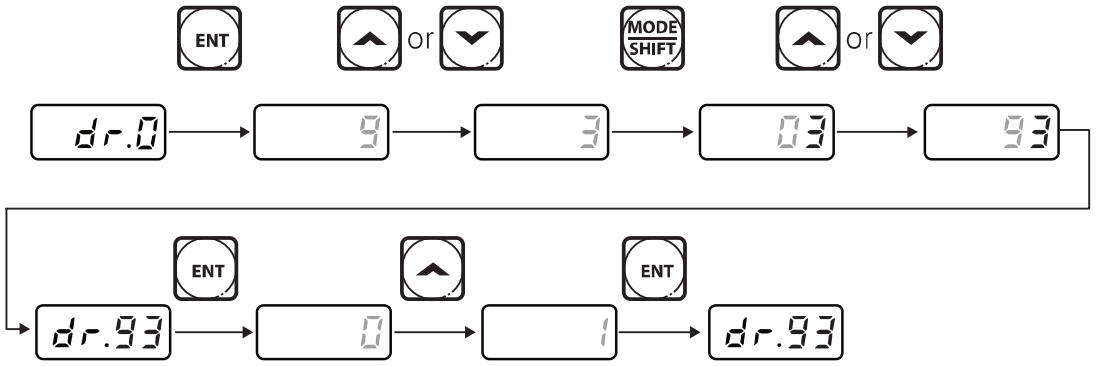


Step	Action	Keypad Display
1	Go to dr.11 in the Drive group.	
2	Press the [ENT] key. The current Jog Frequency value (10.00) for code dr.11 is displayed.	
3	Press the [MODE] key 3 times to move to the tens place value. "1" in the tens place will flash.	
4	To make the target value "20.00", press the Up arrow key to change the tens place value to "2", and then press the [ENT] key. The selected value will flash on the display.	
5	Press the [ENT] key again to save the changes. Code dr.11 will be displayed. The parameter change has been completed.	

Initializing All Parameters (Reset to Defaults)

To reset the drive parameters to factory default settings, utilize dr.93, (Drive Group Parameter 93- parameter initialization). Once executed, all parameters will be set back to original settings.

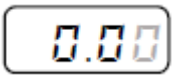
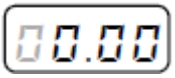
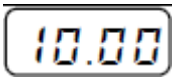
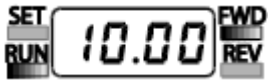
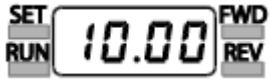
Note: This can be helpful when parameter dependencies are preventing certain parameters from displaying.

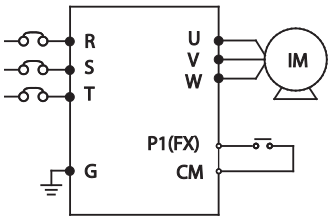


Step	Action	Keypad Display
1	Go to dr.0 in the Drive group.	dr.0
2	Press the [ENT] key. The current parameter value "9" will be displayed.	9
3	To make the target value "93", press the Down arrow key to change the ones place value to "3".	3
4	Press the [MODE] key to move to the tens place value.	03
5	Press the Up or Down arrow key to change the tens place value to "9".	93
6	Press the [ENT] key. Code dr.93 will be displayed.	dr.93
7	Press the [ENT] key again. The current parameter value for code dr.93 is set to 0 (do not initialize).	0
8	Press the Up arrow key to change the value to 1 (All Grp) and then press the [ENT] key. The parameter value will flash.	1
9	Press the [ENT] key again. Parameter initialization begins. Parameter initilization is complete when code dr.93 reappears on the display.	dr.93

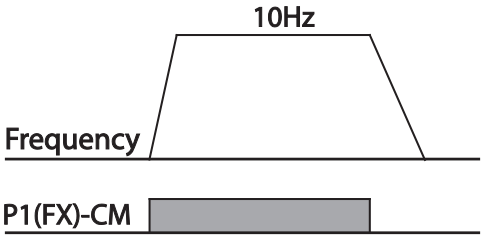
NOTE: Following parameter initialization, all parameters are reset to factory default values. Ensure that parameters are reconfigured before running the drive again after an initialization.

Frequency Setting (Keypad) and Operation (via Terminal Input)

Step	Action	Keypad Display
1	Turn on the drive.	–
2	Select code 0.00 (Command Frequency) in the Operation group and press the [ENT] key.	
3	Press the [MODE] key 3 times to move to the tens place value. "0" in the tens place will flash.	
4	Press the Up arrow key to change the value to 10.00, and then press the [ENT] key. The selected value will flash on the display.	
5	Press the [ENT] key again to save the changes. The reference frequency has been changed.	
6	Refer to the wiring diagram at the bottom of the table, and turn on the switch between the P1 (FX) and CM terminals. The RUN indicator light flashes and the FWD indicator light comes on steady. The current acceleration frequency is displayed.	
7	When the frequency reference is reached (10 Hz), open the switch between the P1 (FX) and CM terminals. The RUN indicator light flashes again and the current deceleration frequency is displayed. When the frequency reaches 0 Hz, the RUN and FWD indicator lights turn off, and the frequency reference 10.00 is displayed again.	



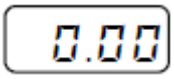
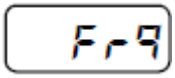
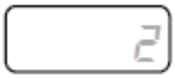
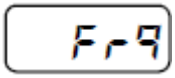
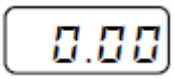
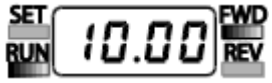
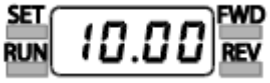
Wiring Diagram

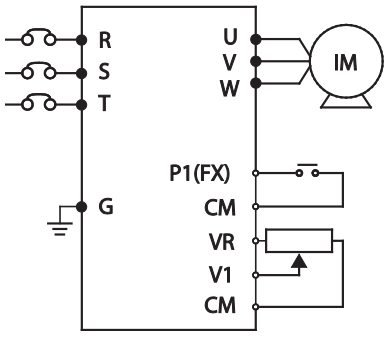


Operation Pattern

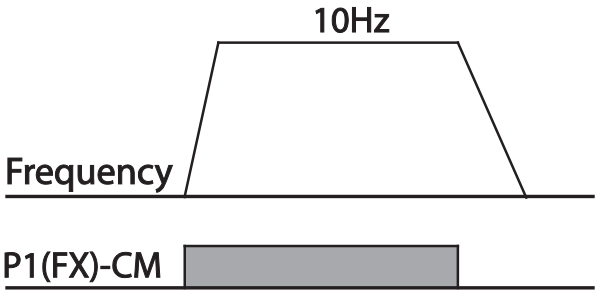
NOTE: The instructions in the table are based on the factory default parameter settings. The drive may not work correctly if the default parameter settings are changed after the drive is purchased. In such cases, initialize all parameters to reset the values to factory default parameter settings before following the instructions in the table (refer to Initializing All Parameters (Reset to Defaults) on page 3–11*).*

Frequency Setting (Potentiometer) and Operation (Terminal Input)

Step	Action	Keypad Display
1	Turn on the drive.	–
2	Select code 0.00 (Command Frequency) in the Operation group and press the [ENT] key.	
3	Press the Up arrow key 4 times. Move to the Frq (Frequency reference source) code.	
4	Press the [ENT] key. The Frq code in the Operation group is currently set to 0 (keypad).	
5	Press the Up arrow key to change the parameter value to 2 (V1-Set frequency input to potentiometer) and then press the [ENT] key. The parameter value will flash.	
6	Press the [ENT] key once again. The Frq code will be displayed again. The frequency input has been configured for the potentiometer.	
7	Press the Down arrow key 4 times. Move to the first code of the Operation group (0.00). From here frequency setting values can be monitored.	
8	Adjust the potentiometer to increase or decrease the frequency reference to 10 Hz.	–
9	Refer to the wiring diagram at the bottom of the table, and turn on the switch between P1 (FX) and CM terminals. The RUN indicator light will flash and the FWD indicator light comes on steady. The current acceleration frequency is displayed.	
10	When the frequency reference is reached (10 Hz), open the switch between the P1 (FX) and CM terminals. The RUN indicator light flashes again and the current deceleration frequency is displayed. When the frequency reaches 0 Hz, the RUN and FWD indicator lights turn off, and the frequency reference 10.00 is displayed again.	



Wiring Diagram

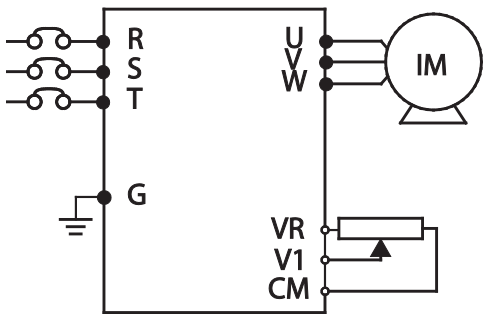


Operation Pattern

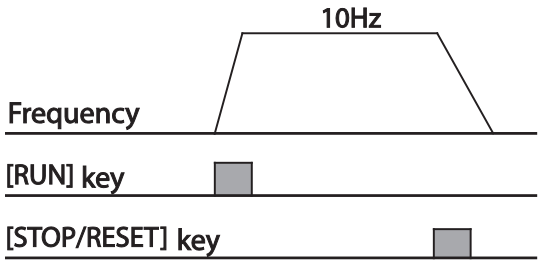
NOTE: The instructions in the table are based on the factory default parameter settings. The drive may not work correctly if the default parameter settings are changed after the drive is purchased. In such cases, initialize all parameters to reset the factory default parameter settings before following the instructions in the table (refer to Initializing All Parameters (Reset to Defaults) on page 3–11*).*

Frequency Setting (Potentiometer) and Operation with the Keypad

Step	Action	Keypad Display
1	Turn on the drive.	–
2	Select code 0.00 (Command Frequency) in the Operation group.	0.00
3	Press the Up arrow key 3 times to move to the drv (command source) parameter.	drv
4	Press the [ENT] key. The drv code in the Operation group is currently set to 1 (FX/RX1 operation command set from the terminal block).	1
5	Press the Down arrow key to change the parameter value to 0 (Keypad), and then press the [ENT] key. The parameter value will flash.	0
6	Press the [ENT] key again. The drv code is displayed again. The fequency input has been configured for the keypad.	drv
7	Press the Up arrow key one time. Move to the Frq (Frequency reference source) code.	Frq
8	Press the [ENT] key. The Frq code in the Operations group is currently set to 0 (keypad).	0
9	Press the Up arrow key to change the parameter value to 4 (V0-Set frequency input to (internal) potentiometer), and then press the [ENT] key.	4
10	Press the [ENT] key once again. The Frq code will be displayed again. The frequency input has been configured for the potentiometer.	Frq
11	Press the Down arrow key 4 times. Move to the first code of the Operation group (0.00). From here, frequency setting values can be monitored.	0.00
12	Adjust the internal potentiometer to increase or decrease the frequency reference to 10 Hz.	–
13	Press the [RUN] key. The RUN indicator light flashes and the FWD indicator light comes on steady. The current acceleration frequency is displayed.	SET RUN 10.00 FWD REV
14	When the frequency reaches the references (10 Hz), press the [STOP/RESET] key on the keypad. The RUN indicator light flashes again and the current deceleration frequency is displayed. When the frequency reaches 0 Hz, the RUN and FWD indicator lights turn off, and the frequency reference, 10.00, is displayed again.	SET RUN 10.00 FWD REV



Wiring Diagram



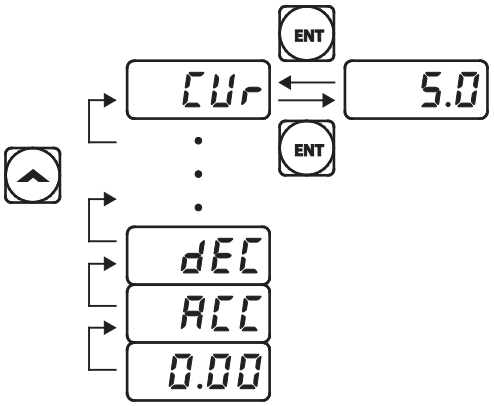
Operation Pattern

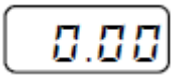
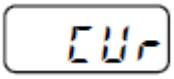
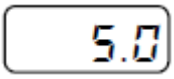
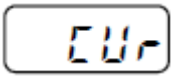
NOTE: The instructions in the table are based on the factory default parameter settings. The drive may not work correctly if the default parameter settings are changed after the drive is purchased. In such cases, initialize all parameters to reset the factory default parameter settings before following the instructions in the table (refer to Initializing All Parameters (Reset to Defaults) on page 3–11*).*

Monitoring the Operation

Output Current Monitoring

The following example demonstrates how to monitor the output current in the Operation group using the keypad.



Step	Action	Keypad Display
1	Select code 0.00 (Command Frequency) in the Operation group.	
2	Press the Up or Down arrow key to move to the Cur code.	
3	Press the [ENT] key. The output current of (5.0 A) is displayed.	
4	Press the [ENT] key again. Returns to the Cur code.	

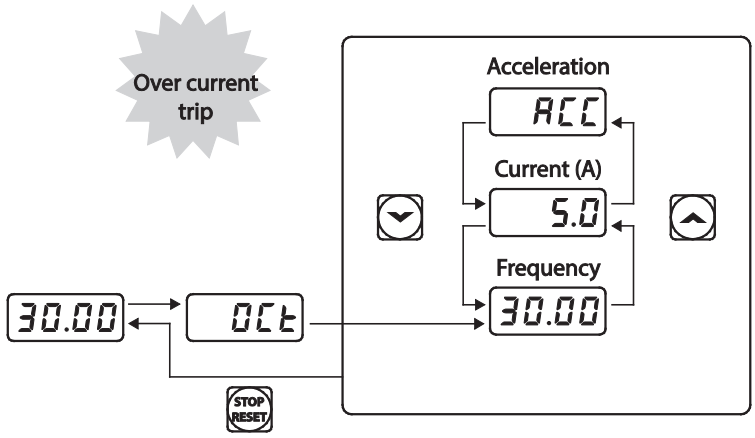
NOTE: You can use the dCL (DC link voltage monitor) and vOL (output voltage monitor) parameters in the Operation group in exactly the same way as shown in the example above, to monitor each function's relevant values.

User Selectable Monitoring

The vOL (output voltage monitor) is configured by parameter dr.81. This parameter can be changed in order to display a user selected value of output voltage, power, torque, or PID feedback.

Fault Trip Monitoring

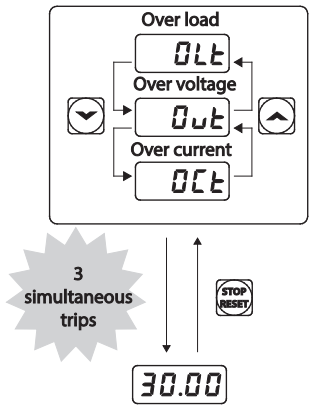
The following example demonstrates how to monitor fault trip conditions in the Operation group using the keypad.



Step	Action	Keypad Display
1	Refer to the example keypad display. An over current trip fault has occurred.	OCt
2	Press the [ENT] key, and then the Up Arrow key. The operation frequency at the time of the fault (30.00Hz) is displayed.	30.00
3	Press the Up Arrow key. The output current at the time of the fault (5.0A) is displayed.	5.0
4	Press the Up Arrow key. The operation status at the time of the fault is displayed. ACC on the display indicates that the fault occurred during acceleration.	ACC
5	Press the [STOP/RESET] key. The drive resets and the fault condition is cleared. The frequency reference is displayed on the keypad.	30.00

NOTE:

- *If multiple fault trips occur at the same time, a maximum of 3 fault trip records can be retrieved as shown in the following example:*



- *If a warning condition occurs while running at a specified frequency, the current frequency and the signal will be displayed alternately, at 1 second intervals. Refer to* "Fault Trips" on page 6–7 *for more details.*