TOPTEK

TOPVERT S1

High-Performance Sensorless Vector Control Inverter User Manual

TOPVERT S1 Series : 0.2kW – 3.7kW

TOPVERT FAMILY>>

High performance Sensorless Vector Control drive

TOPVERT E1 Series

High performance general purpose compact drive
Sensorless Vector Control
Output frequency:0.1-600Hz

1-Phase, 90~132VAC , 0.2kW~1.5kW
1-phase, 180~264VAC, 0.4kW~2.2kW
3-phase, 180~264VAC, 0.4kW~7.5kW
3-phase, 342~528VAC, 0.75kW~7.5kW

TOPVERT G1 series

High performance general purpose multi-function drive
Sensorless Vector Control,
output frequency:0.1-600Hz

1-phase, 180~264VAC, 0.4kW~2.2kW
3-phase, 180~264VAC, 0.4kW~75kW
3-phase, 342~528VAC, 0.75kW~315kW

TOPVERT H1 series

High performance multi-function high speed drive
Sensorless Vector Control
output frequency:0.1-6000Hz

1-phase, 180~264VAC, 0.4kW~2.2kW
3-phase, 180~264VAC, 0.4kW~75kW
3-phase, 342~528VAC, 0.75kW~75kW

TOPVERT P1 series

High performance multi-function variable torque drive
for Fan & Pump
Sensorless Vector Control
output frequency:0.1-600Hz

3-phase, 180~264VAC, 0.75kW~90kW
3-phase, 342~528VAC, 1.5kW~400kW

TOPVERT S1 series

High performance general purpose micro drive
Sensorless Vector Control
Output frequecy :0.1-600Hz

1-Phase, 90~132VAC , 0.2kW~0.75kW
1-phase, 180~264VAC, 0.4kW~2.2kW
3-phase, 180~264VAC, 0.4kW~3.7kW
3-phase, 342~528VAC, 0.4kW~3.7kW

PREFACE

Thank you for choosing TOPTEK'S TOPVERT S1 Series Drive. TOPVERT S1 Series is Sensorless current vector control high-performance Drive. They are manufactured by adopting high-quality components, material and incorporating the latest microprocessor technology available.

Getting Started

This manual will be helpful in the installation, parameter setting, troubleshooting, and daily maintenance of the AC motor drives. To guarantee safe operation of the equipment, read the following safety guidelines before connecting power to the Drives. Keep this operating manual handy and distribute to all users for reference.

WARNING

⚠ Always read this manual thoroughly before using TOPVERT S1 Series Drives.

⚠ **DANGER!** AC input power must be disconnected before any maintenance.
Do not connect or disconnect wires and connectors while power is applied to the circuit. Maintenance must be performed by qualified technicians.

⚠ **CAUTION!** There are highly sensitive MOS components on the printed circuit boards. These components are especially sensitive to static electricity.
To avoid damage to these components, do not touch these components or the circuit boards with metal objects or your bare hands.

⚠ **DANGER!** A charge may still remain in the DC-link capacitor with voltages even if the power has been turned off. To avoid personal injury, please ensure that power has turned off before operating Drive and wait ten minutes for capacitors to discharge to safe voltage levels.

⚠ **CAUTION!** Ground the TOPVERT S1 using the ground terminal.
The grounding method must comply with the laws of the country where the Drive is to be installed. Refer to Basic Wiring Diagram.

⚠ **DANGER!** The Drive may be destroyed beyond repair if incorrect cables are connected to the input/output terminals. Never connect the Drive output terminals U/T1, V/T2, and W/T3 directly to the AC main circuit power supply.

⚠ **CAUTION!** The final enclosures of the Drive must comply with EN50178. (Live parts shall be arranged in enclosures or located behind barriers that meet at least the requirements of the Protective Type IP20.
The top surface of the enclosures or barrier that is easily accessible shall meet at least the requirements of the Protective Type IP40).
(TOPVERT S1 Series corresponds with this regulation.)

⚠ **CAUTION!** Heat sink may heat up over 70℃ (158℉), during the operation. Do not touch the heat sink.

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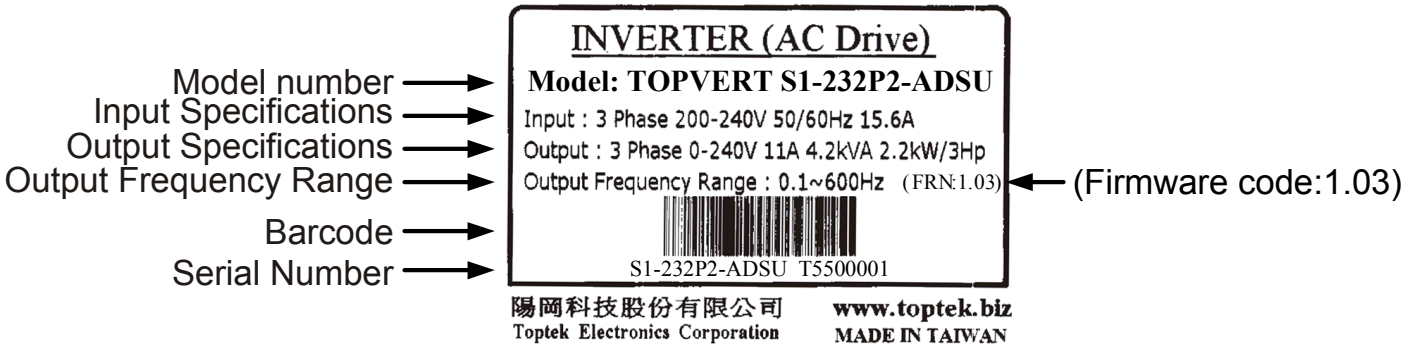
CHAPTER 1 RECEIVING AND INSPECTION

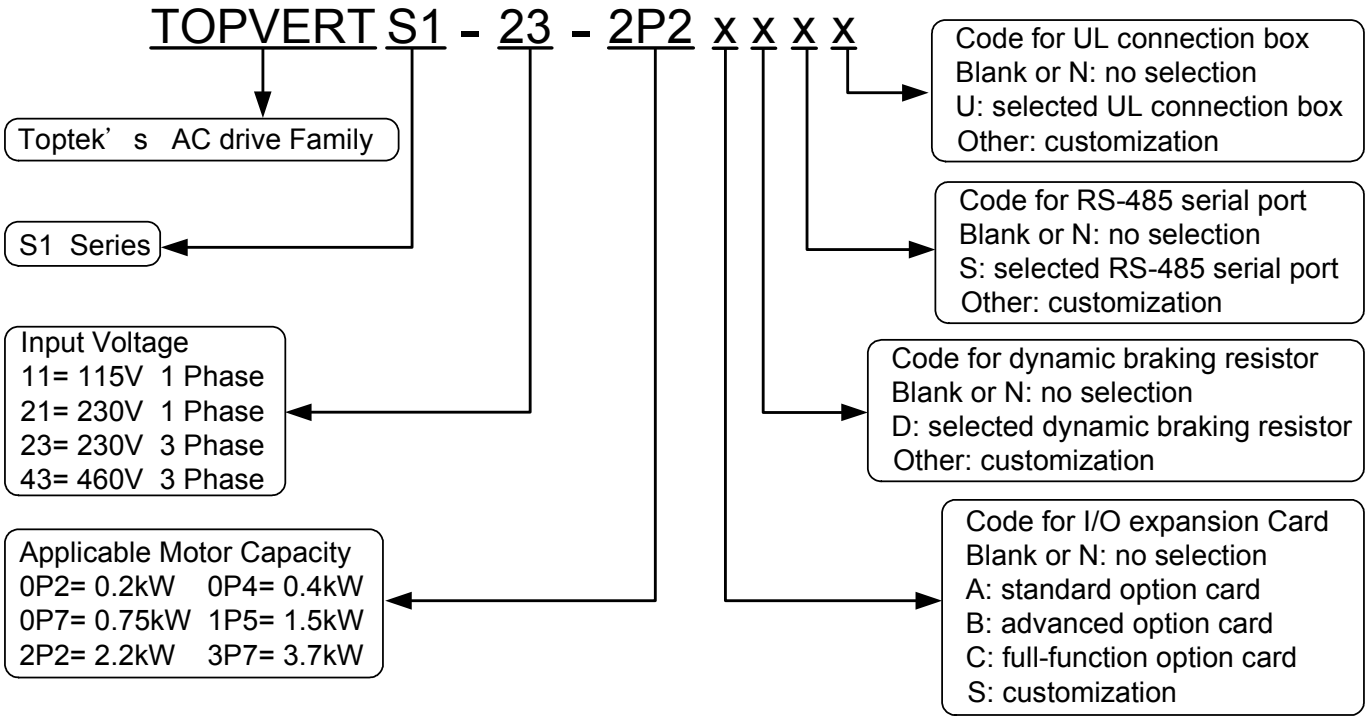
1-1 Nameplate Information

Example for standard S1 series, 3HP/2.2kW 230V 3-Phase with options-dynamic braking resistor, RS-485 serial port and UL connection box



1-2 Model Explanation

(including I/O expansion Card, dynamic braking resistor, RS-485 serial port and UL connection box)



● Please contact the dealers immediately should any discrepancy occurred.

CHAPTER 2 STORAGE AND INSTALLATION

2-1 Storage

The drive should be kept in the shipping carton before installation. In order to retain the warranty coverage, the Drive should be stored properly when it is not to be used for an extended period of time.

Ambient Conditions:

Operation Air Temperature: -10℃ to +50℃ (14℉ to 122℉)
Atmosphere pressure: 86 to 106 kPa
Installation Site Altitude: below 1000m
Vibration: Maximum 9.80 m/s2 (1G) at less than 20Hz
Maximum 5.88 m/s2 (0.6G) at 20Hz to 50Hz

Storage Temperature: -20℃ to +60℃ (-4℉ to 140℉)
Relative Humidity: Less than 98%, no condensation allowed
Atmosphere pressure: 86 to 106 kPa

Transportation Temperature: -20℃ to +60℃ (-4℉to 140℉)
Relative Humidity: Less than 98%, no condensation allowed
Atmosphere pressure: 86 to 106 kPa
Vibration: Maximum 9.80 m/s2 (1G) at less than 20Hz, Maximum 5.88m/s2 (0.6G) at 20Hz to 50Hz

Pollution Degree 2: good for a factory type environment.

2-2 Installation

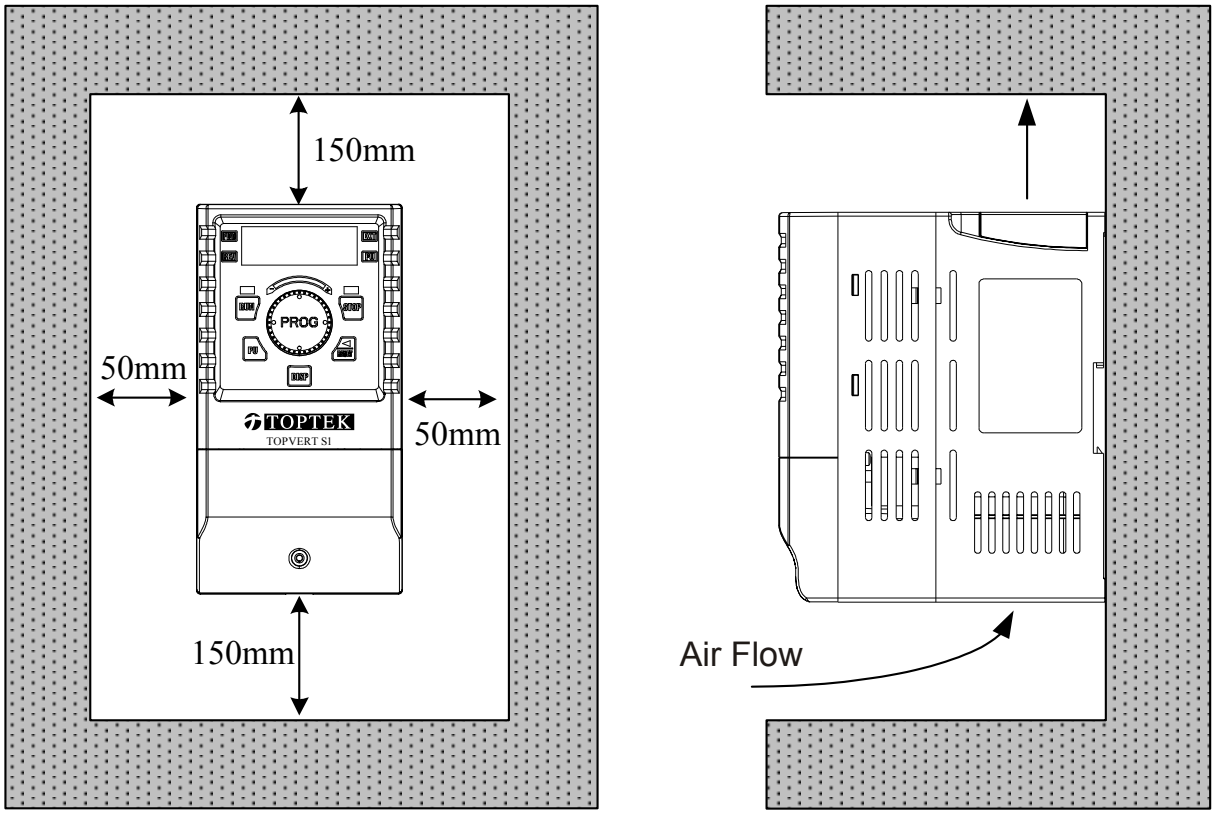
CAUTION

The control, power supply and motor leads must be laid separately. They must not be fed through the same cable conduit / trenching.
High voltage insulation test equipment must not be used on cables connected to the drive.

Improper installation of the Drive will greatly reduce its life. Be sure to observe the following precautions when selecting a mounting location.

Failure to observe these precautions may void the warranty!

The Drive generates heat. Allow sufficient space around the unit for heat dissipation.
Mount the Drive vertically and do not restrict the air flow to the heat sink fins.



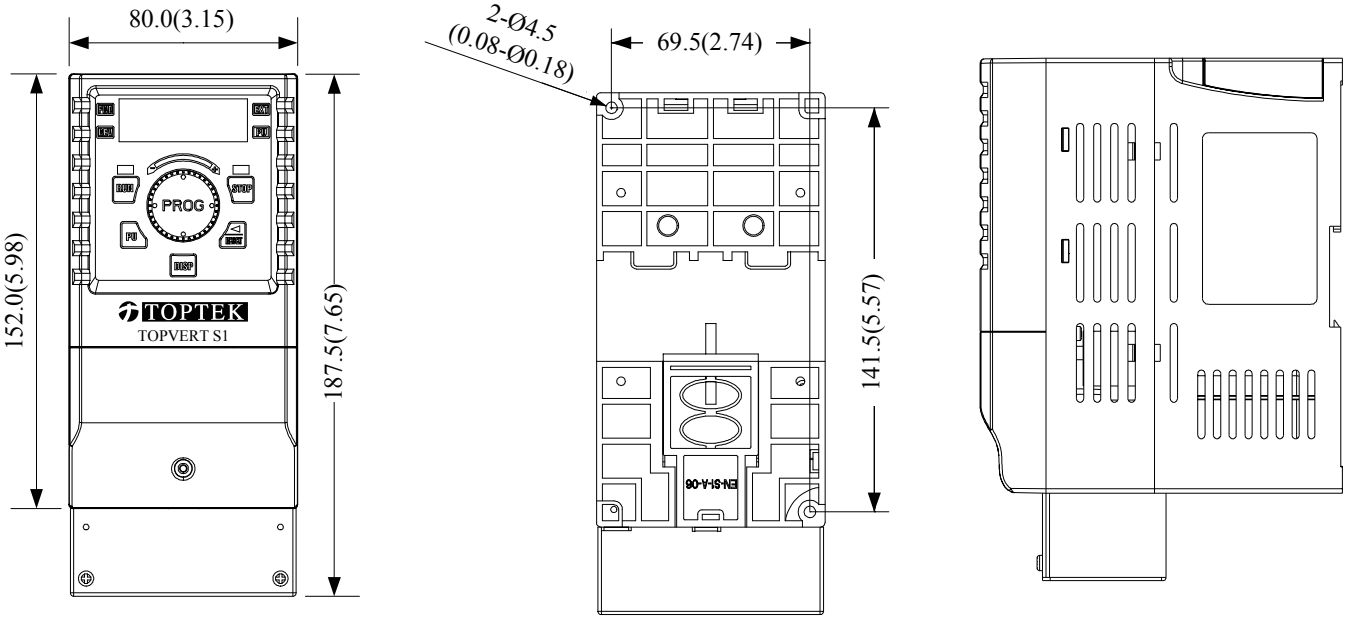
2-3 Installation Environment

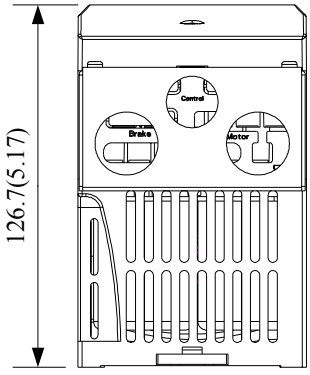
▲ Do not install the Drive in a place subjected to high humidity, steam, dust areas.
▲ Do not install the Drive in a place subjected to corrosive gases or liquids.
▲ Do not install the Drive in a place subjected to airborne dust or metallic particles.
▲ Do not install the Drive in a place subjected to excessive vibration.
▲ Do not mount the Drive near heat-radiating elements
▲ Do not install the Drive in a place subjected to temperature exceed : -10℃ to +50℃
(14℉ to 122℉)

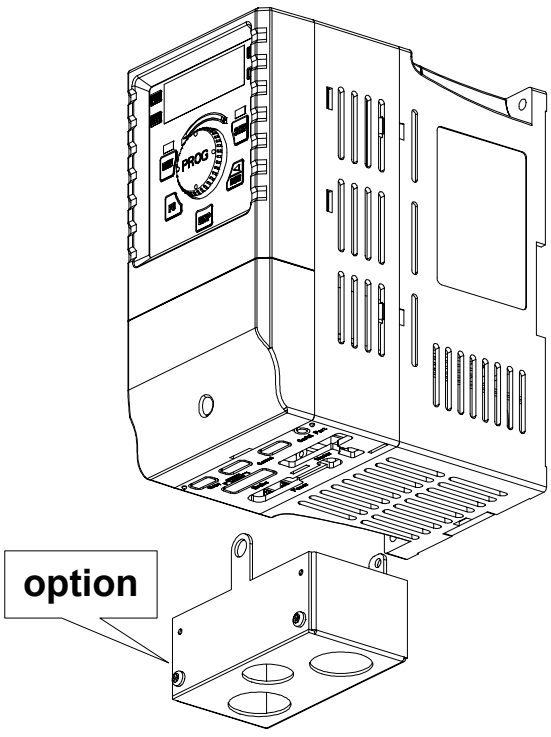
2-4 Dimensions

2-4-1 Frame Code: S1-A

Capacity [kW/Hp]	110V 1 Phase	230V 1 Phase	230V 3 Phase	460V 3 Phase
0.2/0.25	V			
0.4/0.5	V	V	V	V
0.75/1	V	V	V	V
1.5/2		V	V	V







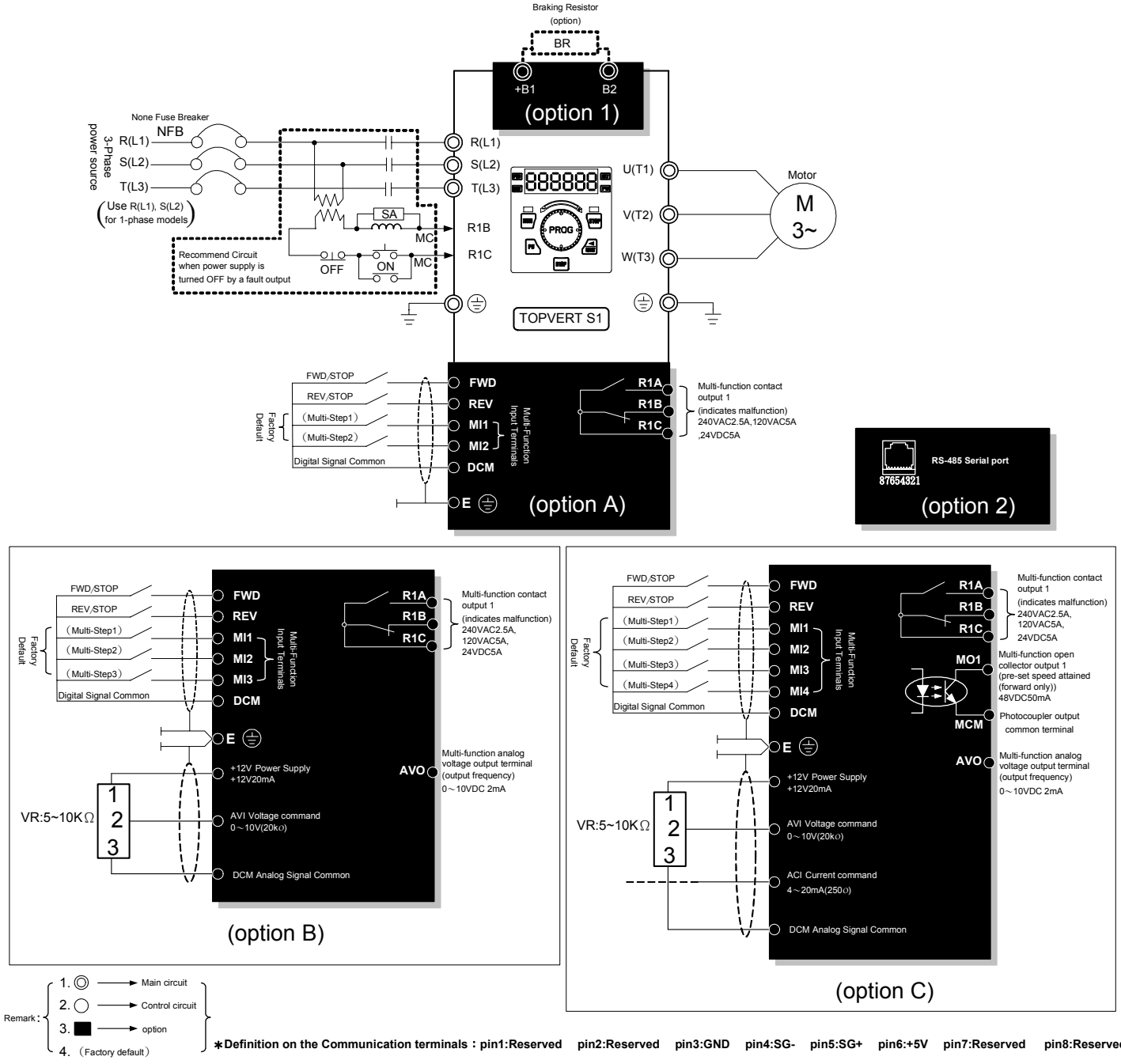
Unit : mm (inch)

CHAPTER 3 WIRING

3-1 Basic Wiring Diagram

For wiring of the drive, it is divided into the main circuit and the control circuit. Users could open the case cover, and could inspect the main circuit terminal and the control circuit terminal; users connect the circuit in compliance with the following wiring method.

The following diagram is the standard wiring diagram for the TOPVERT S1 series drive.



Remark:
1. ◎ → Main circuit
2. ○ → Control circuit
3. ■ → option
4. (Factory default)

∗**Definition on the Communication terminals：pin1:Reserved pin2:Reserved pin3:GND pin4:SG- pin5:SG+ pin6:+5V pin7:Reserved pin8:Reserved**

3-2 Main Circuit Terminal Explanations

Terminal Symbol	Content Explanation
R(L1),S(L2),T(L3)	AC line input terminals
U(T1),V(T2),W(T3)	Drive output terminals motor connections
⊕/B1, B2	Connections for Braking Resistor (optional) Refer to Chapter 9 (the selection chart)
⏚	Ground terminals, please have these terminals grounded following the third-type grounding of 230V series and the special grounding of 460V series within the electrician regulations

3-3 Control Terminal Explanations (Available when an I/O card is installed)

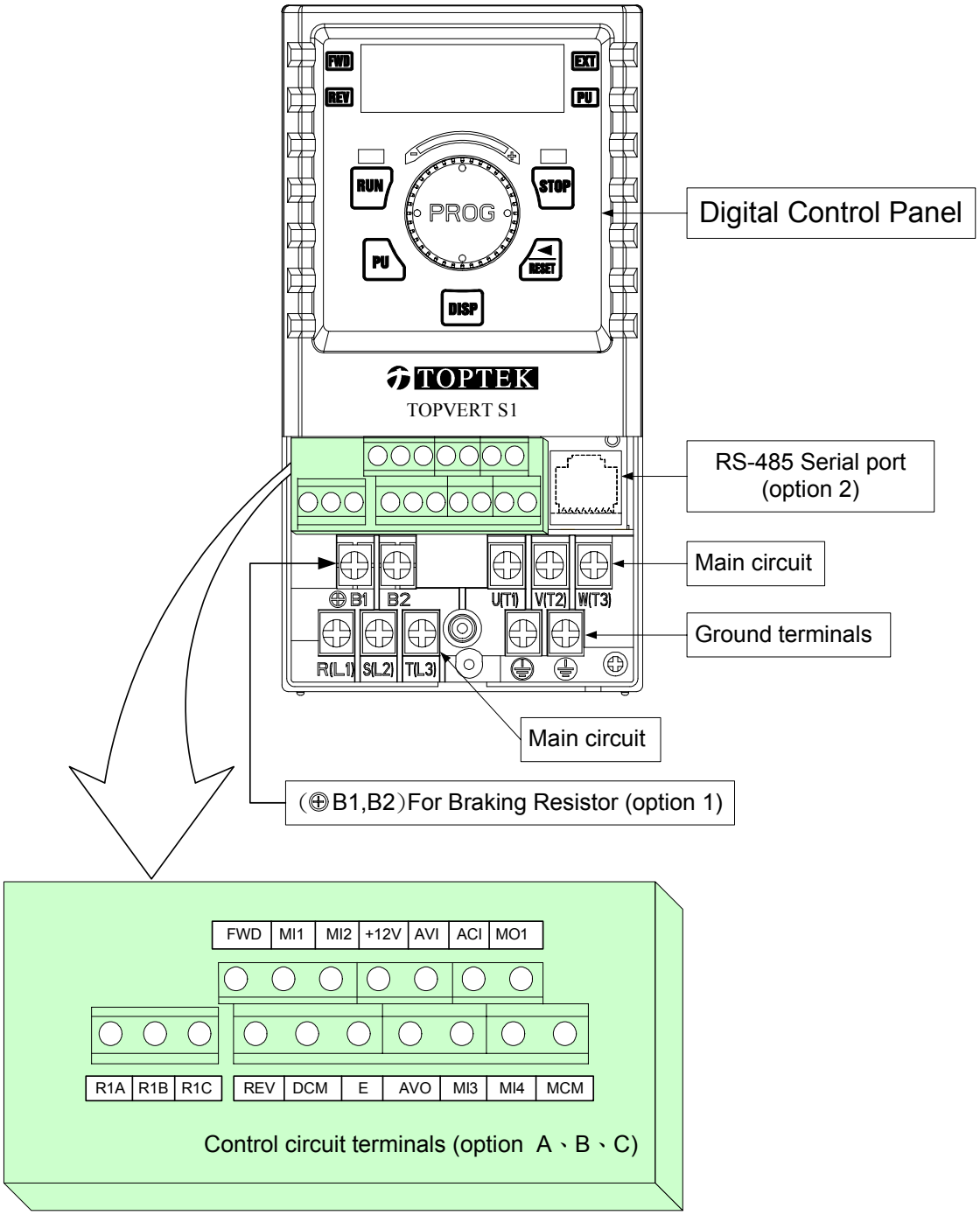
Terminal Symbols	Explanation on the Terminal Function	Factory Default
MI1	Multi-function input selection 1 (3-wire STOP-designated terminal)	multi-step speed command 1
MI2	Multi-function input selection 2	multi-step speed command 2
MI3	Multi-function input selection 3	multi-step speed command 3
MI4	Multi-function input selection 4	multi-step speed command 4
AVO	Multi-function analog voltage output (0~10VDC, 2mA)	Output frequency
R1A	Multi-function relay 1 output contact (NO / a)	Resistive Load 5A(N.O.)/3A(N.C.) 240VAC 5A(N.O.)/3A(N.C.) 24VDC Inductive Load 1.5A(N.O.)/0.5A(N.C.) 240VAC 1.5A(N.O.)/0.5A(N.C.) 24VDC Refer to Pr.2-19, Pr.2-20
R1B	Multi-function relay 1 output contact (NC / b)	
R1C	Multi-function relay 1 output contact – the common end	
E	Shield terminal	
24V	Digital control source signal Reference point is DCM	+24V 50mA
FWD	FWD RUN-STOP command	
REV	REV RUN-STOP command	
DCM	Digital control signal - the common end	
+12V	Auxiliary reference power Reference point is DCM	+12V 20mA
AVI	Multi-Function analog voltage command	The maximum operation frequency corresponding to 0~+10V

ACI	Multi-Function analog current command	The maximum operation frequency corresponding to 4~20mA
MO1	Multi-function output terminal 1 (photo coupler)	pre-set speed attained (Max 48VDC 50mA)
MCM	Multi-function output terminal (photo coupler) – the common end	

Control signal wiring size: 18 AWG (0.75 mm^2)
Analog control signal wire specification: 18 AWG (0.75 mm^2), covered with shield twisted net.
.

3-4 Component Explanations

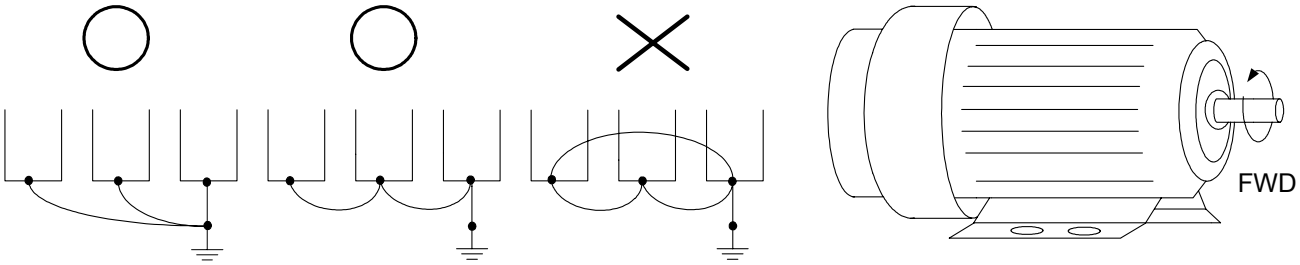
S1-A:



3-5 Wiring Notice:

PLEASE READ PRIOR TO INSTALLATION.

1. When wiring up, and that the wiring route specifications are settled, please conduct the wiring following the electrician regulations.
2. The connection between the three-phase AC input power and the main circuit terminal R/L1, S/L2, T/L3 has to set up a none-fusing switch in between. The best is to series connect with an electro-magnetic contactor (MC) so as to cut off the power supply at the same time when the drive protection function acts.
   (The two ends of the electro-magnetic contactor should have the R-C Varisteor).
3. There is no phase-order differentiation in the input power R/L1, S/L2, T/L3 and users could connect with either one of use.
4. The ground terminal ⏚ is grounded with the third-type grounding method (with the grounding impedance under 100Ω).
5. The grounding wire of the drive could not be grounded at the same time with machinery with grand current loading, like that of the electric soldering machine and of the motor with grand horsepower; they have to be grounded individually.
6. The shorter the ground wire, the better it is.
7. When several drives are grounded at the same time, be sure not to make it into a ground circuit. Please refer to the following diagram:

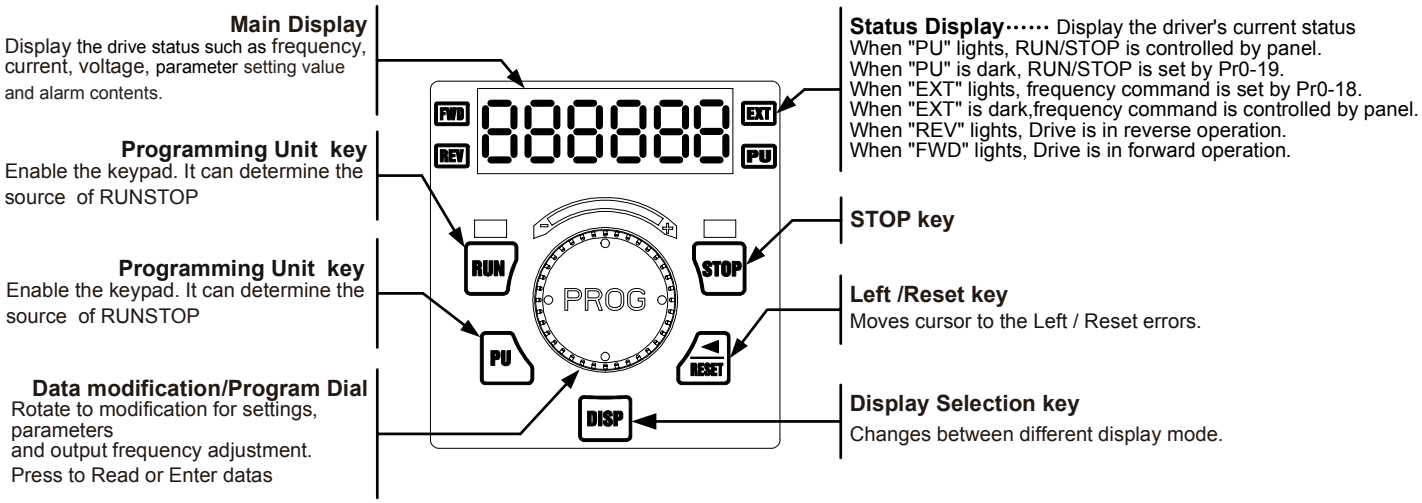


8. If the output terminals U/T1, V/T2 and W/T3 of the drive are connecting relatively to the U, V, and W terminals of the motor, the FWD indicator located on the digital control panel of the drive will be lit, and that means the drive is running forward, and the rotation direction of the motor will be shown as the right hand side diagram above; if the REV indicator is lit, it means that the drive is running in reverse direction, and the rotation direction will be of the opposite direction compared with the above diagram. If users are not sure of whether the connection between output terminals U/T1, V/T2 and W/T3 of the drive is of one-to-one connection with U, V, and W terminals of the motor, simply swap either two wires among the U,V, and W terminals of the motor for correction if the drive is running forward while the motor is running at reverse direction.
9. Ensuring the power voltage and the maximum current possible supplied.
10. When the “Digital Programming Unit” is displayed, please do not disconnect or dissemble any wiring.
11. No braking resistor is installed within the drive (option item), therefore, be sure to purchase and install the braking resistor if to be used on occasions when the loading inertia is great or that it is of frequent start/stop.
12. Be sure not to connect the AC power with the terminals U/T1, V/T2 and W/T3 of the drive.
13. Please tightly fasten the screws of the main circuit terminals so as to prevent sparks generated due to the vibration and loosening of the screws.
14. Wiring of the main circuit and of the control circuit should be separated so as to prevent erroneous actions. If the interlock connection is needed, please make it an intersection of 90°.

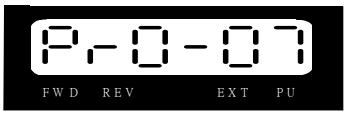
15. If terminals U/T1, V/T2 and W/T3 on the output side of the drive is in need of the noise wave-filter, it is then necessary to use the induction-type L-Varistor, but be sure not to add in the phase-carrying capacitor or the L-C- and R-C-type wave filters.
16. Please use the separating wire as much as possible during control wiring, and be sure not to expose the peeled-off separation net in front of the terminal to the external.
17. Please use the separating wire or tube as much as possible during power wiring, and ground these two ends of the separating layer or tube to the Ground.
18. If the installation site of the drive is sensitive to interferences, please have the RFI filters installed, and the closer the drive to the installation site, the better. In addition, the lower the carrier frequency is, the less the interferences will be.
19. If the electric-leakage circuit breaker is installed in the drive, it could serve as the protection for the electric-leakage error, and as the prevention on the erroneous actions of the electric-leakage circuit breaker; please select the sensor current above 200ma with the action time of more than 0.1 second to have these actions accessible.

CHAPTER 4 DIGITAL KEYPAD OPERATION

4-1 Description of the Digital Keypad

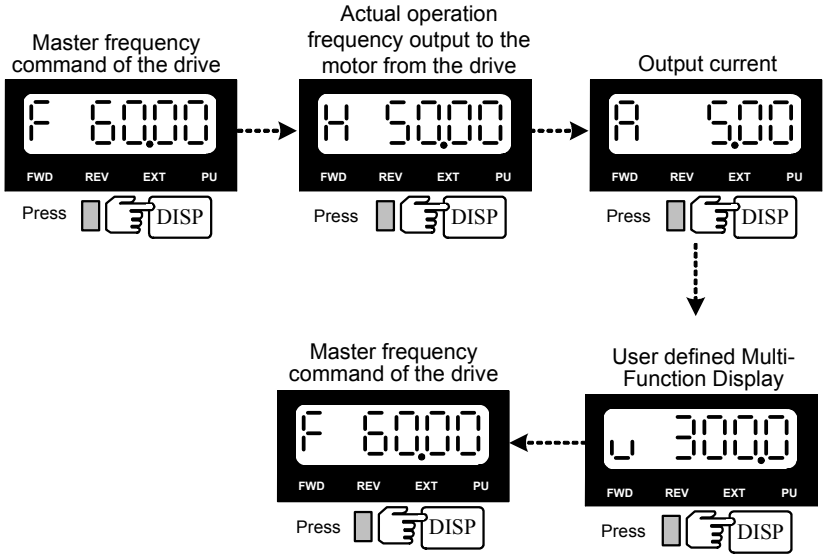


4-2 Explanations of Display Messages

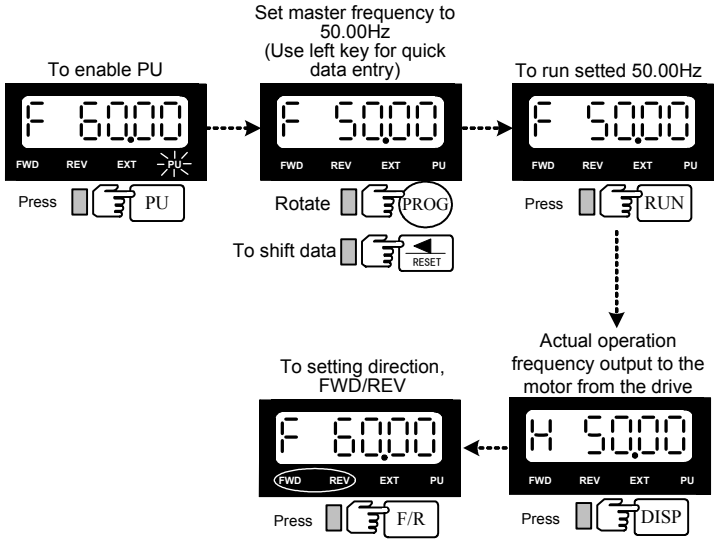
Messages Displayed	Descriptions
	Master frequency command of the drive (Press the DISP key to read)
	Actual operation frequency output to the motor from the drive (Press the DISP key to read)
	Output current (Press the DISP key to read)
	User-selected content (Press the DISP key to read)
	The specified parameter item (Rotate and press the PROG dial to modification ,read and Enter)
	Value of the parameter content (Rotate the PROG dial to modification for setting parameters)
	If the “End” message is displayed (as shown in the figure), for about 1 second, it is an indication that the data has been accepted and saved to the internal memory automatically.

4-3 Operation Steps

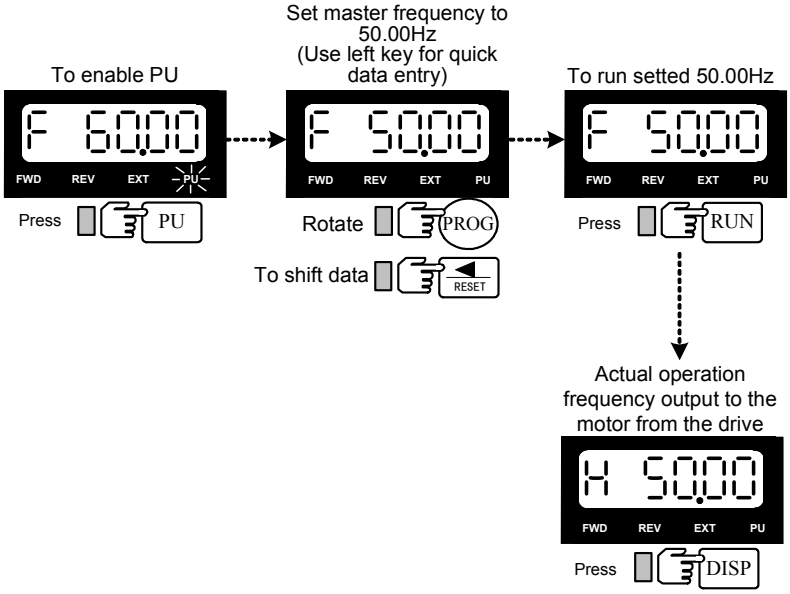
4-3-1 Selecting display mode



4-3-2 Setting parameters



4-3-3 To run



CHAPTER 5 PARAMETER SETTINGS

0 System Parameter

★= This parameter cannot be set during operation.

0-00	**Identity Code**	★	Factory setting	Read only
	Settings	Based on the model type		
0-01	**Rated Current Display**	★	Factory setting	Read only
	Settings	Based on the model type		

Idenitity Code examples:

2=200~240V, 3.7=3.7kW

4=380~460V, 0.7=0.75kW

Users can use the following table to check if the rated current of the Drive is corresponds to the identity code

100-120V Class kW [Hp]	0.2 [0.25]	0.4 [0.5]	0.75 [1]
Model Code	0	3	6
Rated output current	1.6	3	5
Maximum Carrier Frequency	18 kHz		

200-240V Class kW [Hp]	0.4 [0.5]	0.75 [1]	1.5 [2]	2.2 [3]	3.7 [5]
Model Code	3	6	9	12	15
Rated output current	3	5	7.5	11	17
Maximum Carrier Frequency	18kHz				

380-460V Class kW [Hp]	0.4 [0.5]	0.75 [1]	1.5 [2]	2.2 [3]	3.7 [5]
Model Code	4	7	10	13	16
Rated output current	1.6	3	4.2	6	8.5
Maximum Carrier Frequency	18kHz				

Pr0-00 displays the drive model code.

Pr0-01 displays rated output current of the drive. The following chart may be used to look up the identity code, current, and hp of your drive. Those parameters are read-only.

0-02	Parameter Reset	★	Factory Setting	8
	Settings	10	Parameter reset for 60Hz, 230V or 460V field	
		9	Parameter reset for 50Hz, 220V or 380V field	
		8	Parameter reset for 60Hz, 220V or 380V field	
		7	Parameter reset for 50Hz, 230V or 460V field	
		6	Parameter reset for 60Hz, 230V or 415V field	
		5	Parameter reset for 50Hz, 230V or 415V field	

If users would like to reset the parameters to original factory-settings, simple set the parameters to “5”, “6”, “7”, “8”, “9” or “10”.

0-03	Password Input for unlock		Factory Setting	0
	Settings	0～9999		
0-04	Password Setting for lock/unlock		Factory Setting	0
	Settings	0～9999		

Pr0-03: This parameter allows the user to input their password and disable the parameter lockout. An incorrect password may be entered 3 times and then a “Pcode” will flash on the display, alerting the user the password is incorrect. The drive must be powered off and then powered on again to clear the Pcode display.

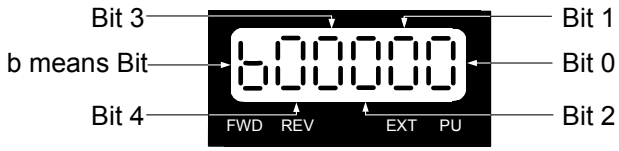
Pr0-04: This parameter allows the user to input their password to lock out the parameters from further changes.

To enter a password, the same password must be input twice within two minutes. To verify the password was entered correctly, display the content of Pr0-04. If the content is “1”, the password is entered. If the content is “0”, no password is entered.

To permanently disable the password. Enter the password in Pr0-03, then enter 0 into Pr0-04 twice within two minutes.

To re-activate the password, either enters an incorrect password into Pr0-04 or power down and then reapply power to the inverter

0-05	Parameter Locking	Factory Setting	b00000
	Settings	Bit 0=1：Parameters cannot be read	
		Bit 1=1：Disable Frequency Command changes.	
		Bit 2=1：Disable run command from keypad	



To unlock the parameter, set Pr0-05 to Bit=0, otherwise, the parameters after Pr0-05 cannot be read and an Err messaged is displayed.

0-06	Start-up Display of the Drive		Factory Setting	0
	Settings	0	F (Master frequency command)	
		1	H (Output frequency)	
		2	A (Output current)	
		3	U (multi-function display of Pr0-07)	

This parameter allows the start-up display to be customized. The display may still be changed, but during each power on, the display will default to the setting in this parameter.

0-07	Definitions of the Multi-Function Display				Factory Setting	0
Settings	0	Motor speed (rpm)	1	DC-BUS voltage		
	2	Output voltage	3	Voltage command		
	4	PID feedback value	5	Multi-step speed (0~15Steps)		
	6	Dwell (Sleep) time	7	Remaining number of times for the “restart after fault” feature		
	8	(Factory Reserved)	9	(Factory Reserved)		
	10	Power factor ±1.000	11	Counter value		
	12	Over-torque accumulated time	13	(Factory Reserved)		
	14	Dwell Time at Start-up	15	Dwell Time during a STOP		
	16	DC Braking Time at Start-up	17	DC Braking Time during a STOP		
	18	Execution time of the multi-step speed	19	(Factory Reserved)		
	20	(Factory Reserved)	21	Day (power-up time)		
	22	Hour, Minute (power-up time)	23	(Factory Reserved)		
	24	Execution step of the multi-step speed	25	(Factory Reserved)		
	26	(Factory Reserved)	27	(Factory Reserved)		
	28	(Factory Reserved)	29	AVI (0~10V)		
	30	ACI (4~20mA)	31	(Factory Reserved)		
	32	(Factory Reserved)	33	(Factory Reserved)		
	34	Over-torque level	35	Torque compensation gain		
	36	(Factory Reserved)	37	(Factory Reserved)		
	38	Stall level limitation	39	(Factory Reserved)		
	40	(Factory Reserved)	41	(Factory Reserved)		
	42	(Factory Reserved)	43	(Factory Reserved)		
	44	(Factory Reserved)	45	(Factory Reserved)		
	46	(Factory Reserved)	47	(Factory Reserved)		
	48	(Factory Reserved)	49	(Factory Reserved)		

	50	(Factory Reserved)	51	(Factory Reserved)
	52	(Factory Reserved)	53	Output power (kW)
	54	Output power (kVA)	55	(Reserved)
	56	OH1 temperature	57	OH2 temperature
	58	(Factory Reserved)	59	(Factory Reserved)
	60	Overload accumulated time	61	(Factory Reserved)
	62	Compensated voltage	63	(Factory Reserved)
	64	DC voltage upon a fault	65	Output AC voltage upon a fault
	66	Output frequency upon a fault	67	Frequency command upon a fault
	68	Current value upon a fault		

This parameter defines the display content the User Defined setting. The User Defined setting may be displayed upon power up (Pr0-06) or by pressing the DISP key on the keypad and scrolling until the “U” is illuminated.

This parameter defines the display content the User Defined setting. The User Defined

0-08	**User-Defined Coefficient Setting**		Factory Setting	0
	Settings	0～39 (no use)		
		40～60000 (relative to Pr1-00)		
0-09	**Number of the decimal places**		Factory Setting	0
	Settings	0~3		

Example: To display rpm’s for a 4-pole 60Hz motor with a base speed 1800rpm and no slip, Pr0-09 must be set to 0.The result of setting 01800 in Pr0-08 determines the value at 60Hz (Maximum Output Frequency).. In case of higher resolution need to set Pr0-08=18000 and Pr0-09=1, then get 1800.0rpm readout, 0.1rpm resolution.

After this parameter is set, all functions relative to the frequency (except for the V/F Curve frequency parameters) will automatically be changed to an RPM scale. RPM, instead of Hz, will now be the unit for the keypad, and thus, if it is displayed as 60.00 before the setup, it will now display 1800 after the setup. Other parameters such as the multi-step speed will be automatically changed also.

0-10	**Software Version**		Factory Setting	x.xx
	Settings	Read-only		

0-11	EPROM store settings		Factory Setting	b00000
	Settings	Bit 0=1：FWD/REV direction command not memorized		
		Bit 1=1：PU frequency command not memorized		
		Bit 2=1：RS-485 frequency command not memorized		
		Bit 3=1：Up/down pin frequency command not memorized		
		Bit 4=1：Parameter not memorized		

Bit 0 = 1：FWD/REV direction command is not written into EEPROM.
Bit 1 = 1：PU frequency command is not written into EEPROM.
Bit 2 = 1：RS-485 frequency command is not written into EEPROM.
Bit 3 = 1：Up/down pin frequency command is not written into EEPROM.
Bit 4 = 1：Changed parameter is not written into EEPROM.

0-12	Optimal Acceleration / Deceleration Setting		Factory Setting	0
	Settings	0	Linear acceleration/deceleration	
		1	Auto acceleration, linear deceleration	
		2	Linear acceleration, auto deceleration	
		3	Auto acceleration/deceleration	
		4	Linear acceleration/deceleration, but conduct the stall prevention throughout the auto acceleration/deceleration function.	

Optimal Acceleration/Deceleration settings could ease the drive vibration during loaded starts and stops. Also if the detected torque is small, the processor will speed up the acceleration time and reach the set frequency at the fastest and smoothest startup possible. At deceleration, the processor will monitor regenerated voltage and automatically stop the drive at the fastest and smoothest time possible. Pr6-08 of Maximum Current Level for Speed Search is regarded as the target of the output current upon acceleration.

0-13	Time unit for Acceleration Deceleration and S curve					
	Settings	0	Unit 0.01 Sec	★	Factory Setting	0
		1	Unit 0.1 Sec			
		2	Unit 1 Sec			

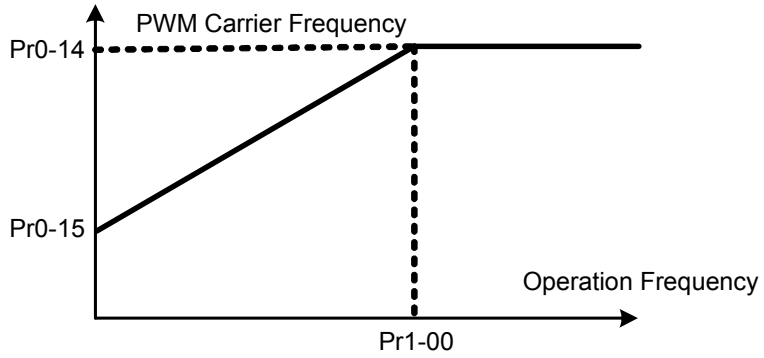
This parameter determines the time unit for the Acceleration/Deceleration setting.
This allows the user to choose either high resolution or long acceleration/deceleration time.
Refer to parameters (Pr1-11~Pr1-14), the 1st to the 2nd Acceleration/Deceleration Time, and (Pr1-19~Pr1-22) the S Curve Acceleration/Deceleration Time.

0-14	Carrier Frequency Upper Bound		Factory Setting	10
	Settings	0：0.7kHz		
		1～18kHz		

0-15	Carrier Frequency Lower Bound		Factory Setting	10
	Settings	0：0.7kHz		
		1～18kHz		

This parameter is utilized in setting the carrier frequency of the PWM output.

Carrier Frequency	Acoustic Noise	Electromagnetic Noise	Leakage Current	Heat Dissipation
0.7kHz	Signification	Minimal	Minimal	Minimal
10kHz	↕	↕	↕	↕
18kHz	Minimal	Signification	Signification	Signification



Carrier Frequency Distribution Chart

This parameter sets the carrier frequency of PWM output. The factory setting and setting range depend on the model type.

The PWM carrier frequency has a direct effect on the electromagnetic noise of the motor and heat dissipation of the drive. Therefore, if the surrounding noise is higher than the electromagnetic noises of the motor, it is suggested to lower the carrier frequency, to decrease the temperature of the drive. Although a quiet operation may be achieved with a higher carrier frequency, it is necessary to take into consideration the relative wiring length between the motor and drive and the effect this high frequency may have on the motor windings.

If the carrier frequency's lower bound (Pr0-15) > the carrier frequency's upper bound (Pr0-14), then the carrier frequency will be operated at the upper bound level.

When the temperature of the heat sink is greater than its limit, the drive will automatic lower the carrier frequency to avoid over heating the Drive.

0-16	Auto Voltage Regulation (AVR) Function			Factory setting	0
	Settings	0	AVR function enabled		
		1	AVR function disabled		
		2	AVR function disabled during deceleration		

This parameter selects the AVR mode. AVR is used to regulate the output voltage to the motor.

set to 0: AVR function is enabled, The drive will calculate output voltage by actual voltage value of DC Bus. Output voltage won't vary by DC Bus varying.

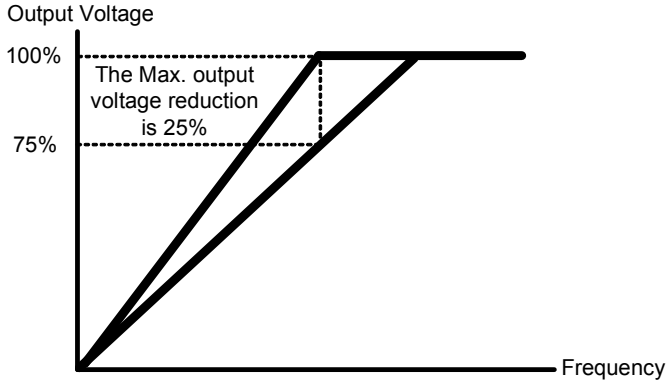
set to 1: AVR function is disabled, The drive will calculate input voltage by DC Bus value. Output voltage will vary by DC Bus varying and may cause output current insufficiently, over current or oscillation.

set to 2: The drive will disable AVR function during decelerate to stop. It can speed up deceleration in some degree

0-17	Automatic Energy-Saving Operation (AESO)				
Settings	Bit0	0	Disable AESO	Factory setting	b00000
		1	Enable AESO		
	Bit 1	0	Maximum output voltage could be higher than the input power voltage		
		1	Maximum output voltage equals to the input power voltage		
	Bit 2	0	OL (100%) constant torque operation		
		1	OL (120%) variable torque operation		
	Bit 3	0	Regen torque without slip compensation		
		1	Regen torque with slip compensation		
	Bit 4	0	Low noise mode operation		
		1	Quiet mode operation		

Bit 0

When the Auto Energy-Saving function is enabled, the drive will operate with full voltage during acceleration and deceleration. At constant speed the Drive will calculate the optimal output voltage value for the load. It is possible for the output voltage to be 25% below Maximum Output Voltage during auto energy saving operation. This function should not be used with variable loads or continuous rated output loads. During these types of conditions, the operation will cycle on and off, giving poor energy saving results.



Auto Energy-Saving Operation

Bit 1

When “0” is selected, Maximum output voltage could be hgher than the input power voltage (over-modulation available), it is good such like,when power source is AC 220V,but the connected motor is AC 230V. The maximum step up range is 13%.

Bit 2

When “0” is selected, the oL starting level is 100% of rated drive current.oL trip level is 150% 60 Sec.

When “1” is selected, the oL starting level is 120% of rated drive current.oL trip level is 150% 60 Sec

It will offer biger margin while working in constant torque mode,but it will offer less margin while working in variable torque mode.

Bit 3

This parameter determine the slipe compensations working at regen condition.

Bit 4

Factory default Bit 4=0 is Low noise mode operation,it should can meet most of applications.
In case of quiet operation is necessary,may set Bit 4=1 , but it is necessary to take into consideration that the heat dissipation of the drive will be higher.

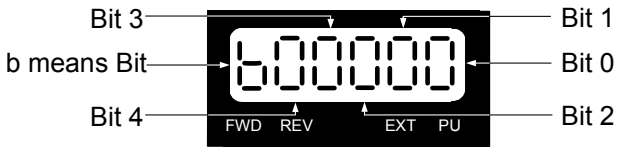
0-18	Source of the Frequency Command		Factory setting	0
	Settings	0	The digital keypad	
		1	The RS485 communication port input	
		2	The external analog input	
		3	The external up/down pins (multi-function input terminal)	

This parameter determines the drive master frequency command source.

0-19	Source of the Operation Command		Factory setting	0
	Settings	0	The RS485 communication port / digital Keypad	
		1	The external terminal / digital Keypad operation	
		2	The digital keypad operation`	
		3	The external terminal operation	

This parameter sets the drive operation command source, which may also be switched via the PU key on the digital keypad. When the PU led on the keypad is illuminated the Keypad has control over the drive operation.

0-20	Stop Methods			Factory Setting	b00000
	Settings	Bit0	0	Ramp to stop	
			1	Coast to stop	
		Bit1	0	Not restart after reset	
			1	Restart after reset	
		Bit2	0	Line Start Lockout is enabled	
			1	Line Start Lockout is disabled	
		Bit3	0	zero speed intervals enabled	
			1	zero speed intervals disabled	
		Bit4	0	linear accel and decel at high speed zone	
			1	S-curve accel and decel at high speed zone	

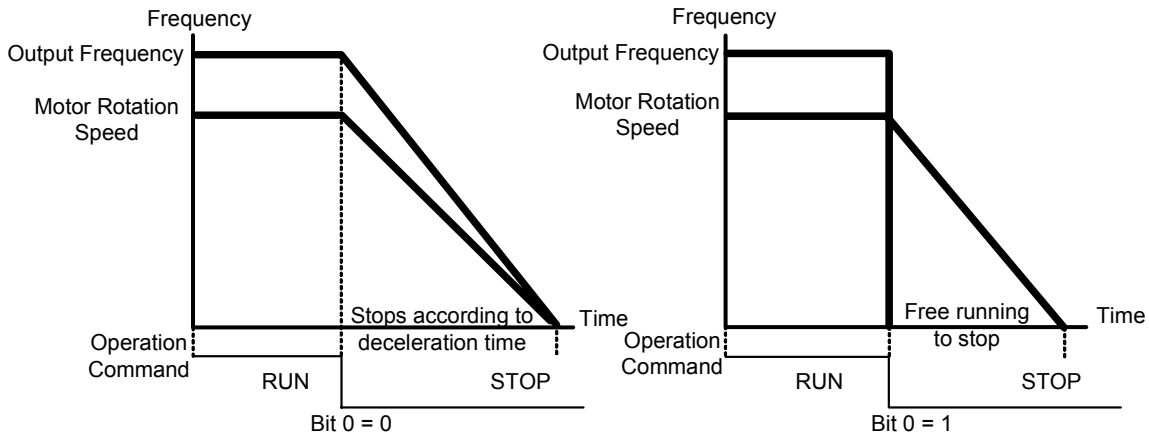


Bit 0:

When a “STOP” command is received, the drive will follow the stop method programmed in this parameter.

●**Ramp to stop**: The drive will ramp down from maximum output frequency (Pr1-00) to startup frequency (Pr1-08) based on the deceleration time.

●**Coast to stop**: The drive will stop the output instantly upon a STOP command and the motor will coast to stop according to its inertia (time unknown).



Ramp to Stop and Coast to Stop

- In applications where the motor must stop after the drive is stopped, please select “Ramp to Stop”. This is often a safety consideration.
- If the inertial load is large, it is recommended to set the drive for “Coast to Stop” to eliminate nuisance Over Voltage faults.

Bit 1 :

Bit 1=0 After the error of the drive is eliminated, The drive will not restart after reset.

Bit 1=1 After the error of the drive is eliminated, The drive will restart after reset.

Bit 2 :

Bit 2=0: Line Start Lockout is enabled.

The drive will not start when powered up with a run command applied.

The drive must see the run command transition from stop to run after power up.

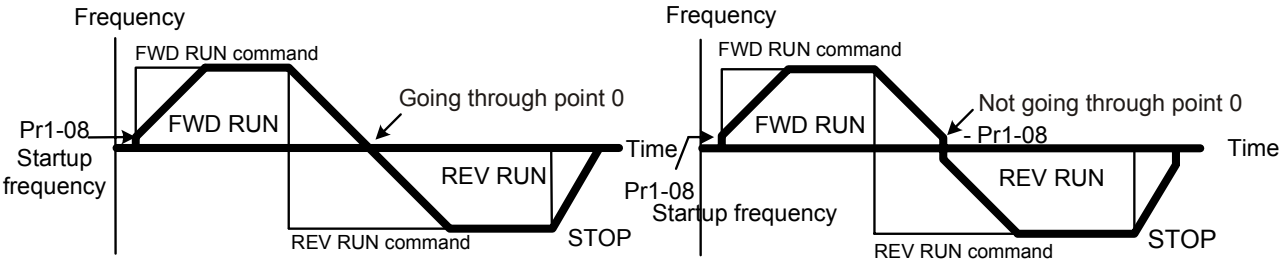
Bit 2=1 : Line Start Lockout is disabled (also known as Auto-Start).

The drive will start when powered-up with run commands applied.

This is a safety feature for applications where applying power does not determine a RUN command.

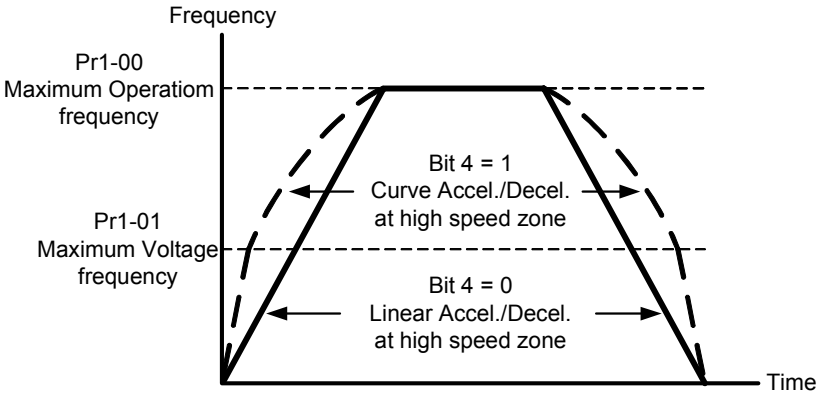
The Line Start Lockout feature does not guarantee the motor will never start under this condition. It is possible the motor may be set in motion by a malfunctioning switch.

Bit 3 :



This parameter selects the transition mode between Forward and Reverse. By skipping the startup frequency range, there will be a short time where the motor has not flux and very little power. It is recommended for all non-horizontal movement to choose “do not skip the startup frequency”

Bit 4 :



0-21	Reverse Operation		Factory Setting	0
	Settings	0	REV enabled	
		1	REV disabled	
		2	FWD disabled	

This parameter enables the drive ability to run in the Reverse Direction. It may be used to prevent a motor from running in a direction that would consequently injure humans or damage the equipment.

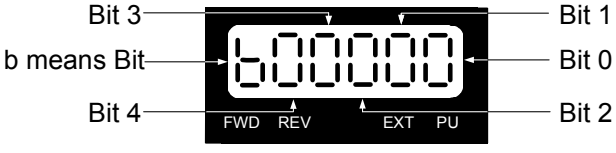
0-22	Stop timer		Factory Setting	0.00
	Settings	0.00~60.00sec		

To setup the waiting time for restart.

0-23	Fan control		Factory Setting	b00000
	Settings	Bit 0=0：when power is applied, the fan will turn on		
		Bit 0=1：When the run command is given, the fan will turn on		

This parameter determines the operation mode of cooling fan.

Bit 0=1, reduce the fan noise when drive is stop, and also extension fan's life.



0-24	Setting resolution of frequency dial on PU			Factory Setting	1
	Settings	0=0.01 Hz	1=0.10Hz	2=1.00Hz	3=10.00 Hz

This setting provide user easy to adjust output frequency by rotary dial on PU.

1 Basic Parameter

1-00	Maximum Operation Frequency			★
	Settings	50.0～600.00Hz	Factory Setting	60.00/50.00

This parameter determines the drive maximum output frequency.
All master frequency commands set by the keypad or analog inputs are limited by this parameter.
Analog input frequency command signal (AVI, ACI) are refer to this setting.

1-01	Maximum Voltage frequency (Base Frequency)			★
	Settings	0.00～600.00 Hz	Factory Setting	60.00/50.00

This parameter sets the frequency, where the maximum output voltage (Pr1-02) will be reached.
The output frequency may exceed this setting, but the output voltage doesn't increase beyond this point. This parameter should be set according to the rated frequency of the motor as indicated on the motor nameplate.

If this parameter setting is smaller than the rated frequency of the motor, nuisance over current faults or damage to the drive may occur. If this parameter setting is greater than the rated frequency of the motor, the motor will encounter torque loss.

This parameter must be set to the motor's nameplate frequency rating.

1-02	Maximum Output Voltage		Setting resolution	0.1
230V models	Settings	0.0～255.0V	Factory Setting	220.0
460V models	Settings	0.0～510.0V	Factory Setting	440.0

This parameter determines the Maximum Output Voltage of the Drive. This parameter setting should be set according to rated voltage of the motor as indicated on the motor nameplate. If rated voltage of the motor is 440V, this parameter must be set to 440V. If rated voltage of the motor is 380V, this parameter must be set to 380V.If this setting is greater than the rated voltage of the motor, nuisance over current faults or damage to the drive may occur.

This parameter must be set to the motor's nameplate voltage rating.

1-03	Upper Midpoint Output Frequency	★	Factory Setting	0.50
	Settings	0.00～600.00 Hz		

This parameter sets the Upper Mid-point Frequency of the V/F curve.
This parameter must meet the following argument. Pr1-01 >= Pr1-03 >= Pr1-05.

1-04	Upper Midpoint Output Voltage		Setting resolution	0.1
230V models	Settings	0.0～255.0V	Factory Setting	5.0
460V models	Settings	0.0～510.0V	Factory Setting	10.0

This parameter sets the Upper Mid-point Voltage of the V/F curve.
This parameter must meet the following argument. Pr1-02 >= Pr1-04 >= Pr1-06.

1-05	Lower Midpoint Output Frequency	★	Factory Setting	0.50
	Settings	0.00～600.00 Hz		

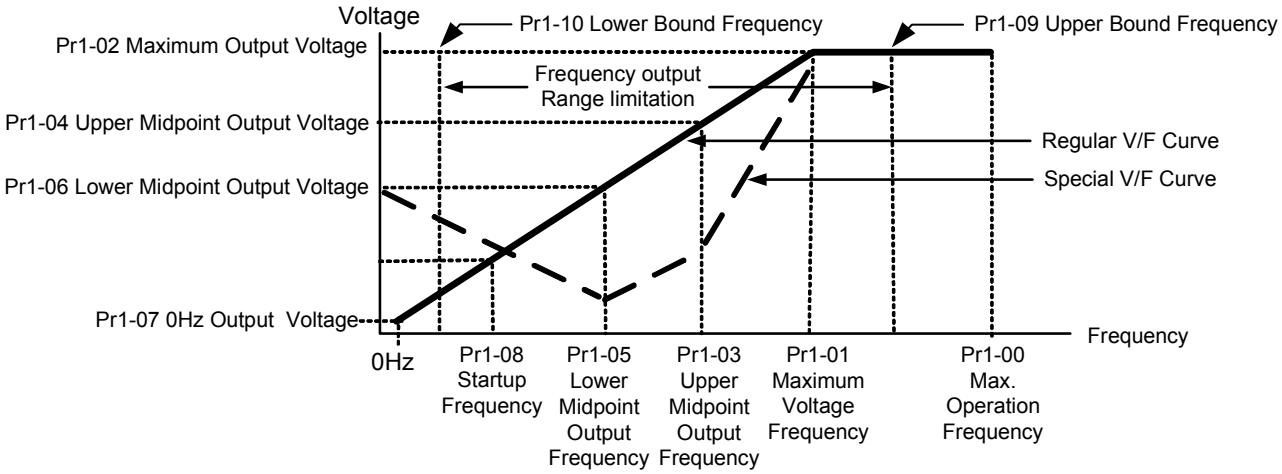
This parameter sets the Lower Midpoint Output Frequency of the drive. This parameter must be lower than or equal to the Upper Mid-point frequency.

1-06	Lower Midpoint Output Voltage		Setting resolution	0.1
230V models	Settings	0.0～255.0V	Factory Setting	5.0
460V models	Settings	0.0～510.0V	Factory Setting	10.0

This parameter sets the Lower Midpoint Output Voltage of the dive. The parameter must be lower than or equal to the Upper Mid-point Voltage.

1-07	0Hz Output Voltage		Setting resolution	0.1
230V models	Settings	0.0～255.0V	Factory Setting	0.0
460V models	Settings	0.0～510.0V	Factory Setting	0.0

Setting of the V/F curve figure is usually based upon the motor's allowable loading characteristics. Pay special attention to the motor's heat dissipation, dynamic balance, and bearing lubricity, if the loading characteristics exceed the loading limit of the motor.



V/F Curve

1-08	Startup Frequency		Factory Setting	0.50
	Settings	0.00～600.00 Hz		

The Start-up Frequency is the initial frequency output upon a RUN command. If the startup frequency setting is higher than the Maximum Output Frequency (Pr1-00), the drive will default to Pr1-00 as the start point.

When the Pr6-11 (Speed-Tracing Function) is enabled, Pr1-08 (Start-up frequency) is disabled.

1-09	Upper Bound Frequency	Factory Setting	110.0
	Settings	0.0～150.0% of Maximum Operation Frequency (Pr1-00)	
1-10	Lower Bound Frequency	Factory Setting	0.0
	Settings	0.0～100.0% of Maximum Operation Frequency (Pr1-00)	

These parameters set the upper and lower bound of the output frequency. If the command frequency is lower than the Start-up frequency, the motor will be operating at ZERO speed;

If the command frequency is lower than the lower bound frequency, the motor will be operating at lower bound frequency; if the command frequency is higher than the Upper Bound frequency, the motor will then operate at the Upper Bound frequency. This function is disabled if the Lower Bound > the Upper Bound.

This function is disabled if the Lower Bound > the Upper Bound.

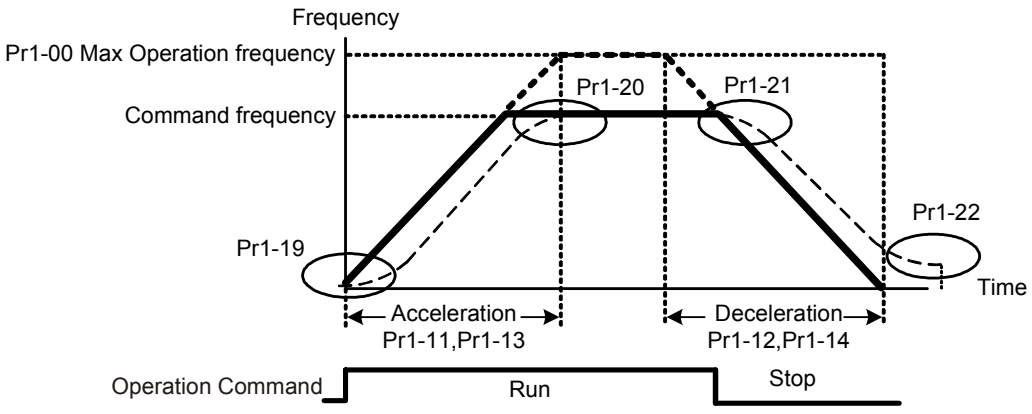
1-11	The 1st Acceleration Time	Factory Setting	10.00/60.00
1-12	The 1st Deceleration Time	Factory Setting	10.00/60.00
1-13	The 2nd Acceleration Time	Factory Setting	10.00/60.00
1-14	The 2nd Deceleration Time	Factory Setting	10.00/60.00
	Settings	0.00～60000 Sec	

The Acceleration time is the time required for the Drive to ramp from 0 Hz to its Maximum Operation Frequency (Pr1-00). Deceleration time is the time required for the Drive to decelerate from Maximum Operation Frequency (Pr1-00) down to 0 Hz.

An Acceleration or Deceleration time that is too quickly, may cause the Drive protection features to enable (over-current stall prevention during Accel Pr5-10 or over-voltage stall prevention Pr5-07). If this occurs, the actual Accel/Decel time will be longer than this setting.

The acceleration/deceleration times will be disabled if Pr0-12. (Auto acceleration/deceleration Selection) is set for automatic operation.

Acceleration/Deceleration times 2 is enabled by using a multi-function terminal set to 7. Acceleration/Deceleration time 1 is the factory default for out-of-the-box operation.



Definition of the Acceleration/Deceleration Time

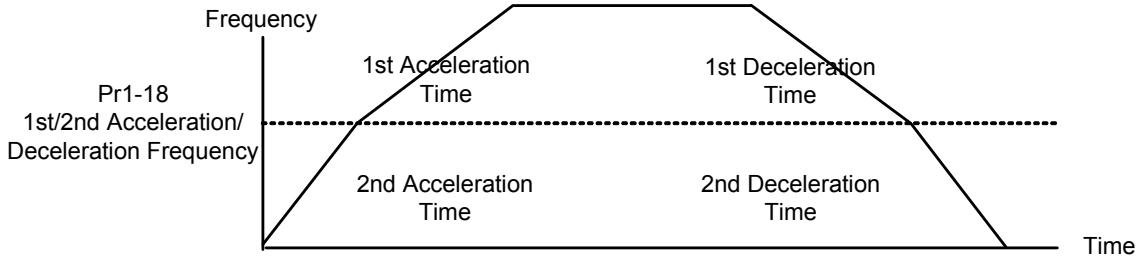
Warning: An acceleration or deceleration that is too quickly, may cause excess loads on the drive and may permanently damage the drive.

If you want to decelerate the Drive in short time period, we recommend adding an external braking module and braking resistor.

1-18	1st/2nd Acceleration/Deceleration Frequency			
	Settings	0.00～600.00 Hz	Factory Setting	0.000

This parameter selects the frequency point for transition from acceleration/ deceleration time 1 to acceleration/deceleration time 2.

The transition from acceleration/deceleration time 1 to acceleration/ deceleration time 2, may also be enabled by the external terminals. The external terminal has priority over Pr1-18.



1st/2nd Accerleration/Deceleration Switching

1-19	S-Curve for Acceleration Departure Time	Factory Setting	0.00
1-20	S-Curve for Acceleration Arrival Time	Factory Setting	0.00
1-21	S-Curve for Deceleration Departure Time	Factory Setting	0.00
1-22	S-Curve for Deceleration Arrival Time	Factory Setting	0.00
	Settings	0.00～12000 Sec	

This parameter determines the S curve strength. A large S curve time will give the smoothest transition between speed changes. Please note the S curve settings increase the actual acceleration/deceleration times as follows:

Actual acceleration time = [½(Pr1-19) + ½(Pr1-20) + Pr1-11]

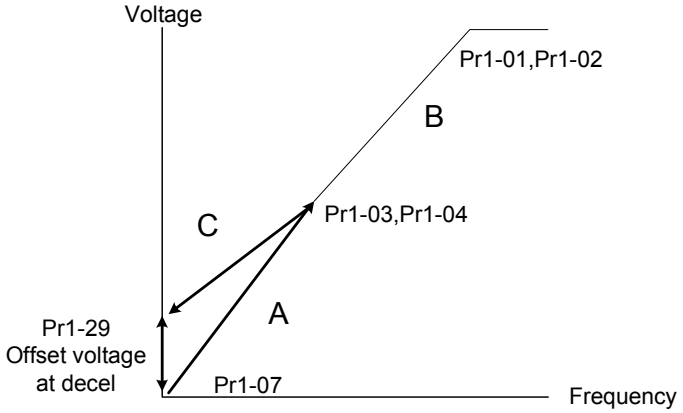
The S curve is disabled when Auto Acceleration/Deceleration Speed Selection is set to Auto or Acceleration /Deceleration times are set to 0.

1-23	Skip Frequency 1 (upper limit)	★	Factory Setting	0.00
1-24	Skip Frequency 1 (lower limit)	★	Factory Setting	0.00
1-25	Skip Frequency 2 (upper limit)	★	Factory Setting	0.00
1-26	Skip Frequency 2 (lower limit)	★	Factory Setting	0.00
1-27	Skip Frequency 3 (upper limit)	★	Factory Setting	0.00
1-28	Skip Frequency 3 (lower limit)	★	Factory Setting	0.00
	Settings	0.00～600.00 Hz		

These parameters determine the skip frequencies of the Drive.
Please use the following hierarchy when setting these parameters:
Pr1-23 > Pr1-24 >Pr1-25 > Pr1-26> Pr1-27 > Pr1-28.
The Skip frequency will be disabled if this rule is not followed.
The Skip Frequencies are useful when a motor has vibration at a specific frequency bandwidth. By skipping this frequency, the vibration will be avoided.

1-29	Offset voltage at decel		Factory Setting	0.0
	Settings	230V models :-50.0~50.0 V	460V models :-100.0~100.0 V	

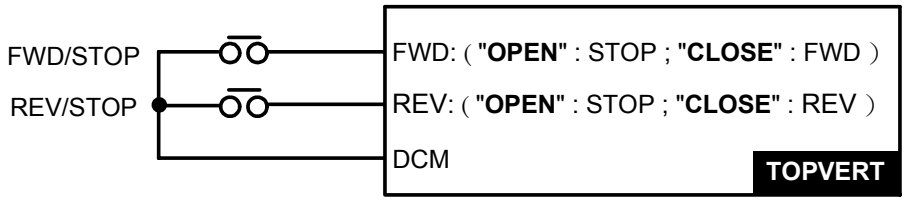
Acceleration route is A-B. Deceleration route is B-C. This parameter can be used when acceleration and deceleration are with different torques.

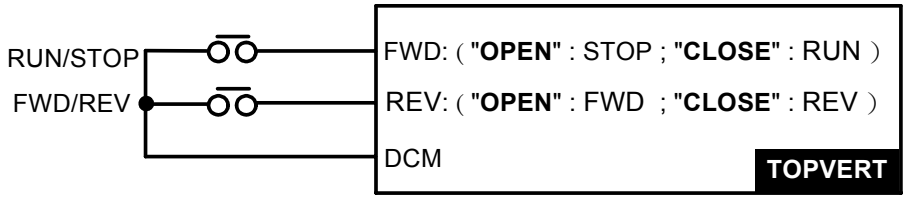
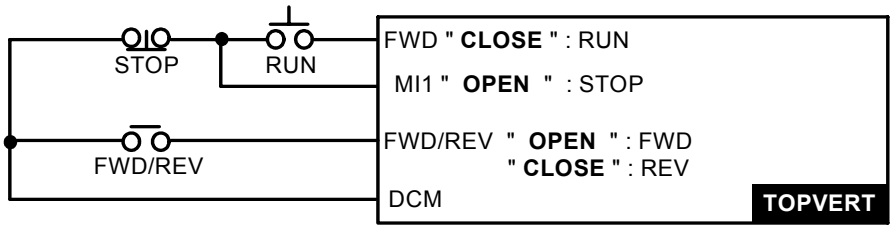


2 Digital Output/Input Parameters (Need optional I/O card)

2-00	2-Wire/3-Wire Operation Control		★	Factory Setting	0
	Settings	0	2-Wire (1)		
		1	2-Wire (2)		
		2	3-Wire (MI1)		

The drive offers three types of external operation control.
For “Line Start Lockout” setting, please refer to Pr0-20
When 3-wire operation control was selected, the stop signal (between MI1 and DCM) must be a normal close connection.

Pr2-00	Control Circuits of the External Terminal
0 2-wire operation FWD/STOP REV/STOP	

1 2-wire operation RUN/STOP FWD/REV	
2 3-wire operation control	

2-01	**Multi-Function Input Command 1 (MI1)**	★	Factory Setting	1
2-02	**Multi-Function Input Command 2 (MI2)**	★	Factory Setting	2
2-03	**Multi-Function Input Command 3 (MI3)**	★	Factory Setting	3
2-04	**Multi-Function Input Command 4 (MI4)**	★	Factory Setting	4

Setting	Functions	Explanations
1	multi-step speed command 1	15 step speeds could be conducted through the digital statuses of the 4 terminals, and 17 in total if the master speed are included.
2	multi-step speed command 2	
3	multi-step speed command 3	
4	multi-step speed command 4	
5	Reset （NO）	After the error of the drive is eliminated, use this terminal to reset the drive
6	clear counter	When this terminal is functioning, the currently displayed counter value will be cleared and “0” is then displayed; the drive could only accept the trigger signals to keep counting upward after this signal disappeared.
7	the 1st, 2nd acceleration/ deceleration time selection	The acceleration/deceleration time of the drive could be selected from this function or the digital statuses of the terminals; there are 2 acceleration/ deceleration speeds in total for selection.
8	acceleration/deceleration speed inhibit	When the acceleration/deceleration speed inhibition function is executed, the drive will stop the acceleration/ deceleration immediately; the drive will go on with the acceleration/ deceleration from where it stopped earlier after this command is removed
9	operation speed command from AVI	When this setting is enabled, forced drive operation speed command from AVI

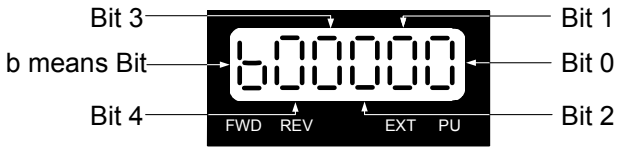
10	operation speed command from ACI	When this setting is enabled, forced drive operation speed command from ACI
12	Emergency Stop	These parameter function is the same as the “STOP” command. It won’t display any error message. Once parameter value 12 occurs, you need to press “RUN” to run drive or to place a run command.
13	PID function disabled	When this setting is enabled, PID feedback control function will be disabled. Drive will operate via Master Frequency Command source Pr0-18.
14	EF input	When the drive receives the signals of malfunction and emergency stop and generates an external fault (EF1). Please press “RESET” after fault has been cleared. The function is identical to the external terminal (EF)
15	B.B. traces from the bottom upward	If the ON/OFF function of the terminal is pre-determined, output of the drive will be cut off immediately, and the motor will then be of the B.B. status. And once the ON/OFF function is restored, the drive will then trace from the bottom upward to catch up with its mutual rotation speed with the same frequency before B.B., then speed up to the pre-set frequency. Even if the motor is of a complete stop after B.B., as long as the ON/OFF status is restored, the speed-tracing function could still be operated.
16	B.B. traces from the top downward	
17	Operation Command selection (Keypad = terminal open) (External terminals = terminal closed).	External selection of the Operation Command Source. Pr0-19 will automatically be disabled once this parameter value is enabled; the situation will be determined by the terminals. If the terminal is open, it is via keypad; if closed, it is via the external terminals otherwise.
18	Cancel the setting of the optimal acceleration/ deceleration time	If enables, the auto accel/ ecal mode set by Pr0-12 will be disabled, Then the drive willrun in Linear acceleration/deceleration
22	Disable PLC RUN	To disable the drive internal PLC RUN program.
23	Pause PLC RUN	To enable the drive internal PLC RUN program.
24	Digital Up command	Enables the external terminals to increase or decrease the Master Frequency command each time an input is received. Terminals are not active during a stop command. Refer to Pr0-18, Pr2-07, Pr2-08
25	Digital Down command	

26	Zero speed is replaced by DC current control	It is a zero speed command and it is valid during running. It is used to improve the vibration by using DC mode at zero speed when drive is not matched with motor or parameter settings of motor is not very well. Refer to Pr6-00
27	Pause Stop	Drive stops at this moment and it will run after closing the function of this terminal.
28	Disable Dwell function	When this setting is enabled, Dwell function is disabled Refer to Pr6-14~ Pr6-18
29	Disable Interfere jump function	When this setting is enabled, Interfere jump function is disabled Refer to Pr6-19, Pr6-20
30	Cancel Speed search	When this setting is enabled, Speed Search function is disabled. Refer to Pr6-11
31	EEPROM write function disable	When this setting is enabled, EEPROM write function is disabled.

This parameter selects the functions for each multi-function terminal.

Note 1: If Pr2-00 is set to 3-wire operation control. Terminal MI1 is needed for the third wire position. Therefore MI1 is not allowed for any other operation. Full List of the Functions

2-07	**UP/DOWN key mode**		Factory Setting	b00000
Settings	0	UP/DOWM following the acceleration/ deceleration time		
	1	UP following the constant speed, and DOWN following the deceleration time		
	2	UP following the acceleration time, and DOWN following the constant speed		
	3	UP/DOWN following the constant speed		



The maximum Up/Down acceleration/deceleration speed is 10.00Hz/Sec.

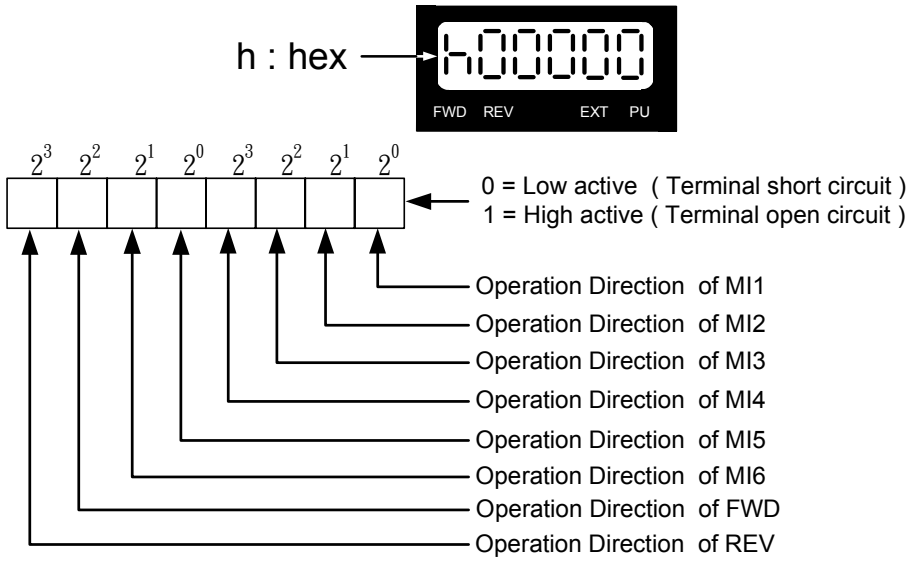
2-08	**The Acceleration /Deceleration Speed of the UP/DOWN Key with Constant Speed**		Factory Setting	0.01
	Settings	0.01～1.00Hz/msec		
2-09	**Digital Input Responding Time**		Factory Setting	0.005
	Settings	0.001～30.000 Sec		

Function of this parameter is to delay or confirm the message of the digital input terminals; the delayed time is the confirmation time, which will be helpful in preventing some uncertain interferences that would consequently result in erroneous motions (except for the counter input)

in the input of the digital terminals (FWD, REV, and MI1~4), and under this condition, confirmation for this parameter could be improved effectively, but the responding time will be somewhat delayed.

2-10	Digital Input Operation Direction			Factory Setting	h00000
	Settings	00000～000FF			
		Bit 0~7	0~1	0=Low active 1=High active	

This parameter determines the level of the input signal operation.



2-11	Pre-set target Counter Values Achieved		Factory Setting	0
	Settings	0～65500		

The input contact of the counter could set the multi-function terminal MI2 (with the designated terminal Pr2-02 as 32) as the trigger terminal, and when the counting is over (which reaches the destination), the signals could select one among the multi-function output terminals (with Pr2-19,Pr2-21 set as 15) to be the motion contact.

2-12	Pre-warn Counter Value Achieved		Factory Setting	0
	Settings	0～65500		

When the counter value starts counting upward from 1 to the setting of this parameter, its corresponding multi-function output terminal contact with the “arbitrary counting achieves the output indication” function would start functioning. This parameter could be utilized at the moment when the counting is almost to an end, and then, set the output signal to enable the drive operating at a low speed till it stopped.

This signals could select one among the multi-function output terminals (with Pr2-19,Pr2-21 set as 16) to be the motion contact.

The Time-and-Order Diagram is shown as follows:

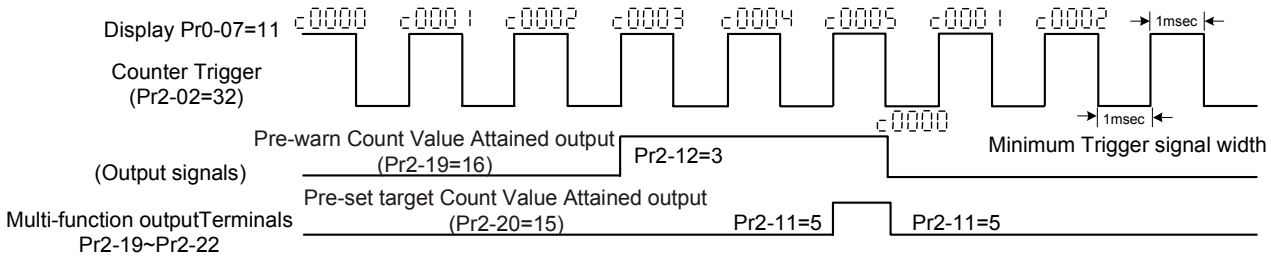
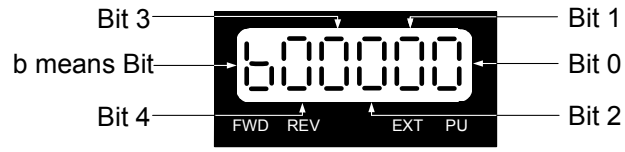


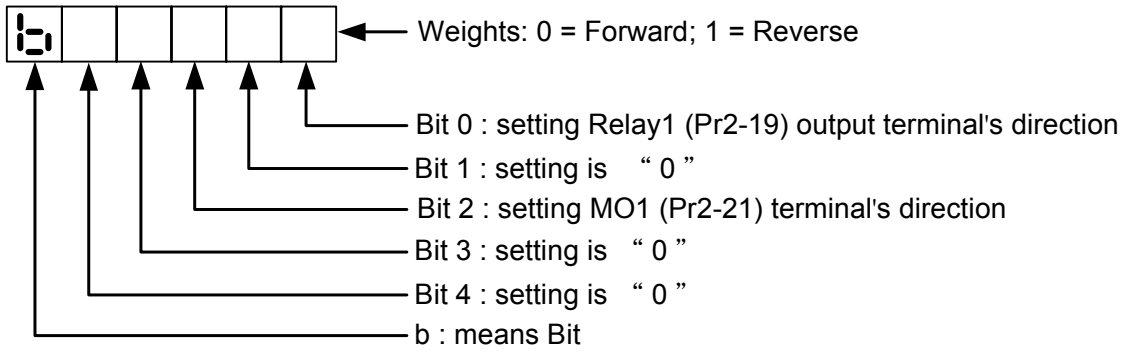
Diagram of the External Counter Terminal and Arrival of the Counter Value

2-14	**Pre-set Arrival Frequency 1**	Factory Setting	60.00/50.00
	Settings 0.00～600.00 Hz		
2-15	**Pre-set Arrival Frequency 1 band width**	Factory Setting	2.00
	Settings 0.00～600.00 Hz		
2-16	**Pre-set Arrival Frequency 2**	Factory Setting	60.00/50.00
	Settings 0.00～600.00 Hz		
2-17	**Pre-set Arrival Frequency 2 band width**	Factory Setting	2.00
	Settings 0.00～600.00 Hz		

Once the drive output speed (frequency) achieves the arbitrary designated (speed) frequency, and that if the corresponding multi-function output terminal is set as 2~7 (Pr2-19,Pr2-21), then the multi-function output terminal contact will be “closed”.

2-18	**Multi-Function Output Direction**	Factory Setting	b00000
	Settings Bit 0～Bit 3 separate setting as table in below		

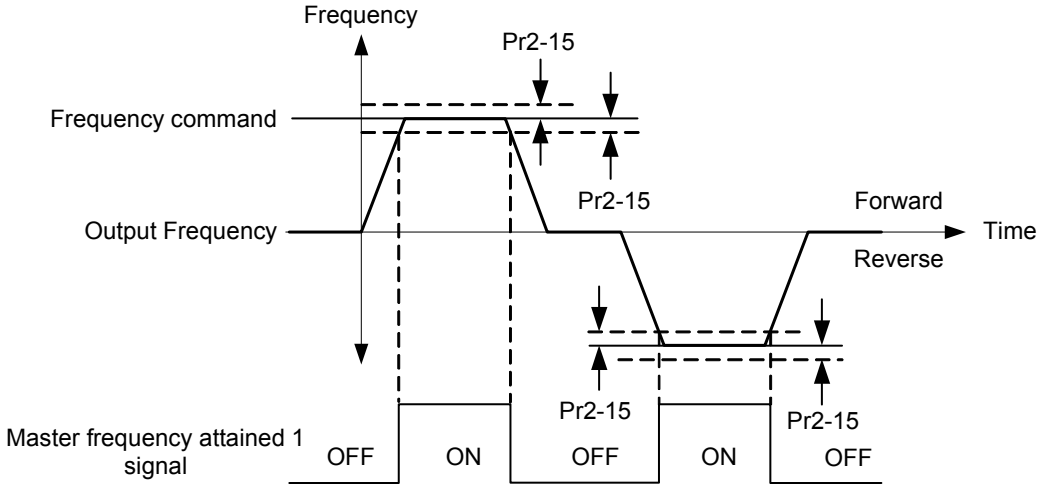
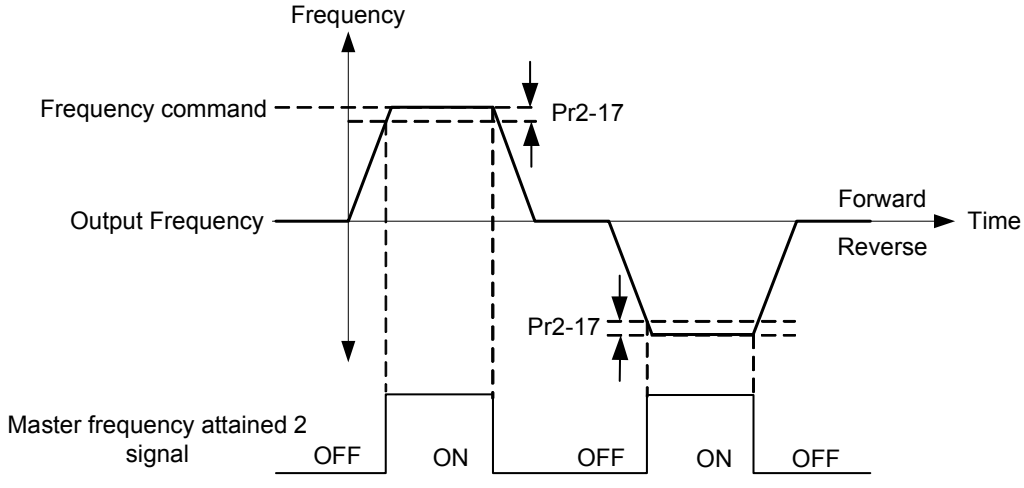


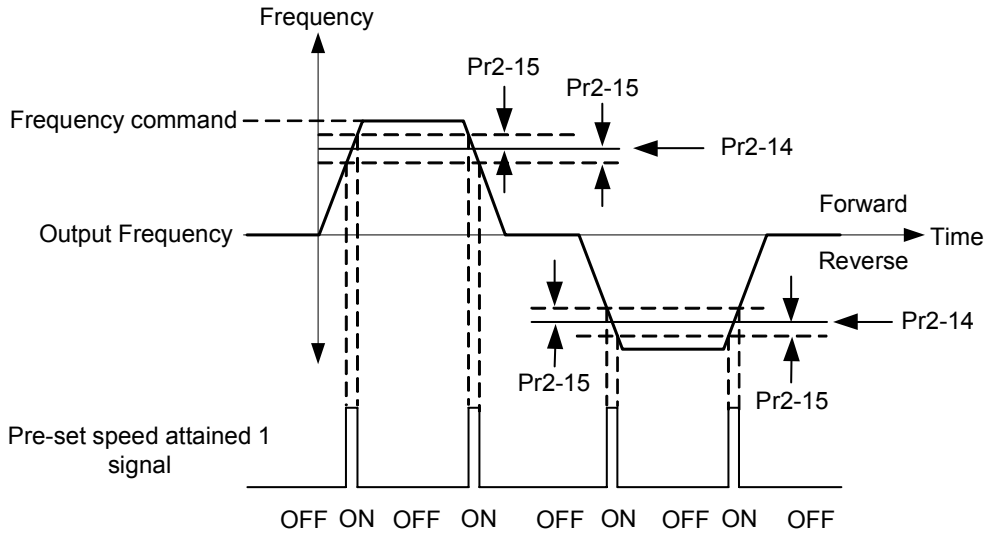
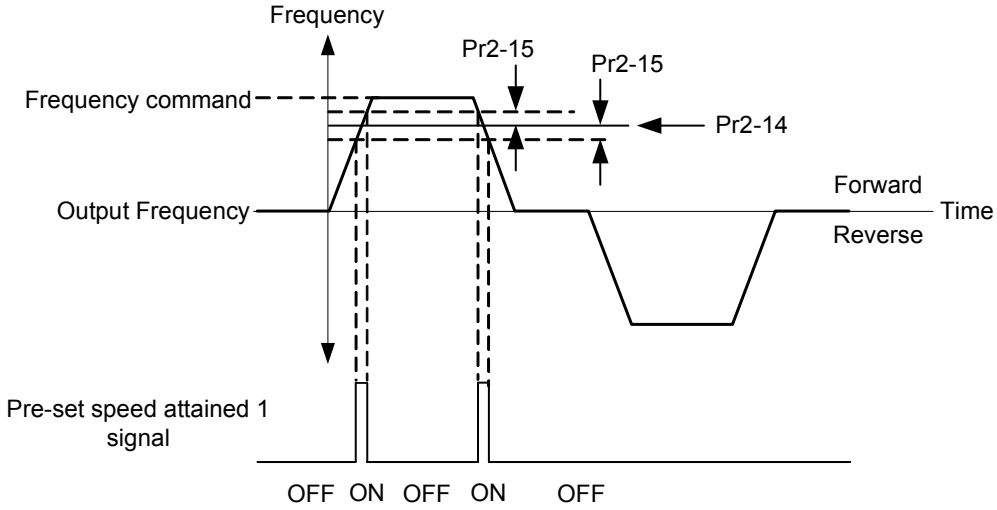


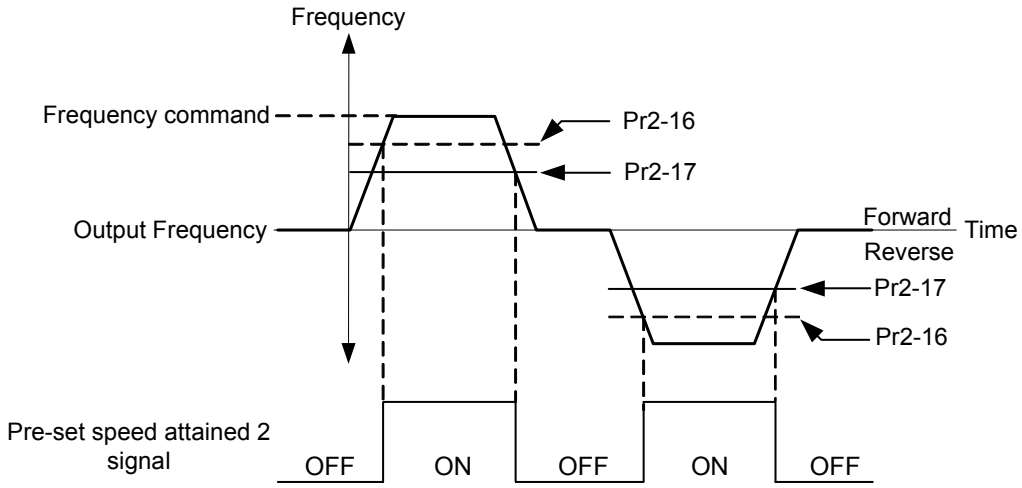
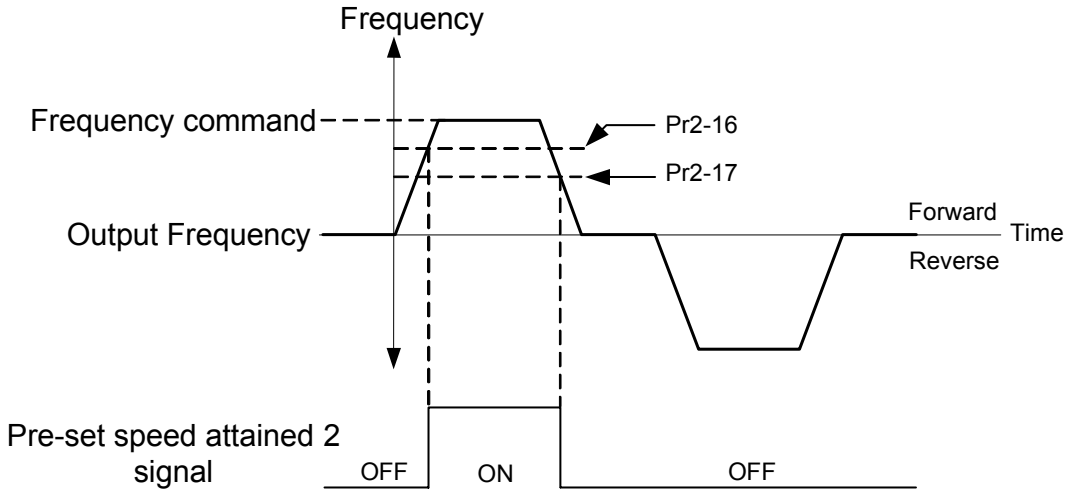
This function uses the Bit setting method.

Example: If Pr2-19 is 1 (Drive running), and Relay 1 is set to N.O., then R1 close when the drive has an output and will open when the drive has stopped.

2-19	Multi-Function Output 1 R1A, R1B, R1C (Relay 1)	Factory Setting	11
2-21	Multi-Function Output 3 (MO1)	Factory Setting	5

Settings	Functions	Explanations
1	Drive running	The corresponding output will be closed during operation (including DC braking time).
2	Master frequency attained 1 (Both Forward and Reverse)	The corresponding output will be closed when output frequency equal to master command frequency or within the band width (Pr2-15). Effective both Forward and Reverse
		
3	Master frequency attained 2 (Both Forward and Reverse)	The corresponding output will be closed when drive accel to master command frequency or within the bandwidth (Pr2-17). But will neglect the bandwidth (Pr2-17) while in decel. Effective both Forward and Reverse
		

4	Pre-set speed attained 1 (Both Forward and Reverse)	The corresponding output will be closed when output frequency equal to pre-set speed attained 1 (Pr2-14) or within the bandwidth (Pr2-15). Effective both Forward and Reverse
		
5	Pre-set speed attained 1 (Forward only)	The corresponding output will be closed when output frequency equal to pre-set speed attained 1 (Pr2-14) or within the bandwidth (Pr2-15). Effective only in Forward.
		

6	Pre-set speed attained 2 (Both Forward and Reverse)	The corresponding output will be closed when drive accel to pre-set speed attained 2(Pr2-16) .But will count in the band width (Pr2-17) while in decel. Effective both Forward and Reverse
		
7	Pre-set speed attained 2 (Forward only)	The corresponding output will be closed when drive accel to pre-set speed attained 2(Pr2-16) But will count in the band width (Pr2-17) while in decel. Effective both Forward and Reverse. Effective only in Forward.
		
8	Drive in decel	The corresponding output will be closed when the drive in decel.
9	Drive ready for use	The corresponding output will be closed the when the drive is ready and has no faults.
10	Low voltage alarm (LV)	The corresponding output will be closed when the DC Bus voltage drops below setted value in Pr5-06. The keypad will display “Lu”.
11	Fault Indication	The corresponding output will be closed when drive has experienced a fault.

12	Base block (B.B.) Indication	The corresponding output will be closed when when the drive is shut off by external baseblock.
13	Zero Speed (including shutdown)	The corresponding output will be closed when the drive has no output voltage.
14	Zero speed (while in run)	The corresponding output will be closed when the drive has no output voltage.（Not including shutdown, must while run command active）
15	Pre-set target Count Value Attained	The corresponding output will be closed when Pre-set target Counter Values Achieved (Pr2-11)
16	Pre-warn Count Value Attained	The corresponding output will be closed when Pre-warn Count Value Attained (Pr2-12)
17	PLC RUN Command	The corresponding output will be closed when PLC Program is running
18	PLC RUN paused	The corresponding output will be closed when PLC RUN operation is paused.
19	A step of PLC RUN completed	The corresponding otput will be closed for 0.5 sec when each multi-step speed is completed
20	PLC RUN completed	The corresponding output will be closed for 0.5 sec when the PLC RUN cycle has completed
21	Heatsink over-heat indication	The corresponding output will be closed when the heatsink temperature exceeds the over-heat value setted in Pr5-16
22	Gear Gap Accel/Decel interruption	The corresponding output will be closed when the Gear Gap Accel/Decel interrupted. Refer to Pr6-14, Pr6-16
23	Operation Mode indication	The corresponding output will be closed when the drive “Operation Command” is controlled by the external terminals.
24	Over-torque (ot)	The corresponding output will be closed when the drive output current exceeds the over-torque detection level Pr5-16
26	Software braking output (MO1, Pr2-21 only)	The corresponding output will be closed when the drive DC bus voltage exceeds the braking level setted value in Pr5-08.
27	Auxiliary Motor no. 1	For the fan & pump control applications, one can use the Multi-function Output Terminals to define the auxiliary motor Pr1-3. Refer to Chapter 5-7 (PID Controls) and CH 5-8 (Fan and Pump Control).
28	Auxiliary Motor no. 2	
29	Auxiliary Motor no. 3	
32~47	PLC RUN step indication	Corresponds to the 0~15 step speeds
48~63	Multi-step indication	Corresponds to the 0~15 step speeds

3 Analog Output/Input Parameters (Need optional I/O card)

3-00	Addition Function of the Analog Inputs			Factory Setting	0
	Settings	0	enable addition function		
		1	disable addition function (AVI,ACI)		

If the addition between AVI and ACI are disabled, and that the selections on the analog input setting function are similar among the three, the priority order of the analog input will be: AVI > ACI .

If the addition between a positive value and a negative value is meaning subtract

3-01	Analog Input Noise Filter		Factory Setting	0.10
	Settings	0.00~2.00 sec		

Interferences commonly exist with analog signals, such as those entering AVI and ACI. These interferences constantly affect the stability of analog control and using the Input Noise Filter will create a more stable system.

If Pr3-01 is large, the control will be stable, yet the response to the input will be slow.

If Pr3-01 is small, the control may be unstable, yet the response to the input will fast.

3-02	AVI Analog Input			Factory Setting	1
Valid for ACI (Pr3-06)	Settings	0	No functions		
		1	Frequency command		
		2	Acceleration/deceleration time gain (increase or decrease time base)		
		3	Over-current stall prevention level during operation		
		4	Over-current stall prevention level during Acceleration		
		5	Over-torque current level		
		6	Torque compensation gain		
		7	AVI auxiliary frequency (multiplication by the ratio of AVI)		
		8	ACI auxiliary frequency (multiplication by the ratio of ACI)		
		9	(Factory Reserved)		
		10	Auxiliary frequency of master frequency		
		11	PID feedback		
		12	PID offset		
		13	DC level (same as Pr6-00)		
		14	Torque adjust during run. (AVI only)		

When 14 setted, a external analog voltage (0.00～10.00V) signal can be use as a torque adjust command during run.

The function is identical to the Upper Midpoint Output Voltage adjust (Pr1-04).

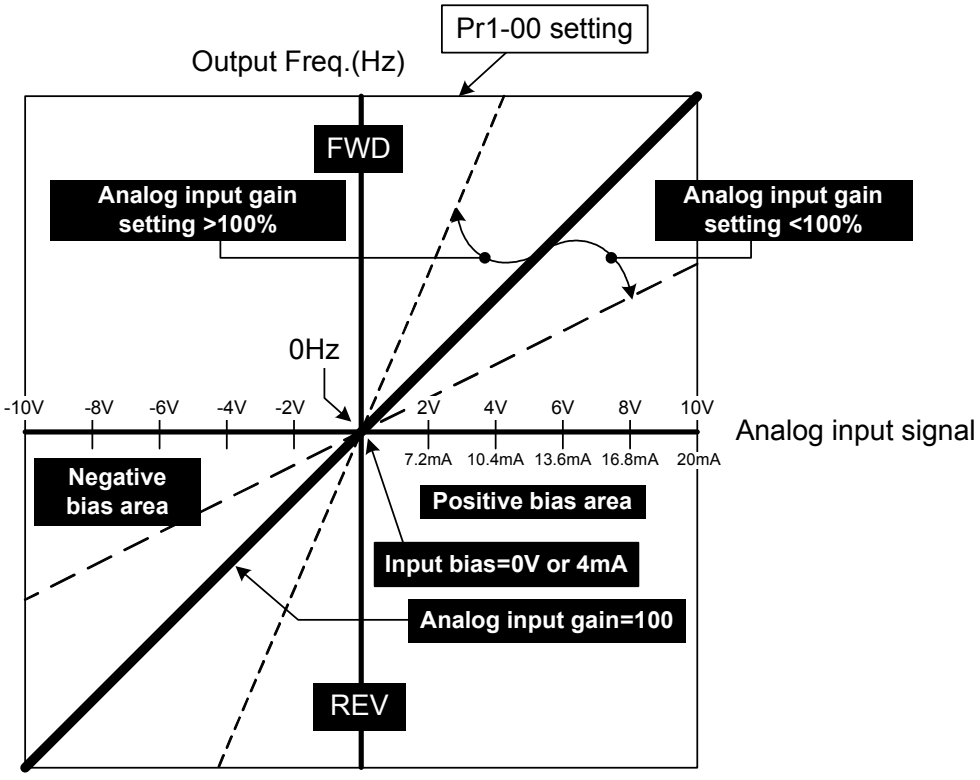
This performance make “Topvert + induction motor” can work as a torque motor control system which are very popular using in winding applications.

3-03	AVI Analog Input Bias		Factory Setting	0.00
	Settings	-10.00～10.00V		

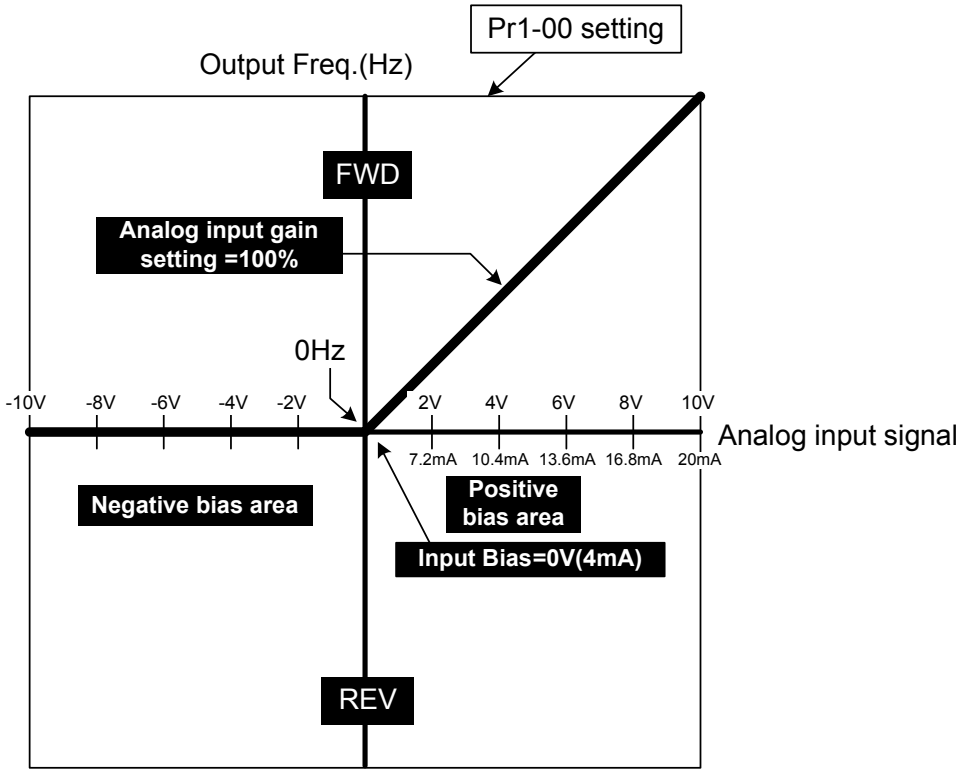
This parameter determines the AVI voltage value that corresponds to 0Hz frequency.

3-04	AVI Analog Input Gain		Factory Setting	100.0
	Settings	-500.0～+500.0%		

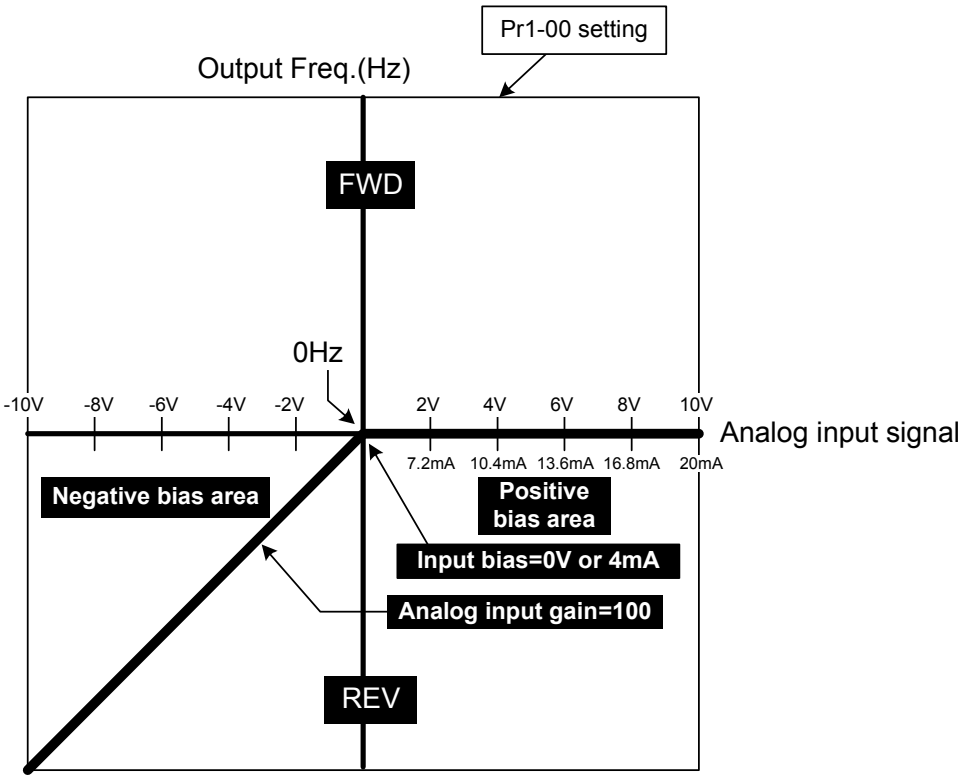
3-05	AVI Positive/Negative Bias Mode		Factory Setting	0
	Settings	0	zero bias	
		1	value lower than bias = bias	
		2	value higher than bias = bias	
		3	the absolute value of the bias voltage while serving as the center	



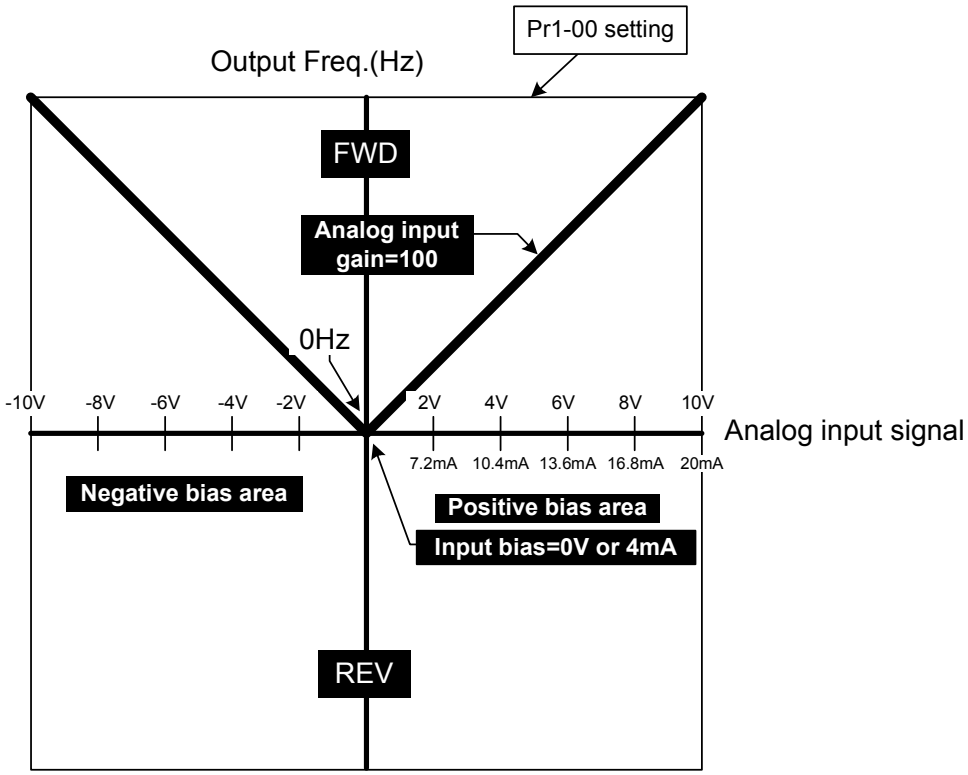
Positive/negative bias mode:
Bias as the center
(Pr3-05=0 or Pr3-09=0 or Pr3-14=0)



Positive/negative bias mode:
lower than "bias = bias"
(Pr3-05=1 or Pr3-09=1 or Pr3-14=1)



Positive/negative bias mode:
higher than "bias = bias"
(Pr3-05=2 or Pr3-09=2 or Pr3-14=2)



Positive/negative bias mode:
Absolute value of the bias
(Pr3-05=3 or Pr3-09=3 or Pr3-14=3)

3-06	ACI Analog Input		Factory Setting	0.00
3-07	ACI Analog Input Bias		Factory Setting	4.00
	Settings	0.00～20.00mA		

This parameter determines the ACI current value that corresponds to 0Hz frequency.

3-08	ACI Analog Input Gain (Same as Pr3-04)		Factory Setting	100.0
	Settings	-500.0～+500.0%		

3-09	ACI Positive/Negative Bias Mode (Same as Pr3-05)		Factory Setting	1
	Settings	0	zero bias	
		1	value lower than bias = bias	
		2	value higher than bias = bias	
		3	the absolute value of the bias voltage while serving as the center	

3-10	Loss of the ACI signal		Factory Setting	0
	Settings	0	disabled	
		1	continue operation at last known frequency	
		2	decelerate to a stop	
		3	stop immediately and display AcI	

This parameter determines the operation of the drive when the 4~20mA (ACI) signal is lost.

AVI Input Gain (Pr3-04) calculation is:

$$\text{Input Gain}=\frac{\text{Expected output Freq. (Hz) at the max external analog voltage}}{[\text{Max external analog volt}-\text{Input Volt (Pr3-03)}]\ (\text{V})}\times\frac{10\text{V}}{\text{Pr1-00 (Hz)}}\times 100\%$$

ACI Input Gain (Pr3-08) calculation is:

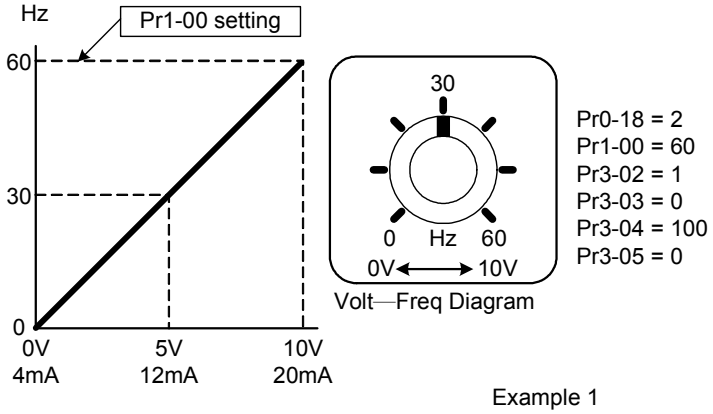
$$\text{Input Gain}=\frac{\text{Expected output Freq (Hz) at the max external analog current}}{[\text{Max external analog current}-\text{Input bias (Pr3-08)}]\ (\text{mA})}\times\frac{(20-4)\ \text{mA}}{\text{Pr1-00 (Hz)}}\times 100\%$$

The benefit of negative bias setting is to prevent the noise interfere. Please avoid using the smaller than 1V signal to set up inverter's operation frequency.

Pr3-02 ~ Pr3-05 are to adjust the parameters when frequency is set by analog voltage signals from AVI terminal.

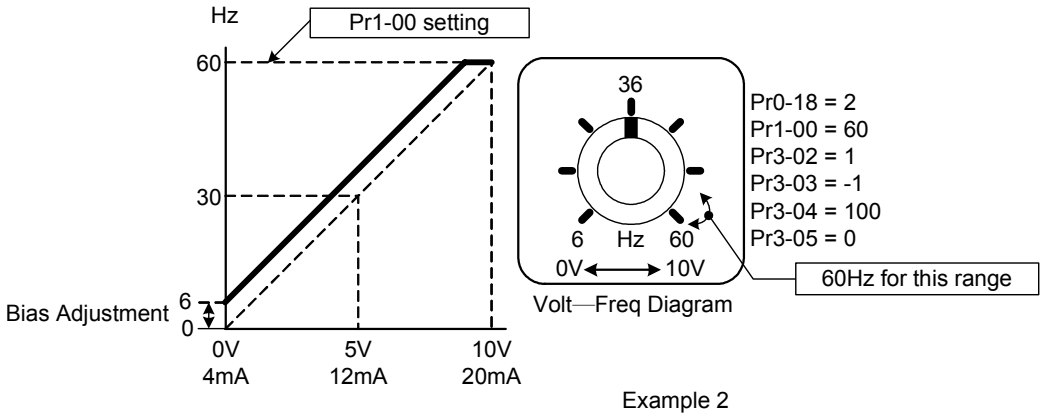
Pr3-06 ~ Pr3-10 are to adjust the parameters when frequency is set by analog current signals from ACI terminal.

Please read following examples, when the frequency settings are by voltage signals (0~10V or 0~ ±10V), current signals (4~20mA) or potentiometer from external analog terminals:



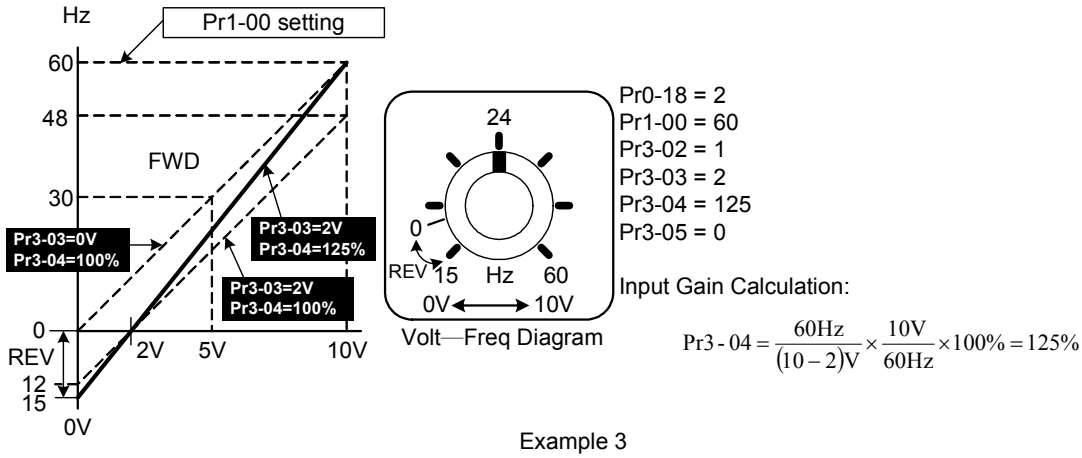
Example 1

This is the most common application. After completing the parameter settings, the user can adjust the output frequency by signals from external analog terminals or by potentiometer.



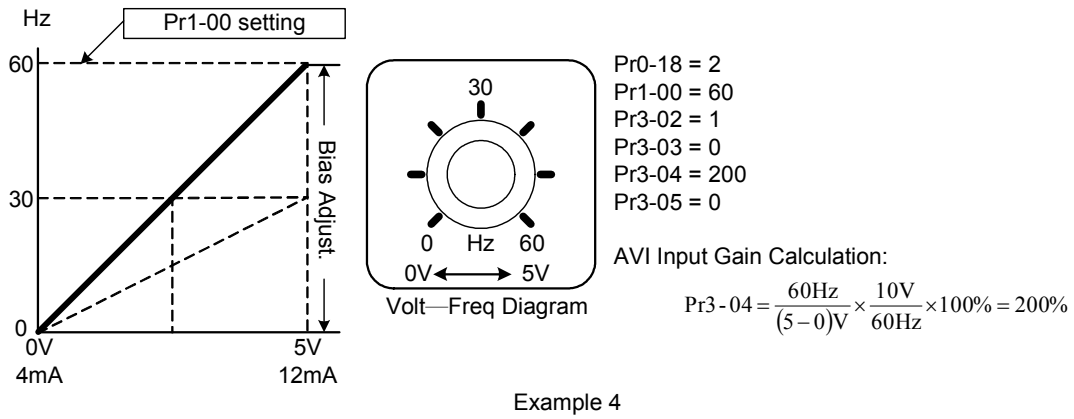
Example 2

In this example, when base voltage is 0V, the output frequency is 6Hz.

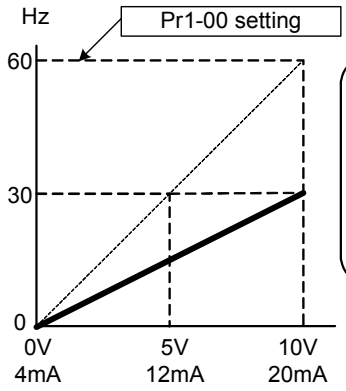


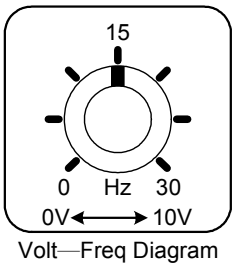
Example 3

This is a proportional control application. When the output frequency is 0, the out put voltage should be 0V. If the input power surge induces interfere and the frequency has been shifted, the user can set Pr3-03 to “2”to induce a reverse torque to stop the motor running. This application has been used on cabling industry and spindling industry.



Example 4



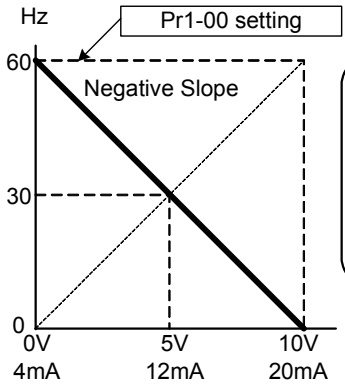


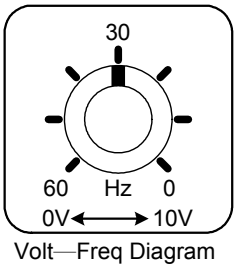
Pr0-18 = 2
Pr1-00 = 60
Pr3-02 = 1
Pr3-03 = 0
Pr3-04 = 50
Pr3-05 = 0

Input Gain Calculation:

$$Pr3-04 = \frac{30Hz}{(10-0)V} \times \frac{10V}{60Hz} \times 100\% = 50\%$$

Example 5

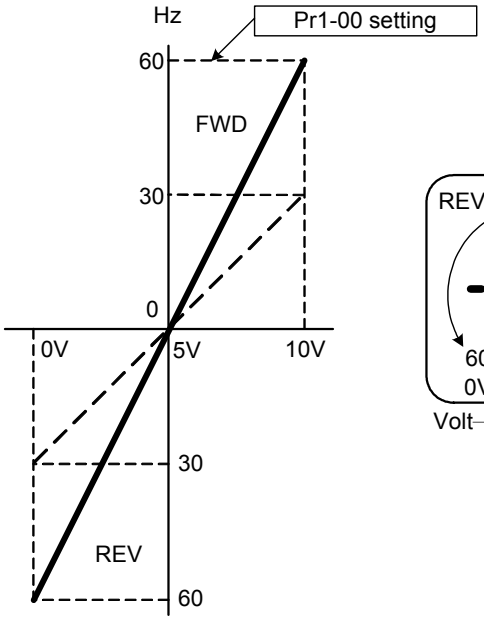


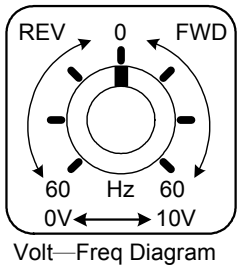


Pr0-18 = 2
Pr1-00 = 60
Pr3-02 = 1
Pr3-03 = 10
Pr3-04 = -100
Pr3-05 = 0

Example 6

This is a negative slope application. In pressure, temperature and flow control applications, many sensors have a 20mA output to tell inverters to stop or decelerate. But in this application, the direction cannot be changed.





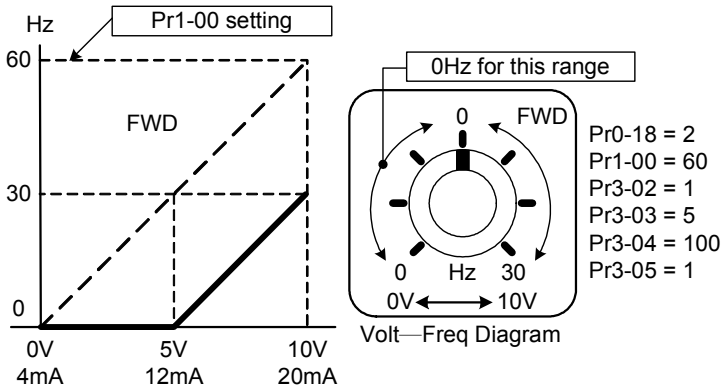
Pr0-18 = 2
Pr1-00 = 60
Pr3-02 = 1
Pr3-03 = 5
Pr3-04 = 200
Pr3-05 = 0

Input Gain Calculation:

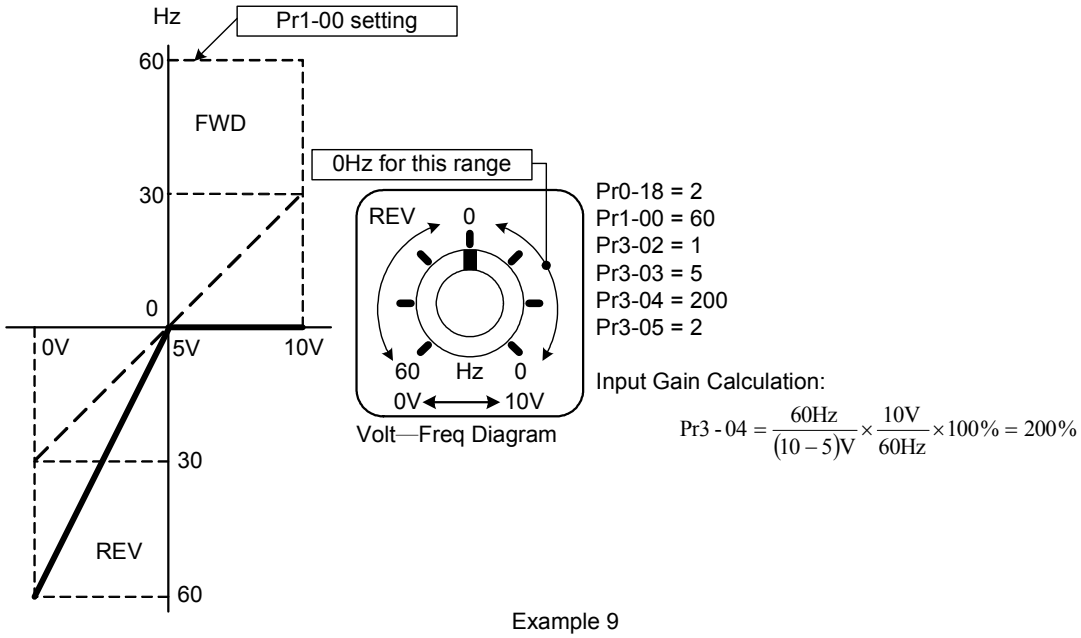
$$Pr3-04 = \frac{60Hz}{(10-5)V} \times \frac{10V}{60Hz} \times 100\% = 200\%$$

Example 7

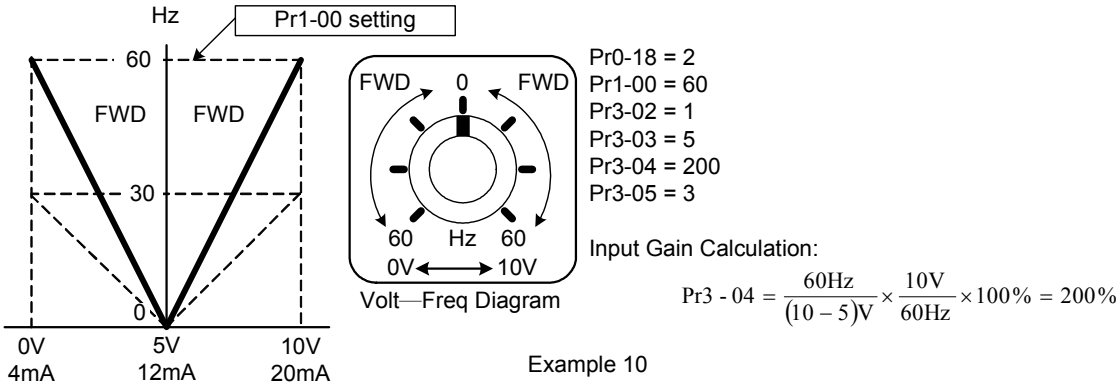
In this application, if the voltage response time is shortened, it will generate the max torque output.



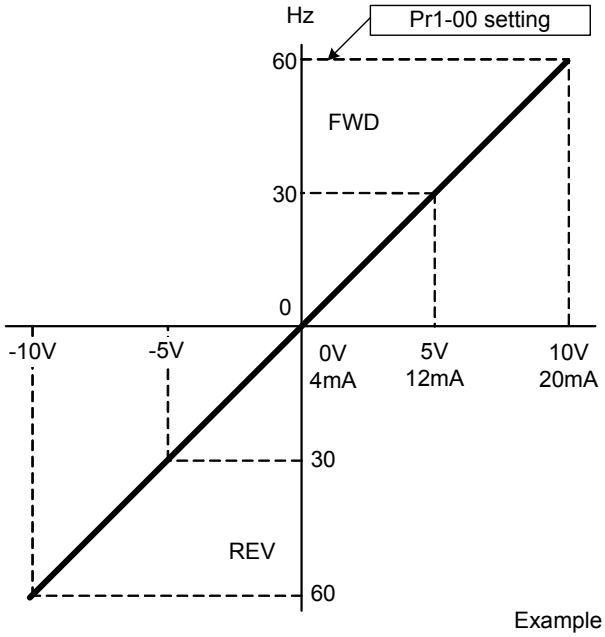
Example 8



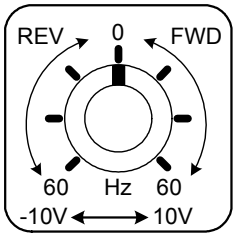
Example 9



Example 10



Pr0-18 = 2
Pr1-00 = 60
Pr3-11 = 1
Pr3-12 = 0
Pr3-13 = 100
Pr3-14 = 2



Volt—Freq Diagram

Example 11

3-15	AVO Analog Output 1 Selection	Factory Setting	0
	Settings 0-15		

Full List of the Functions

Setting	Function	Description
0	output frequency	Pr1-00=100%
1	command frequency	Pr1-00=100%
2	Speed	Pr1-00=100%
3	Current	rated current of the inverter =100%
4	Output voltage	200V（400V）=100%
5	DC BUS voltage	400V（800V）=100%
6	Power factor	-1.000~1.000=100%
7	Power	rated power of the inverter =100%
8	AVI	（0~10V=0~100%）
9	ACI	（0~20mA=0~100%）
13	voltage command	200V（400V）=100%
14	counter	Pr2-11=100%
15	Analog Output Value (Pr3-21)	

3-17	AVO Analog Output Gain	Factory Setting	100.0
	Settings -900.0～900.0%		

This parameter adjusts the voltage level of the analog output signal (AFM = Pr3-17).

3-19	AVO Analog Output Bias Voltage		Factory Setting	0.00
	Settings	-10.00～10.00V		

This parameter determines the output voltage value corresponding to 0Hz.

3-21	Analog Output Value		Factory Setting	0.0
	Settings	0.0~100.0%		

When Pr3-15 =15, this is the output value.

4 Multi-Step Speed Run (MSS Run) and Process Control Run (PLC Run)

With 4 multi-function input terminals (refer to Pr2-01 to Pr2-04) can operation the drive up to 15 steps multi-Step Speeds run. These speeds may also be used in conjunction with Pr4-15 to Pr4-33 to run the process control operation (PLC Run).Their relative parmeters as below:

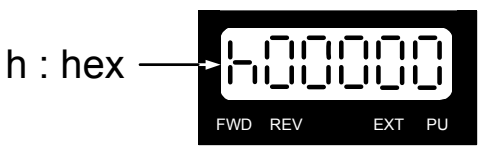
	step	Frequency command	Operation Command	Operation Direction	Accel/Decel time
Multi-Step Speed Run	15	Pr4-00～ Pr4-14	MI1～MI4	Pr4-32, Pr4-36	Pr1-11～ Pr1-14
PLC Run	15	Pr4-00～ Pr4-14	Pr4-15～ Pr4-28	Pr4-32, Pr4-33	Pr1-11～ Pr1-14

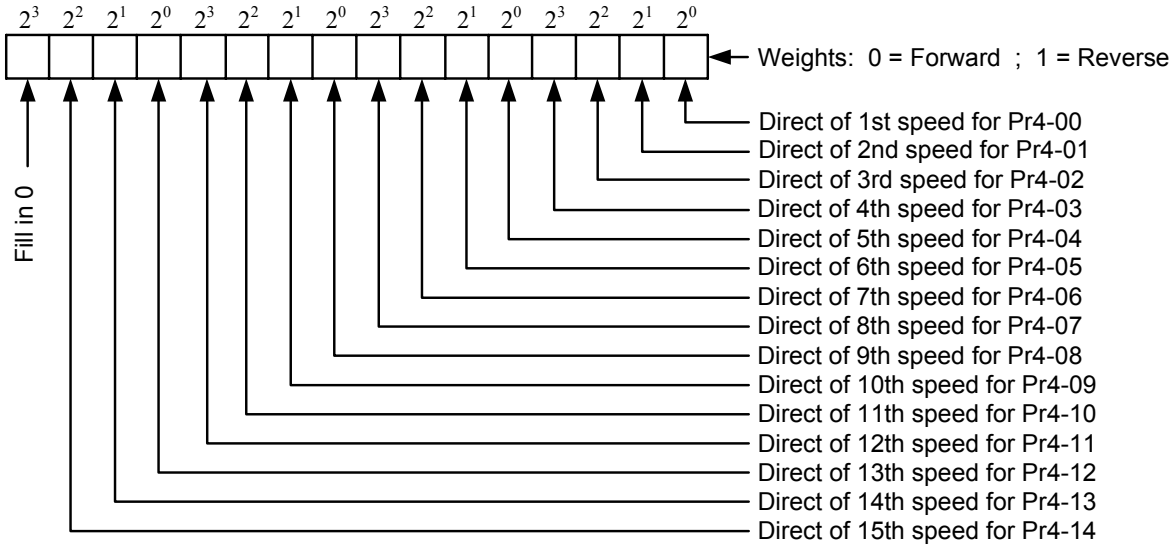
4-00	The 1st Step Speed		Factory Setting	0.00
4-01	The 2nd Step Speed		Factory Setting	0.00
4-02	The 3rd Step Speed		Factory Setting	0.00
4-03	The 4th Step Speed		Factory Setting	0.00
4-04	The 5th Step Speed		Factory Setting	0.00
4-05	The 6th Step Speed		Factory Setting	0.00
4-06	The 7th Step Speed		Factory Setting	0.00
4-07	The 8th Step Speed		Factory Setting	0.00
4-08	The 9th Step Speed		Factory Setting	0.00
4-09	The 10th Step Speed		Factory Setting	0.00
4-10	The 11th Step Speed		Factory Setting	0.00
4-11	The 12th Step Speed		Factory Setting	0.00
4-12	The 13th Step Speed		Factory Setting	0.00
4-13	The 14th Step Speed		Factory Setting	0.00
4-14	The 15th Step Speed		Factory Setting	0.00
	Settings	0.00～600.00 Hz		

The multi-function input terminals (refer to Pr2-01 to Pr2-04) are used to select one of the Drive Multi-Step Speeds above. These speeds may also be used in conjunction with Pr4-00 - Pr4-14 to run the process control operation.

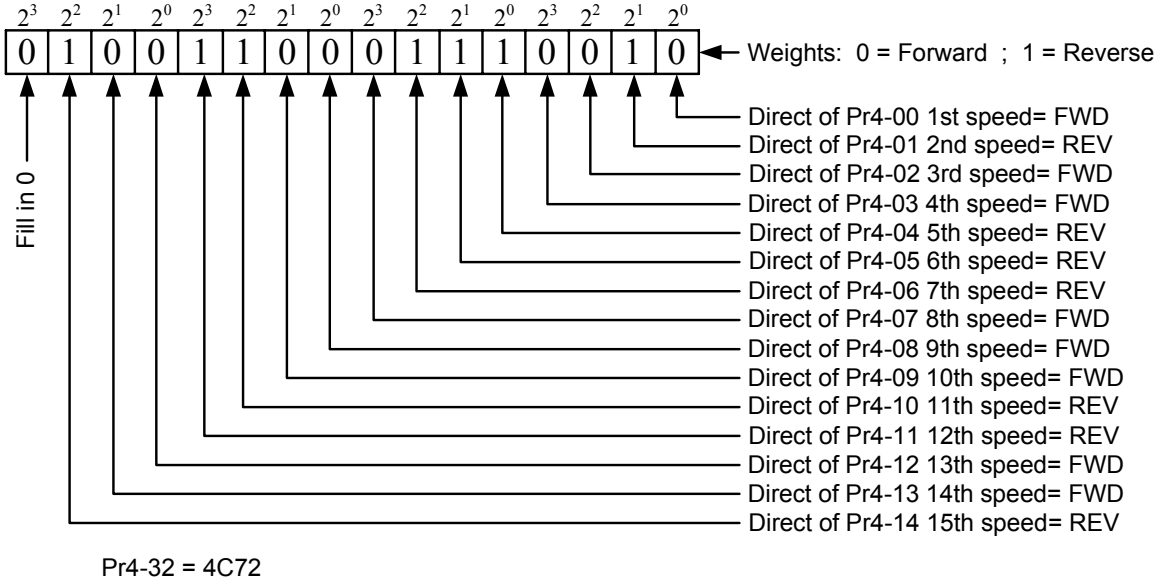
4-15	**Time Duration of the PLC RUN Master Speed**	Factory Setting	0.00
4-16	**Time Duration of PLC RUN Step 1**	Factory Setting	0.00
4-17	**Time Duration of PLC RUN Step 2**	Factory Setting	0.00
4-18	**Time Duration of PLC RUN Step 3**	Factory Setting	0.00
4-19	**Time Duration of PLC RUN Step 4**	Factory Setting	0.00
4-20	**Time Duration of PLC RUN Step 5**	Factory Setting	0.00
4-21	**Time Duration of PLC RUN Step 6**	Factory Setting	0.00
4-22	**Time Duration of PLC RUN Step 7**	Factory Setting	0.00
4-23	**Time Duration of PLC RUN Step 8**	Factory Setting	0.00
4-24	**Time Duration of PLC RUN Step 9**	Factory Setting	0.00
4-25	**Time Duration of PLC RUN Step 10**	Factory Setting	0.00
4-26	**Time Duration of PLC RUN Step 11**	Factory Setting	0.00
4-27	**Time Duration of PLC RUN Step 12**	Factory Setting	0.00
4-28	**Time Duration of PLC RUN Step 13**	Factory Setting	0.00
4-29	**Time Duration of PLC RUN Step 14**	Factory Setting	0.00
4-30	**Time Duration of PLC RUN Step 15**	Factory Setting	0.00
	Settings	0～65500 sec	
4-31	**The PLC RUN Time Multiplier**	Factory Setting	10
	Settings	1～10	
4-32	**The PLC RUN Operation Direction**	Factory Setting	h00000
	Settings	00000～07FFF（0：forward；1：reverse）	

This parameter controls the direction of Pr4-00~Pr4-14, for the Process Control Operation.
Programming: A 15bit binary number determines the PLC Run direction. Every 4 binary numbers are then converted to 16'mal and entered into Pr4-32.
Below is an example on how to generate the decimal value needed for this parameter.



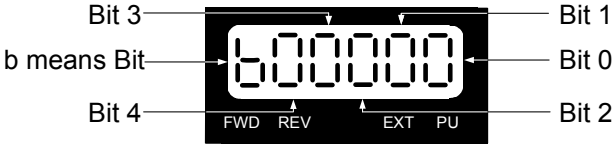


Simple Example



Pr4-32 = 4C72

4-33	Process Control Operation Mode (PLC RUN)			Factory Setting	b00000
	Settings	Bit 0	0	direction determined by Pr4-32	
			1	direction determined by the master speed control	
		Bit 1	0	continuously execute the process control operation	
			1	zero speed intervals enabled	
		Bit 2	0	operate at zero speed upon time extension	
			1	operate at a constant speed upon time extension	



4-34	Process Control operation Cycle (PLC RUN)			Factory Setting	0
	Settings	0: PLC RUN disabled			
		1~60000 cycle			
		60001 endless			
4-35	**What to do after Process Control Operation (PLC RUN) finished**				
	Settings	0~15：step speed		Factory Setting	16
		16：stop			
4-36	**Multi-Step Speed Operation Mode (MSS RUN)**			Factory Setting	b00001
	Settings	Bit 0	0	direction determined by Pr4-32	
			1	direction determined by the master speed	
		Bit 1	0	continuously execute multi-step speed	
			1	execute only one process control operation cycle	
		Bit 2	0	zero speed intervals disabled	
			1	zero speed intervals enabled	
		Bit 3	0	PID offset no use	
			1	multi-speed + PID offset	

5 Motor and Protection Parameter

5-00	Full-Load Current of Motor	★	Factory Setting	A（100%）
	Settings	****A（10~120%）		

This parameter will limit the Drive output current in order to prevent the motor from overheating. The value entered must be in Amps, and should be found on the motor nameplate.

This parameter must be programmed correctly if the drive is to operate in the Vector or Torque control mode, the Electronic Thermal Overload Relay is used, or if the Slip Compensation function is used.

5-01	Torque Compensation of Motor (for the V/F Mode Only)			
	Settings	0.0～25.0%	Factory Setting	0.0

This parameter increases the amount of voltage the drive will output to the motor during operation to increase motor torque. The V/F Torque Compensation is based on the setting of the parameter.

Be careful when setting this parameter. Always start at the lowest setting and increase the value until sufficient torque is achieved. A large Torque Compensation may generate more voltage than needed and the motor will overheat and possibly be damaged.

5-02	Slip Compensation of Motor	Factory Setting	0.0
	Settings	0.0～20.0%	

While driving an asynchronous motor, an increasing load will cause an increase in slip. This parameter may be used to compensate the nominal slip within a range of 0.0-10.0% (Pr1-01). When the output current of the drive is higher than the motor's no-load current, the drive will adjust the output frequency to the motor to compensate for slip.

Note 1. If the motor's no-load current > the rated current of the motor, the slip compensation will not work correctly.

Note 2. To obtain effective slip compensation, use the auto tune feature Pr5-04.

5-03	Number of Poles for Motor	Factory Setting	4
	Settings	2～20	

This parameter sets the number of poles of your motor (must be an even number).

5-04	Line to Line resistance R1 of Motor	Factory Setting	0
	Settings	Ω	

5-05	auto-tuning (Selection of V/F mode or Sensorless vector control mode)					
	Settings	0	No function	★	Factory Setting	0
		1	Measure R1 by Pr5-00 current			
		2	reset			

This parameter automatically measures the motor's characteristics and enters the values into Pr05-01, Pr05-04, Pr1-07, respectively.

Motor Auto Tuning Procedure:

1. Make sure all the parameter settings are at the factory settings and all power wiring is correct.
2. Enter the motor rated voltage in Pr1-02 and motor rated frequency in Pr1-01. and Full-Load current in Pr5-00.
3. Set Pr5-05 = 1, then press the "RUN" key on the keypad to execute the motor auto-tuning operation The execution time is about 2 minutes. (The greater the horsepower of the motor, the longer the acceleration/deceleration time should be set).
4. After the auto tuning procedure is complete, verify the parameters (Pr5-01,Pr5-04,Pr1-07) have been updated. If not, set Pr5-00 = 1 and press the "RUN" key again.

The drive is now switch to Sensorless Vector control mode.

(Proper setting Slip Compensation of Motor in Pr5-02, may get optimam control result)

Set Pr5-05 = 2 select reset, the values of Pr5-01, Pr5-04, Pr1-07 will be zero.

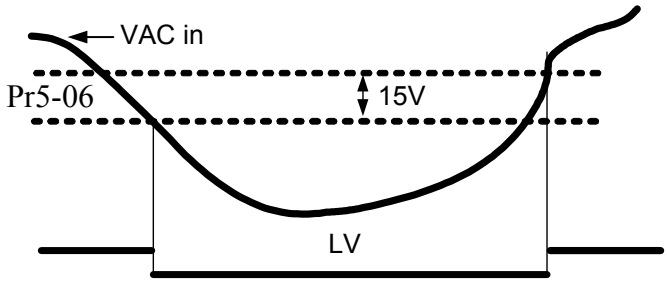
The drive is now switch to V/F mode

Note 1. The sensorless vector control mode is not intended for use with multiple motors connected to one Drive.

Note 2. If two motors will be connected to one drive and both must be auto tuned, it is necessary to set a multi-function input terminal to switch between Motors 1 and 2.
This will enable the drive to enter the calculated values into the correct parameter positions.

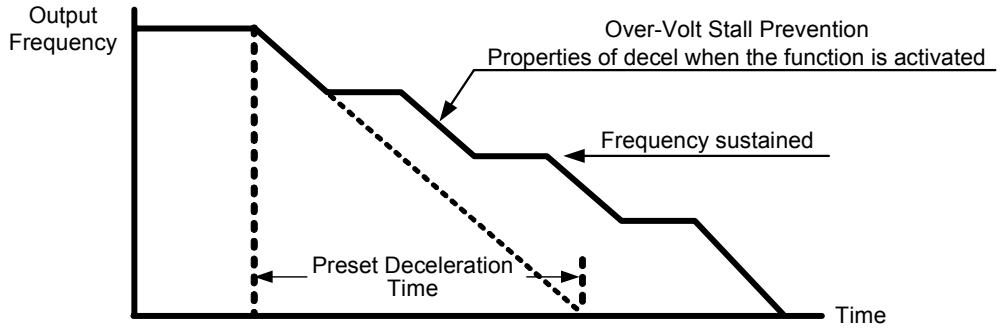
5-06	Low Voltage Level			★
230V models	Settings	160～220VAC	Factory Setting	180.0
460V models	Settings	320～440VAC	Factory Setting	360.0

This parameter determines the level for "LV" fault.



5-07	Over-Voltage Stall Prevention			★
230V models	Settings	320～500VAC	Factory Setting	380
460V models	Settings	640～1000VAC	Factory Setting	760

This parameter sets the voltage limit for use with the Over Voltage Stall during deceleration; a heavy loaded motor will begin to regenerate voltage back to the drive. As the drive absorbs this regenerated voltage the DC bus will increase. If the DC bus reaches the value programmed in this parameter, the drive will stop deceleration, hold speed, and wait for the power to dissipate, before deceleration begins again.



*Twice the voltage for the 460V model

5-08	Software Setting of the Braking Level (the action level of the braking resistor)		Setting resolution	0.1
230V models	Settings	320～500V	Factory Setting	373
460V models	Settings	640～1000V	Factory Setting	746

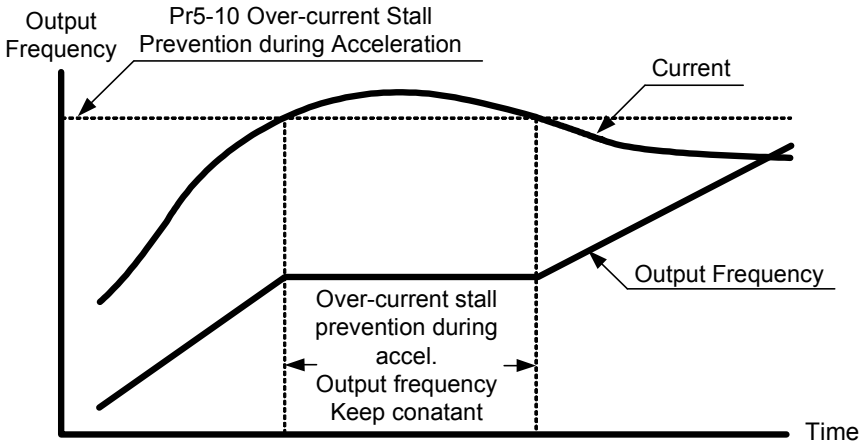
The action level of the braking resistor could be set by this parameter. The value must be higher than the steady state DC-BUS voltage; otherwise the braking transistor will have a 100% duty. At 100% duty the transistor and resistor will most likely fail.

5-09	Phase-Loss Protection		Factory Setting	0
	Settings	0	Warn and keep operating (below 50%)	
		1	warn and ramp to stop	
		2	warn and coast to stop	

The phase-loss protection is for the input side of the power phase-loss protection. The drive will have influence on control characteristics and driver life when it operates the input phase-loss. But it can be operated if its' output current is less than 50% of rated current.

5-10	Over-Current Stall Prevention during Acceleration			
	Settings	Amp (10～250%)	Factory Setting	A(170%)

This value sets the current limit for the Over Current Stall Prevention function. During acceleration, a heavy loaded motor may require very high current. If the current reaches the value programmed in Pr5-10, the drive will stop acceleration, hold speed and wait for the current to dissipate in the motor. Once the current has fallen below the limit set in Pr5-10, the drive will begin to accelerate to command speed as shown in the graph below.



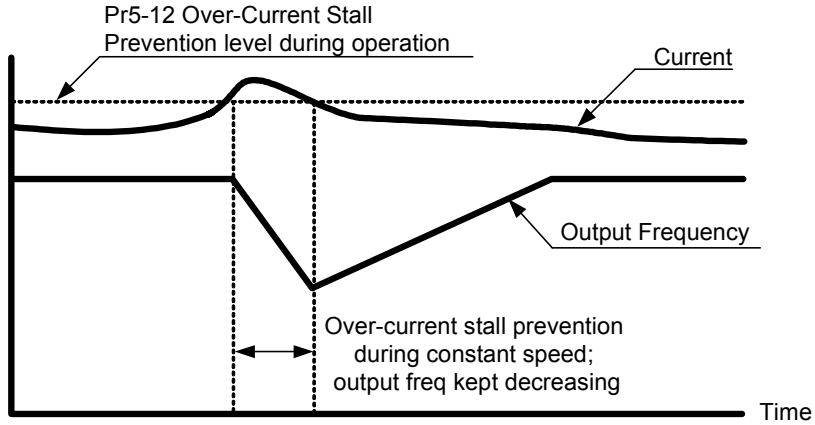
Function of the Over-Current Stall Prevention during Accel

5-11	Over-Current Stall Prevention during Acceleration			
	Settings	Amp (0~250%)	Factory Setting	A(120%)

5-12	Over-Current Stall Prevention during Operation			
	Settings	Amp (10～250%)	Factory Setting	A(170%)

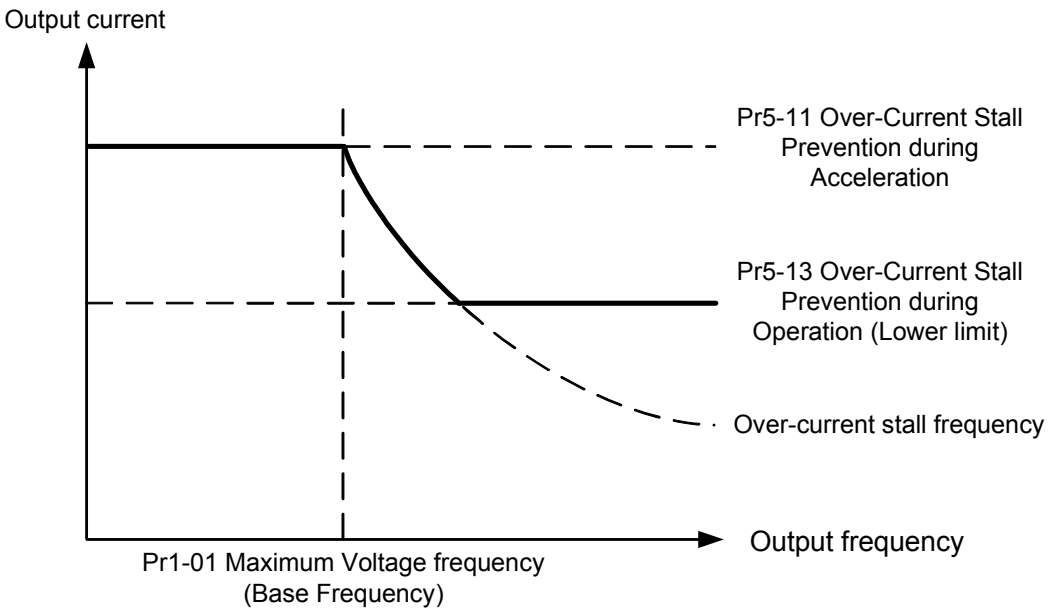
This parameter sets the current limit for the Over-Current Stall Prevention during Operation function.

If the load on the motor causes the current to rise above the value set in this parameter, the drive will lower its output frequency (therefore lowering current) to avoid the motor from stalling. After the current has fallen below the value set in Pr5-12, the drive will begin to bring the motor back to command speed as shown in the graph below.



Function of Over-Current Stall Prevention during Constant Speed

5-13	Over-Current Stall Prevention during Operation (Lower limit)			
	Settings	Amp (0~250%)	Factory Setting	A(120%)



5-14	Over-Current Deceleration Time during Operation		Factory Setting	3.00
	Settings	0.050~600.00 Sec		

5-15	Over-Torque Detection Selection		Factory Setting	0
	Settings	0	disabled	
		1	Over-torque detection during constant speed Operation, stop operation after detection.	
		2	Over-torque detection during constant speed operation, continue to operate after detection.	
		3	Over-torque detection during entire (acceleration, steady state, deceleration) operation, stop operation after detection	
		4	Over-torque detection during entire (acceleration, steady state, deceleration) operation, continue operation after detection.	

5-16	Over-Torque Detection Level		Factory Setting	A(150%)
	Settings	Amp(20～250%)		
5-17	Over-Torque Detection Time		Factory Setting	0.1
	Settings	0.0～60.0 Sec		

These parameters define the current level and detection time for the Over Torque Detection function.

The Over Torque Detection level is a percentage of the rated drive current. The factory setting, Pr5-16, is 150% of the drive rated current.

The Over Torque Detection time is the length of time the drive may be in an over torque condition.

Example: When the output current exceeds the over torque detection level (Pr5-17) and exceeds the over torque detection time (Pr5-16), the drive will display oL2 on the keypad and will follow the setting in Pr5-15.

5-18	Electronic Thermal Relay Selection		Factory Setting	0
	Settings	0	Electronic thermal relay function disabled	
		1	Inverter/vector motor	
		2	Standard motor	

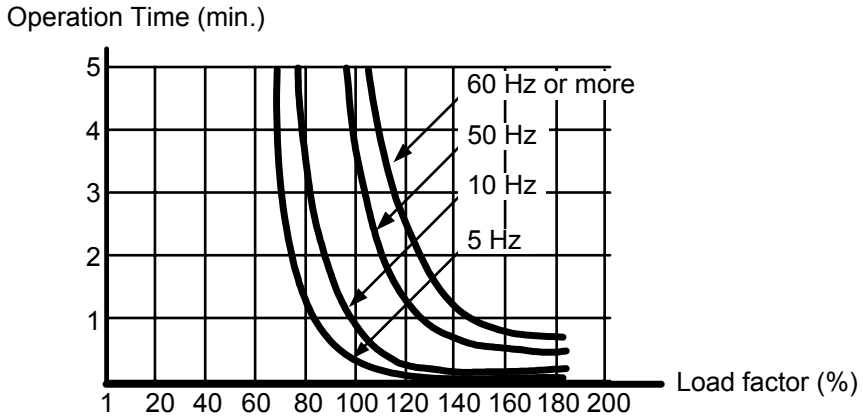
This parameter selects the type electronic thermal relay function based on the motor characteristics.

Inverter/vector motor = windings designed for Drive output and low speeds with high currents.

Standard motor = windings not designed for Drive. Motor has a shaft mounted fan which offers poor cooling at low speeds

5-19	Electronic Thermal Relay Time		Factory Setting	60
	Settings	30～600 Sec		

This parameter sets the time period for the Electronic Thermal Relay (I^2t) function.



The electronic thermal relay function is designed to protect the motor from overheating, due to low output frequency and high currents.

5-20	Heat Sink Over-Heat Warning		Factory Setting	85.0
	Settings	0.0~110.0	Unit	℃

The setting for parameters Pr2-19,Pr2-21 is 21.

5-21	Most Recent Fault Record		Factory Setting	0
5-22	2nd Most Recent Fault Record		Factory Setting	0
5-23	3rd Most Recent Fault Record		Factory Setting	0
5-24	4th Most Recent Fault Record		Factory Setting	0
Content display	0	no fault	18	oH2 (brake overheat)
	1	oc (over-current)	19	Soft start (Inrush limit)
	2	ov (over-voltage)	20	ACI (ACI error)
	3	GFF (ground fault)	21	ASC (RS-485 error)
	4	sc (IGBT failure)	22	PID (PID error)
	5	oL (drive overload)	23	PU (KEYPAD communication overtime)
	6	oL1 (electronic thermal relay)	24	Tune (Motor auto tuning failure)
	7	ot (Over-Torque)	25	brake (braking transistor failure)
	8	OCN (over-current during constant speed)	26	PG (PG loose wires)
	9	OCA (over-current during accel)	27	PHL (Phase loss)
	10	OCD (over-current during decel)	29	CPU (CPU error)
	11	EP1 (EPROM error 1)	30	FAN (FAN failure)
	12	EP2 (EPROM error 2)	31	ANI fault (Analog Input Error)
	13	EF (external fault)	37	OVd (Decel OverVoltage)
	14	CT1 (current sensor 1)	38	COPY Fault (Parameter Copy Error)
	15	CT2 (current sensor 2)	39	LV (Low Voltage)
	16	HPF (protection circuit fault)	40	BB (External Base Block)
	17	oH1 (IGBT overheat)		

6 Special Parameters

6-00	DC Braking Current Level		Factory Setting	A(0%)
	Settings	Amp (0~125%)		

This parameter sets the DC braking current level in percentage, for use with DC injection braking. The percentage is based on the rated current of the Drive. When programming this parameter, be sure to increase the percentage slowly from 0, until sufficient braking torque is obtained. A current level too high may damage the motor.

6-01	DC Braking Time at Start-up		Factory Setting	0.00
	Settings	0.00～60.00 Sec		

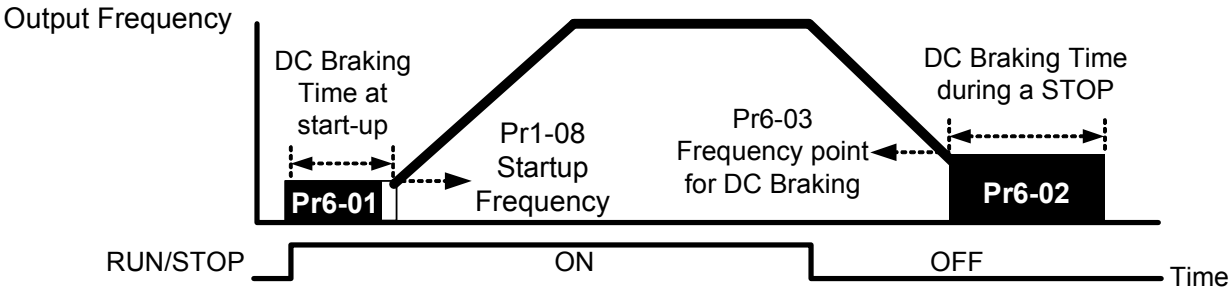
This parameter determines the duration of DC braking current applied to the motor immediately following a START command.

6-02	DC Braking Time during stopping		Factory Setting	0.00
	Settings	0.00～60.00 Sec		

This parameter determines the duration of DC braking current applied to the motor upon a STOP command. This is often used to hold a motor shaft in position for a short time.

6-03	Start-point for DC Braking		Factory Setting	0.00
	Settings	0.00～600.00 Hz		

During deceleration, the drive will begin to output a DC current once the frequency reaches the value set in this parameter.



The Procedural Diagram of the DC Braking Output

Immediately following a RUN command, the drive will output a DC current until the output frequency reaches the value set in this parameter.

The DC braking is commonly used to help decrease the deceleration time. For the best stopping performance, it is recommended to use the Deceleration Time to slow the motor and then apply the DC brake at speeds below 25 Hz.

6-04	Increasing Rate of the DC Voltage		Factory Setting	50.00%
	Settings	0.01~300.00%		

This parameter determines the rate of increase for the DC voltage output during the DC injection braking function.

6-05	Re-activate after Momentary Power Loss		Factory Setting	0
	Settings	0	disable	
		1	begins from command frequency	
		2	begins from minimum output frequency	

This parameter selects the speed search type after a momentary power loss.

6-06	Maximum Allowable Power Loss Time		Factory Setting	2.0
	Settings	0.1～5.0 Sec		

During a power loss, if the power loss time is less than the time defined by this parameter, the Drive will resume operation. If the Maximum Allowable Power Loss Time is exceeded, the Drive output is then turned off.

If the power loss occurs while the drive is under heavy load, it is possible all available rides through power will be dissipated in the motor and the drive will shut down quickly (less than 1 second).

The Momentary Power Loss function is only enabled while the “LV” is displayed on the keypad.

6-07	Base Block Time for Speed Search		Factory Setting	0.5
	Settings	0.1～5.0 Sec		

When a momentary power loss is detected, the Drive waits for a specified time interval determined by Pr6-07 before resuming operation.

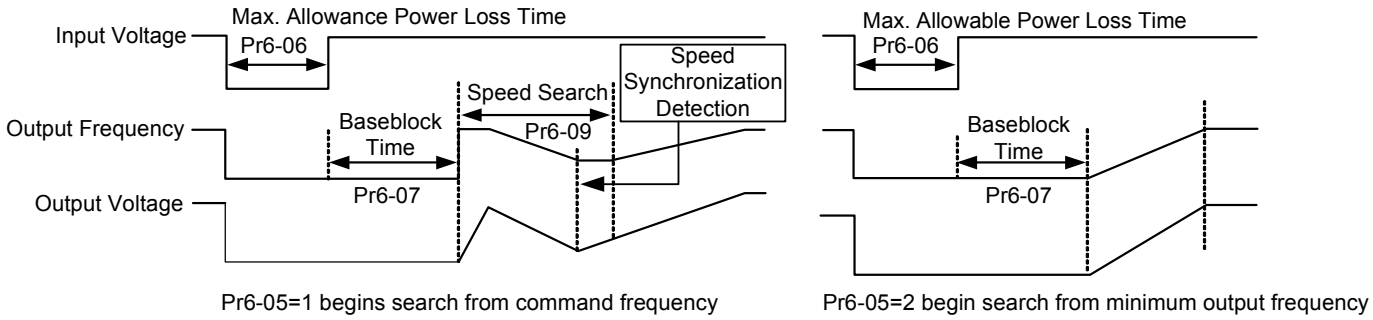
This parameter also determines the wait time after performing an external Base Block and Fault Reset function.

6-08	Maximum Current Level for Speed Search		Factory Setting	A(120%)
	Settings	Amp(20～200%)		

This parameter determines the maximum current level used for the speed search function. The drive will only conduct a speed search if the drive output current is higher than the current level set in this parameter. If the current is below this value, then the drive will simply ramp up in a normal condition.

When speed search is conducted, the dive will follow the V/F curve determined by Pr1 group.

This parameter is used for both the “Auto Acceleration/Deceleration Time” and “Speed Search” functions.



Pr6-05=1 begins search from command frequency

Pr6-05=2 begin search from minimum output frequency

Procedure Diagram of " Re-ctivate after Momentary Power Loss"

6-09	Deceleration Time for Speed Search		Factory Setting	3.00
	Settings	0.50～120.00 Sec		

This parameter determines the rate at which the drive will decelerate the output frequency to find the motor speed, during the momentary speed search method "begins from command frequency".

When speed search is executed, the Auto Deceleration and the S curve deceleration will not be conducted.

6-10	Auto Restart after Fault		Factory Setting	0
	Settings	0～10		

This parameter determines the number of restarts after the following faults, "OC, GFF and OV".

The "Auto Restart after Fault" begins with the "Maximum Output Frequency Speed Search" method.

If this parameter is set to 10 and 3 faults occur, the remaining number of faults for auto restart is 7. If there are no more faults within 10 minutes, the drive will reset this parameter to 10.

6-11	Speed Search Type		Factory Setting	0
	Settings	0	speed search disabled	
		1	speed search through the frequency command	
		2	FWD-speed search only (motor only runs in FWD direction)	
		3	REV-speed search only (motor only runs in REV direction)	
		4	FWD/REV speed search enabled in both directions (FWD first)	
		5	REV/FWD speed search enabled in both directions (REV first)	

The speed search function is most applicable to a large Punch Press machine, blower, or other high inertia application. While these applications normally stop, using the "Coast to Stop" method, this may take 2~5 minutes or the application comes to a complete stop. However, with the speed search function enabled, users could instantly start the drive without waiting for the flywheel to come to a stop and the drive would quickly find the speed and bring the motor to speed.

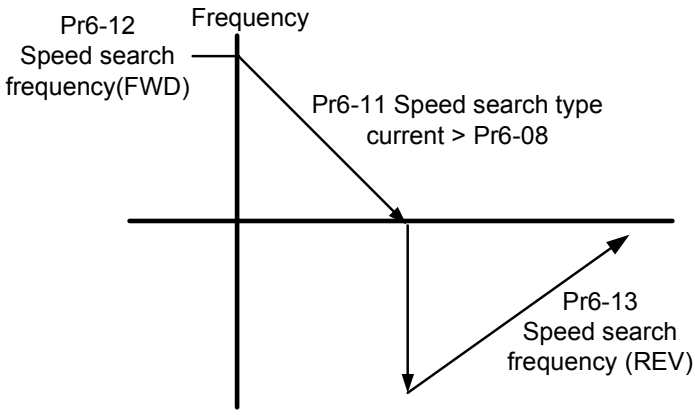
By adding an encoder (PG) to the application, a faster and more speed search would occur.

6-12	Speed Search Frequency (FWD direction)	Factory Setting	60.00/50.00
	Settings	0.00～600.00 Hz	

This parameter is used as the frequency start point for the Speed Search function, when Pr6-11 is set to 2 or 4.

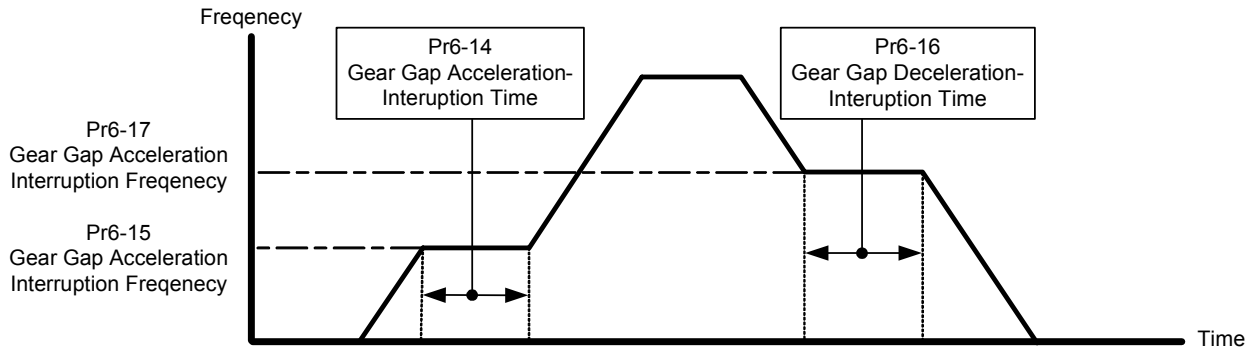
6-13	Speed Search Frequency (REV direction)	Factory Setting	60.00/50.00
	Settings	0.00～600.00 Hz	

This parameter is used as the frequency start point for the Speed Search function when Pr6-11 is set to 3 or 5.



6-14	Gear Gap Acceleration-Interruption Time	Factory Setting	0.00
	Settings	0.00~60.00 Sec	
6-15	Gear Gap Acceleration-Interruption Frequency	Factory Setting	6.00
	Settings	0.00～600.00 Hz	
6-16	Gear Gap Deceleration-Interruption Time	Factory Setting	0.00
	Settings	0.00~60.00 Sec	
6-17	Gear Gap Deceleration-Interruption Frequency	Factory Setting	6.00
	Settings	0.00～600.00 Hz	

These parameters determine the time and frequency point for the drive to stop acceleration or deceleration to allow the motor to catch up to the drive output frequency. This is commonly used with heavy loaded applications where the motors rotor is lagging the stator.

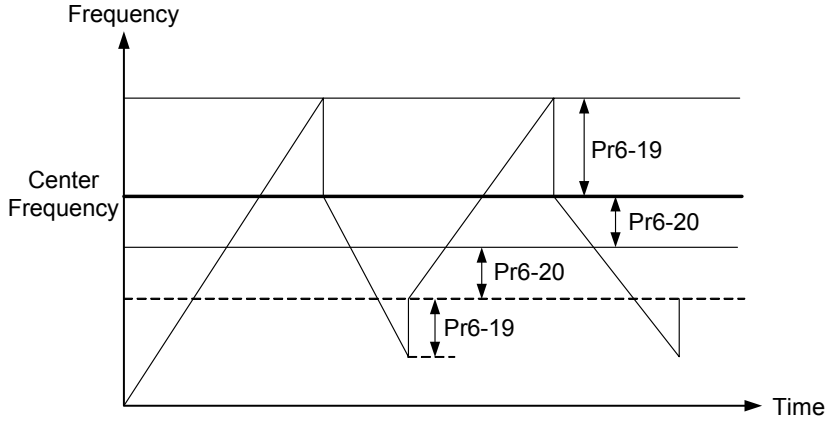


Gear Gap Acceleraion/Deceleration

6-18	Gear Gap current		Factory Setting	A(0%)
	Settings	Amp (0~150%)		

The motor current of Pr6-14 and 6-16

6-19	Skip Frequency Width		Factory Setting	0.00
	Settings	0.00~100.00Hz		
6-20	Bias Frequency Width		Factory Setting	0.00
	Settings	0.00~200.00Hz		



7 High Performances and Communication Parameter

A RS-485 serial port (option) is necessary for serial communication

7-00	Proportional Gain (P)		Factory Setting	80.0
	Settings	0.0～500.0%		

This parameter determines the gain of the feedback loop. If the gain is large, the response will be strong and immediate (If the gain is too large, vibration may occur). If the gain is small, the response will be weak and slow.

7-01	Integral Time (I)		Factory Setting	1.00
	Settings	0.00～100.00 Sec		
		0.00：no integral		

This parameter determines the speed of response for the PID feedback loop. If the integral time is long, the response will be slow. If the integral time is short, the response will be quick. Be careful not to set (I) too small, since a rapid response may cause oscillation in the PID loop.

If the integral time is set as 0.00, Pr7-01 will be disabled.

7-02	Differential Time (D)	Factory Setting	0.00
	Settings	0.00～5.00 Sec	

This parameter determines the damping effect for the PID feedback loop. If the differential time is long, any oscillation will quickly subside. If the differential time is short, the oscillation will subside slowly.

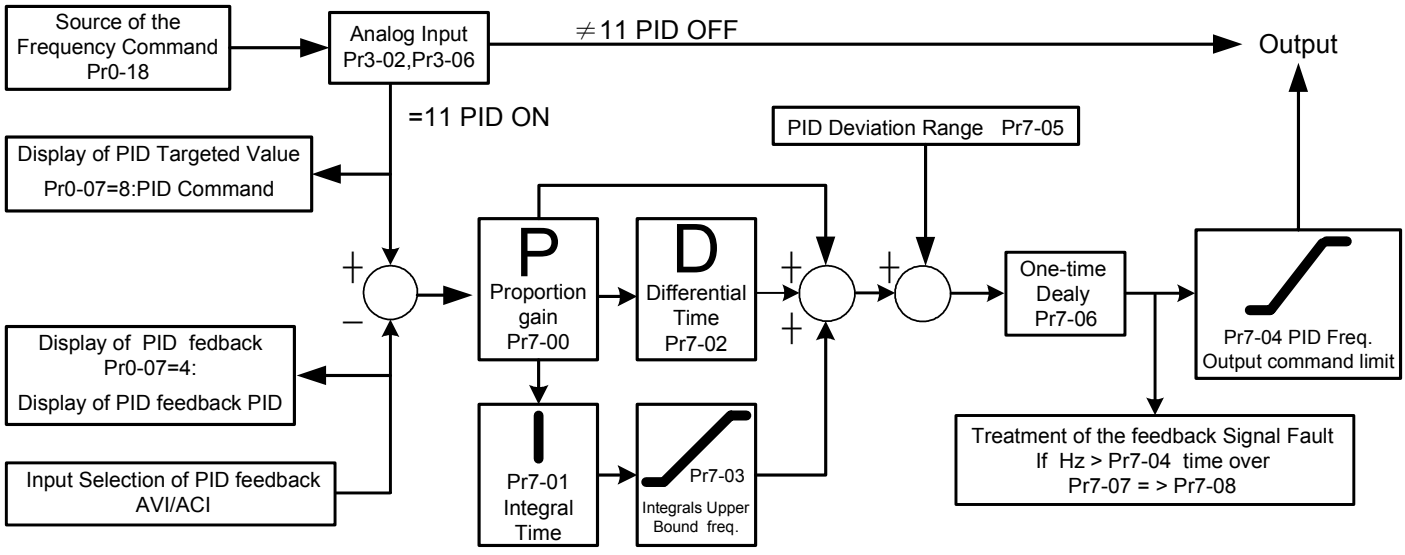
7-03	Integration's Upper Bound Frequency	Factory Setting	100.0
	Settings	0.0～100.0%	

This parameter determines the integration's upper frequency limit while operating in the PID feedback loop. (Limit = Pr1-00×Pr7-03 %). During a fast Integration response, it is possible for the frequency to spike beyond a reasonable point. This parameter will limit this frequency spike.

7-04	PID Frequency Output Command limit	Factory Setting	100.0
	Settings	0.0～100.0%	

This parameter determines the limit of the PID Command frequency. If this parameter is set to 120%, then the maximum output frequency while in the PID operation will be (120% x Pr1-00) 72%.

7-05	PID Deviation Range	Factory Setting	0.0
	Settings	-100.0~+100.0%	
7-06	One-Time Delay	Factory Setting	0.000
	Settings	0.000~0.100 Sec	



PI Control: controlled by the P action only, and thus, the deviation cannot be eliminated entirely. To eliminate residual deviations, the P + I control will generally be utilized. And when the PI control is utilized, it could eliminate the deviation incurred by the targeted value changes and the constant external interferences. However, if the I action is excessively powerful, it will delay the responding toward the swift variation. The P action could be used solely on the loading system that possesses the integral components.

PD Control: when deviation occurred, the system will immediately generate some operation load that is higher than the load generated single handedly by the D action to restrain the increment of the deviation. If the deviation is small, the effectiveness of the P action will be decreasing as well. The control objects include occasions with integral component loads, which are controlled by the P action only, and sometimes, if the integral component is functioning, the whole system will be vibrating. On such occasions, in order to make the P action's vibration subsiding and the system stabilizing, the PD control could be utilized. In other words, this control is good for use with loadings with no braking functions over the processes.

PID Control: Utilize the I action to eliminate the deviation and the D action to restrain the vibration, thereafter, combine with the P action to construct the PID control. Use of the PID method could obtain a control process with no deviations, high accuracies and a stable system.

7-07	Detection Time of the Feedback Error		Factory Setting	0.0
	Settings	0.0～6000.0 Sec		

This parameter defines the detection time for the loss of a feedback analog signal. The drive will follow the operating procedure programmed in Pr8-09 if the feedback signal is lost for more than the time set in Pr7-07

A setting of 0.0 disables this function.

7-08	Feedback Signal Fault Treatment			Factory Setting	0
	Settings	0	warn and keep operating		
		1	warn and RAMP to stop		
		2	warn and COAST to stop		

This parameter selects the operation of the drive upon a loss of PID feedback signal.

7-09	Keypad Transmission Fault Treatment		Factory Setting	0
	Settings	warn and RAMP to stop		
		warn and COAST to stop		

7-10	Keypad Transmission Fault detection		Factory Setting	0.0
	Settings	0.0: Disable and keep operating		
		0.1~60.0 Sec		
7-11	Communication Address		Factory Setting	1
	Settings	1-254		

When the system is controlling or monitoring with the RS-485 series connection communication interface, every drive has to be determined with one communication address then and that the address connected to the network should be specific and could not be repeated.

7-12	Transmission Speed of the Communication			
	Settings	1.2～125 Kbits/Sec	Factory Setting	9.6

Through the internal RS-485 series connection ports within the computer, users are to set and revise the parameters within the drive, and to control the operation of the drive, and further, to monitor the operation status of the drive. This parameter is utilized in setting up the transmission speed between the computer and the drive.

7-13	Transmission Fault Treatment			Factory Setting	3
	Settings	0	warn and keep operating		
		1	warn and RAMP to stop		
		2	warn and COAST to stop		
		3	no treatment and no display		

This parameter is utilized in setting the drive treatment toward transmission overtime fault (e.g. when the communication cord is broken) during the communication.

7-14	Overtime Detection			Factory Setting	0.0
	Settings	0.0	disabled		
			0.1~60.0 Sec		

This parameter is utilized in setting the transmission overtime between the communication and the keypad.

7-15	Communication Protocol			Factory Setting	0
	Settings	0：7，N，2 ASCII	6：8，N，2 ASCII	12：8，N，2 RTU	
		1：7，E，1 ASCII	7：8，E，1 ASCII	13：8，E，1 RTU	
		2：7，O，1 ASCII	8：8，O，1 ASCII	14：8，O，1 RTU	
		3：7，E，2 ASCII	9：8，E，2 ASCII	15：8，E，2 RTU	
		4：7，O，2 ASCII	10：8，O，2 ASCII	16：8，O，2 RTU	
		5：8，N，1 ASCII	11：8，N，1RTU		

Computer-controlled Link: when the RS-485 series connection communication interface is utilized, every VDF-V has to pre-determine the communication address at Pr7-12, and thereafter, the computer will proceed with the control based on respective addresses.

The Communication Protocol is of the MODBUS ASCII (American Standard Code for Information Interchange) Mode: every byte is composed of 2 ASCII words. For example, if the numeric value is 64 Hex, the way to show it through the ASCII mode will be ”64”, which is composed respectively be ”6” (36Hex) and ”4” (34Hex).

1. Meaning of Encoding:

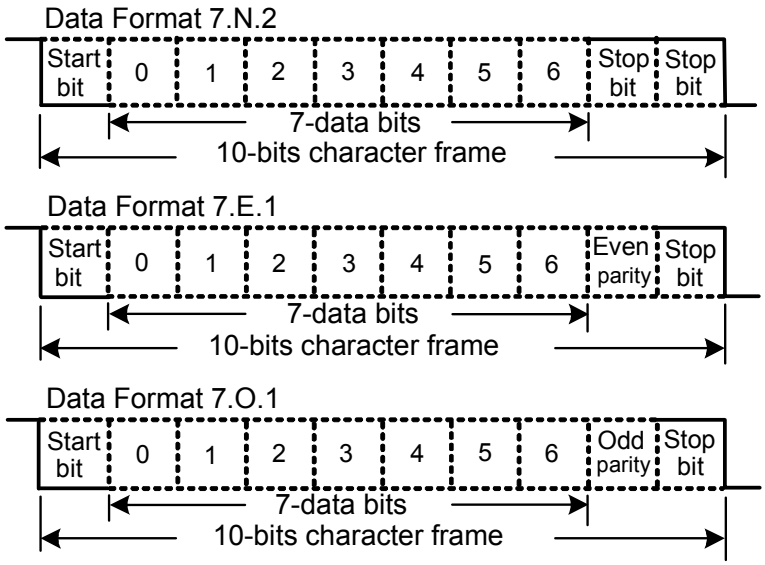
The communication protocol is of the Hexadecimal system, and thus, the meaning of the ASCII message words would be: ”0”…”9”, ”A”…”F”, which every Hexadecimal code represents every ASCII message word.

For instance:

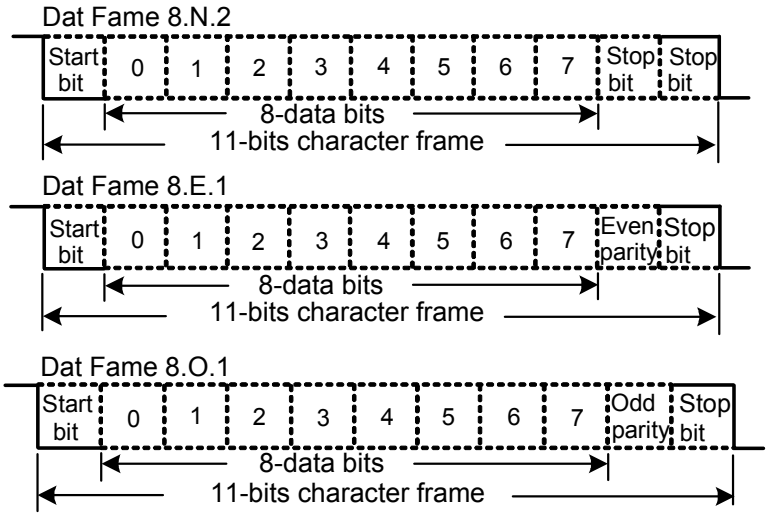
Word	‘0’	‘1’	‘2’	‘3’	‘4’	‘5’	‘6’	‘7’	‘8’	‘9’	‘A’	‘B’	‘C’	‘D’	‘E’	‘F’
ASCII code	30H	31H	32H	33H	34H	35H	36H	37H	38H	39H	41H	42H	43H	44H	45H	46H

2. WORD Structure

2-1 10-bits Word Frame (for ASCII)



2-2 11-bits Word Frame (for RTU)



3. Communication Data Structure

3-1 Communication Data Frame

ASCII Mode：

STX	Start Word= ‘ : ’ (3AH)
Address Hi	Communication Address:
Address Lo	The 8-bit address is composed of 2 ASCII codes
Function Hi	Function Code:
Function Lo	The 8-bit function code is composed of 2 ASCII codes
DATA (n-1)	Data Contents:
…….	n×8-bit, the data contents is composed of 2n ASCII codes
DATA 0	n<=16, 32 ASCII codes as the maximum
LRC CHK Hi	LRC Check Sum:
LRC CHK Lo	The 8-bit check sum is composed of 2 ASCII codes
END Hi	End Word:
END Lo	END Hi = CR (0DH), END Lo = LF(0AH)

RTU Mode:

START	Keep the non-input message higher or equal to 10 ms
Address	Communication Address: the 8-bit binary address
Function	Function Code: the 8-bit binary address
DATA (n-1)	Data Contents:
…….	n×8-bit data, n<=16
DATA 0	
CRC CHK Low	CRC Check Sum:
CRC CHK High	The 16-bit CRC check sum is composed of 2 8-bit binary codes
END	Keep the non-input message higher or equal to 10 ms

3-2 Communication Address

00H: all the drive are broadcasting

01H: toward the drive at the 01 address

0FH: toward the drive at the 15 address

10H: toward the drive at the 16 address

and consequently, the maximum to be reached is 254 (FEH).

3-3 Function Code and Data Contents

03H: read the contents of the register

06H: write one WORD into the register

3-3-1 Function Code 03H: read the contents of the register.

e.g.: When the address of the drive is set as 01H, read 2 data contents that exist successively within the register, as shown follows: the address of the start register is 4110 (100EH).

ASCII Mode:

Inquiry message:

STX	' : '
Address	'0'
	'1'
Function	'0'
	'3'
Starting address	'1'
	'0'
	'0'
	'E'
Number of data (count by word)	'0'
	'0'
	'0'
	'2'
LRC Check	'D'
	'C'
END	CR
	LF

Response message:

STX	' : '
Address	'0'
	'1'
Function	'0'
	'3'
Number of data (count by byte)	'0'
	'4'
Content of starting Address 4110	'1'
	'7'
	'7'
	'0'
Content of address 4111	'0'
	'0'
	'1'
	'2'
LRC Check	'5'
	'F'
END	CR
	LF

RTU Mode:

Inquiry message:

Address	01H
Function	03H
Starting data address	10H
	0EH
Number of data (count by word)	00H
	02H
	A1H
	08H

Response message:

Address	01H
Function	03H
Number of data (count by byte)	04H
Content of data	17H
	70H
Content of data	00H
	12H
CRC CHK Low	7EH
CRC CHK High	51H

3-3-2 Function Code 06H: write a WORD into the register.

e.g.: aim at address 01H of the drive, and write 6000 (1770H) into the interior of the drive to set the parameter 100(64H).

ASCII Mode:

Inquiry message:

STX	':'
Address	'0'
	'1'
Function	'0'
	'6'
Data address	'0'
	'0'
	'6'
	'4'
Data content	'1'
	'7'
	'7'
	'0'
LRC Check	'0'
	'E'
END	CR
	LF

Response message:

STX	':'
Address	'0'
	'1'
Function	'0'
	'6'
Data address	'0'
	'0'
	'6'
	'4'
Data content	'1'
	'7'
	'7'
	'0'
LRC Check	'0'
	'E'
END	CR
	LF

RTU Mode:

Inquiry message:

Address	01H
Function	06H
Data address	00H
	64H
Data content	17H
	70H
CRC CHK Low	C6H
CRC CHK High	01H

Response message:

Address	01H
Function	06H
Data address	00H
	64H
Data content	17H
	70H
CRC CHK Low	C6H
CRC CHK High	01H

3-4 The LRC Check of the ASCII Mode

The LRC Check is the added sum from “Address” to “Data Contents”. For example, in 3.3.1, the LRC Check for the inquiry message will be: 01H + 03H + 21H + 02H + 00H + 02H = 29H, then take the complementary of 2, D7H.

3-5 The CRC Check of the RTU Mode

The CRC Check starts from “Address” and ends in “Data Contents”. Its calculation is as follows:

Step 1: Load the 16-bit register (the CRC register) with FFFFH.

Step 2: Exclusive OR the first 8-bit byte message command with the 16-bit CRC register of the lower bit, then save the result into the CRC register.

Step 3: Shift the CRC register one bit to the right and fill in 0 to the higher bit.

Step 4: Check the value that shifts to the right. If it is 0, save the new value from Step 3 into the CRC register, otherwise, Exclusive OR A001H and the CRC register, then save the result into the CRC register.

Step 5: Repeat Steps 3 and 4 and calculates the 8-bit.

Step 6: Repeat Steps 2~5 for the next 8-bit message command, till all themessage commands are processed. And finally, the obtained CRC register value is the CRC Check value. What should be noted is that the CRC Check must be placed interchangeably in the Check Sum of the message command.

What follows is the calculation example of the CRC Check using the C language:

```
unsigned char* data <- // index of the message command
unsigned char length <- // length of the message command
unsigned int crc_chk(unsigned char* data, unsigned char length)
{
int j;
unsigned int reg_crc=0Xffff;
while(length--){
      reg_crc ^= *data++;
      for(j=0;j<8;j++){
         if(reg_crc & 0x01){ /* LSB(b0)=1 */
            reg_crc=(reg_crc>>1) ^ 0Xa001;
      }else{
            reg_crc=reg_crc >>1;
      }
   }
}
return reg_crc; // the value that sent back to the CRC register finally
}
```

4. Definition of the Parameters Addresses of the Communication Protocol:

Command toward the drive

Parameter Address(Dec.)	Parameter Address(Hex.)	Function Description	
100*Gr+F		parameter	
4000	FA0	freq. Command	
4001	FA1	0x0001	STOP
		0x0002	RUN
		0x0030	FWD/REV
		0x0300	LOCAL/REMOTE
4002	FA2	0x0001	EF
		0x0002	RESET
4106	100A	u page	
4108	100C	error number	
4109	100D	status	bit0 run command
			bit1 run state
			bit2 rev command
			bit4 rev state
			bit5 jog command
			bit8 external freq command
			bit9 run/stop F/R pu control
			bit10 R/S F/R 485
			bit12 freq command 485
			bit15 pass word
4112	1010	H page	
4114	1012	A page	
4118	1016	VDC	
4120	1018	VAC	
4122	101A	VAC command	
4324	10E4	AN0	Iu(0~1023=5v)
4326	10E6	AN1	Iw
4328	10E8	AN2	VDC
4330	10EA	AN3	Th1
4332	10EC	AN4	Th2
4334	10EE	AN5	AVI
4336	10F0	AN6	ACI
4340	10F4	PORT0(H/L)	

4342	10F6	PORT1(H/L)	
4344	10F8	PORT3	
4346	10FA	PORT4	
4348	10FC	PORT5	
4350	10FE	PORT20	

Monitor the status of the drive

Content	0	No fault	18	oH2 (brake overheat)
	1	oc (over-current)	19	soft start (soft start Inrush limit)
	2	ov (over-voltage)	20	ACI (ACI error)
	3	GF (ground fault)	21	ASC (RS485 watchdog timer)
	4	SC (IGBT failure)	22	PID (PID error)
	5	oL (drive overload)	23	PU (Keypad error)
	6	oL1(electronic thermal relay)	24	Tune (motor auto tuning failure)
	7	Ot (over-torque)	25	bF (brake transistor failure)
	8	OCN (over-current during constant speed)	26	PG (PG error)
	9	OCA (over-current during accel)	27	PHL (input phase loss)
	10	OCD (over-current during decel)	29	CPU (CPU error)
	11	EP1 (unable to write to memory)	30	FAN (FAN failure)
	12	EP2 (unable to read memory)	31	ANI fault (Analog Input Error)
	13	EF (external fault)	37	OVd (Decel Over Voltage)
	14	CT1 (current sensor 1)	38	COPY Fault (Parameter Copy Error)
	15	CT2 (current sensor 2)	39	LV (Low Voltage)
	16	HPF (protection circuit fault)	40	BB (External Base Block)
	17	oH1 (IGBT overheat)		

5. Additional Response during Erroneous Communication:

If errors occurred when the drive is conducting the communication connection, the drive will respond to this error and then respond (send) the Function code AND 80H to the master control system so that the system will be informed of the error. And at the same time, the keypad display panel of the drive will show “CE-XX” as a warning message, and “XX” is then the error code. Please refer to “Meaning of the Error Codes” during the communication.

For example:

ASCII Mode:

STX	':'
Address	'0'
	'1'
Function	'8'
	'6'
Exception code	'0'
	'2'
LRC CHK	'7'
	'7'
END	CR
	LF

RTU Mode:

Address	01H
Function	86H
Exception code	02H
CRC CHK Low	C3H
CRC CHK High	A1H

Meaning of the Error Codes:

Error Codes	Explanations
1	Data Contents Error: If the value of the data contents is great, it is then not recognizable by the drive.
2	Parameter Address Error: Parameter addresses not recognizable by the drive.
3	Password Locked: parameter change disabled
4	Parameter change disabled during operation
5	E2ROM Error when the parameter is written in
6	Data Length Error
7	The parameter is a fixed value, and thus, parameter read is enabled and parameter change disabled
8	When LV, parameter read enabled and parameter change disabled
9	Parameter Locked: parameter read disabled (Pr0-05 bit =0)
10	Transmission Overtime
11	Frame Error: word frame error.
12	parity error

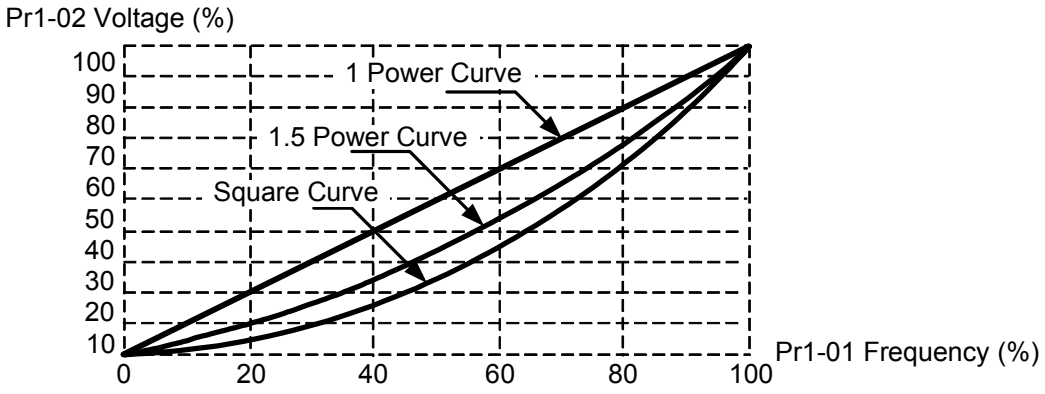
8 Control Parameters for Fan and Water Pump

8-00	V/F Curve Selection		★	Factory Setting	0
	Settings	0	V/F Curve determined		
		1	1.5 Power Curve		
		2	Square Curve		

Input current of the motor could divide into two orthogonal vectors: magnetic vector and torque vector. Gap flux, which is produced by Magnetic vector, is in direct proportion with output voltage of motor. Torque vector produces torque. Torque is in direct proportion with the result of magnetic vector multiply by torque vector. In theory, if the value of magnet vector is the same with torque vector (in unsaturated flux condition), the input current is inimum. If motor loading is unsteady torque loading (loading torque is in direct proportion ith speed. For example, the loading of fan or pump), loading torque is low during low speed, suitable lower input voltage will decrease input current of magnetic field to lower flux oss and iron loss of the motor and promote whole efficiency.

When this parameter is set to high power V/F curve and low frequency torque is lower, it is not suitable for drive to accel/decel quickly. If it needs to accel/decel quickly, it is not ecommended to use this parameter.

Please ensure the at-site loading, and then select the proper V/F curve.



8-01	Start-Up Frequency of the Auxiliary Motor		Factory Setting	0.00
	Settings	0.00～600.00 Hz		

The Start-up Frequency is the initial frequency output upon a RUN command for the auxiliary motor. If the startup frequency setting is 0.00, the auxiliary motor will not be activated.

8-02	Start-Up Frequency width of the Auxiliary Motor		Factory Setting	5.00
	Settings	0.00～600.00 Hz		

8-03	Time Delay before Starting the Auxiliary Motor	Factory Setting	0.00
	Settings	0.0～6000.0 Sec	

8-04	Time Delay before Stopping the Auxiliary Motor	Factory Setting	0.00
	Settings	0.0～6000.0 Sec	

The q'ty number of the auxiliary motor is decided by multi-function output terminal settings. The maximum q'ty number is 3.

The time delays before Starting and before Stopping can prevent the motor over it's limitation at the moments of start-up and stop.

The order of stopping auxiliary motors is the first startup, the first stop.

For example:

Starting order: auxiliary motor1→auxiliary motor2→auxiliary motor3

Stopping order: auxiliary motor1→auxiliary motor2→auxiliary motor3

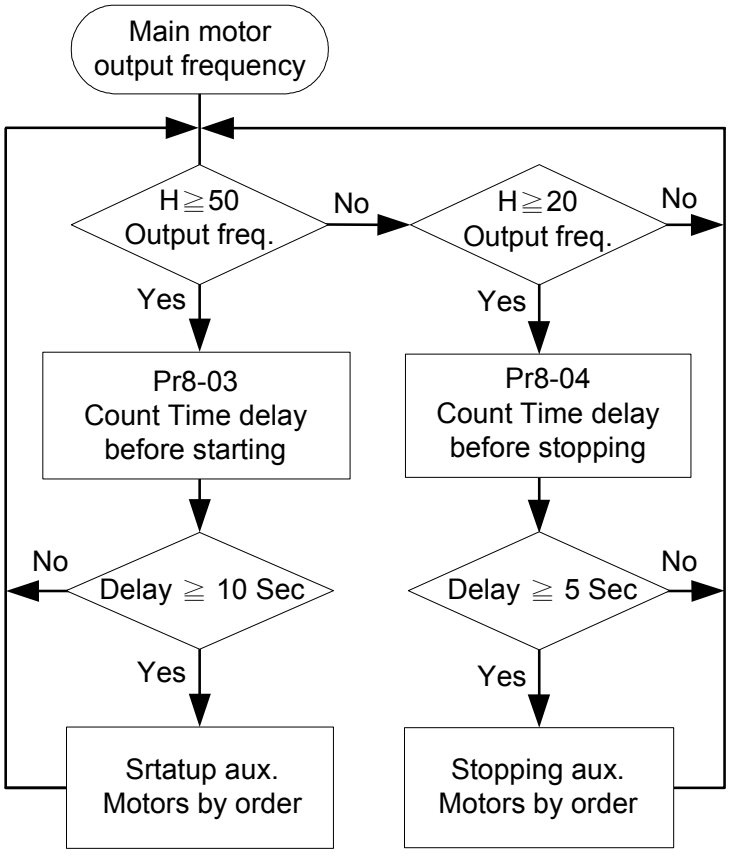
Startup procedure example:

Pr8-01 Startup Frequency = 50 Hz

Pr8-02 Start-Up Frequency width =20 Hz

Pr8-03 Time Delay before Starting =10 Sec

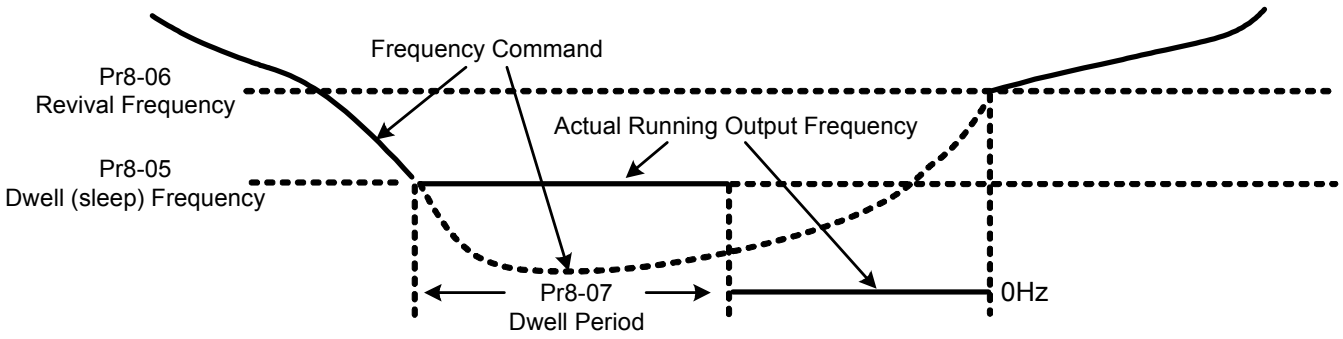
Pr8-04 Time Delay before Stopping =5 Sec



8-05	Dwell (sleep) frequency		Factory Setting	0.00
	Settings	0.00～600.00 Hz		
8-06	**Revival Frequency**		Factory Setting	0.00
	Settings	0.00～600.00 Hz		
8-07	**Dwell (sleep) Period**		Factory Setting	0.0
	Settings	0.0～6000.0 Sec		

These parameters determine Dwell (sleep) functions of the Drive. If the command frequency falls below the Dwell frequency, for the specified time in Pr8-07, then the drive will shut off the output and wait until the command frequency rises above Pr8-06.

Please see the below diagram.



Dwell (sleep) Function

CHAPTER 6 FUNCTIONS AND PARAMETER SUMMARY

0 System Parameter

★= This parameter cannot be set during operation.

	Para-meter	Functions	Settings	Factory Setting	User
★	0-00	Identity Code	Based on the model type	Read Only	
★	0-01	Rated Current Display	Based on the model type	Read Only	
★	0-02	Parameter Reset	10: Parameter reset for 60Hz, 230V or 460V field 9: Parameter reset for 50Hz, 220V or 380V field 8: Parameter reset for 60Hz, 220V or 380V field 7: Parameter reset for 50Hz, 230V or 460V field	8	
	0-03	Password Input for unlock	0~9999	0	
	0-04	Password Setting for lock/unlock	0~9999	0	
	0-05	Parameter Locking	Bit 0=1: Parameters cannot be read Bit 1=1: Disable Frequency Command changes. Bit 2=1: Disable run command from keypad	b00000	
	0-06	Start-up Display of the Drive	0: F (Master frequency command) 1: H (Output frequency) 2: A (Output current) 3: U (multi-function display of Pr. 0-07)	0	
	0-07	Definitions of the Multi-Function Display	0: Motor speed (rpm) 1: DC-BUS voltage 2: Output voltage 3: Voltage command 4: PID feedback value 5: Multi-step speed (0~15Steps) 6: Dwell (Sleep) time 7: Remaining number of times for the "restart after fault" feature 8: (Factory Reserved) 9: (Factory Reserved) 10: Power factor ±1.000 11: Counter value 12: Over-torque accumulated time 13: (Factory Reserved) 14: Dwell Time at Start-up 15: Dwell Time during a STOP 16: DC Braking Time at Start-up 17: DC Braking Time during a STOP 18: Execution time of the multi-step speed 19: (Factory Reserved) 20: (Factory Reserved)	0	

			21: Day (power-up time)		
			22: Hour, Minute (power-up time)		
			23: (Factory Reserved)		
			24: Execution step of the multi-step speed		
			25: (Factory Reserved)		
			26: (Factory Reserved)		
			27: (Factory Reserved)		
			28: (Factory Reserved)		
			29: AVI (0~10V)		
			30: ACI (4~20mA)		
			31: (Factory Reserved)		
			32: (Factory Reserved)		
			33: (Factory Reserved)		
			34: Over-torque level		
			35: Torque compensation gain		
			36: (Factory Reserved)		
			37: (Factory Reserved)		
			38: Stall level limitation		
			39～52: (Factory Reserved)		
			53: Output power (kW)		
			54: Output (kVA)		
			55：(Reserved)		
			56: OH1 temperature		
			57: OH2 temperature		
			58: (Factory Reserved)		
			59: (Factory Reserved)		
			60: Overload accumulated time		
			61：(Factory Reserved)		
			62: Compensated voltage		
			63: (Factory Reserved)		
			64: DC voltage upon a fault		
			65: Output AC voltage upon a fault		
			66: Output frequency upon a fault		
			67: Frequency command upon a fault		
			68: Current value upon a fault		
	0-08	User-Defined Coefficient Setting	0～39 (no use)	0	
			40～60000 (relative to Pr1-00)		
	0-09	Number of the decimal places	0~3	0	
	0-10	Software Version	Read-only	x.xx	
	0-11	EPROM store settings	Bit0=1: FWD/REV direction command not memorized	b00000	
			Bit1=1: PU frequency command not memorized		
			Bit2=1: RS-485 frequency command not memorized		
			Bit3=1: Up/down pin frequency command not memorized		
			Bit4=1: Parameter not memorized		

	0-12	Optimal Acceleration / Deceleration Setting	0: Linear acceleration/deceleration 1: Auto acceleration, linear deceleration 2: Linear acceleration, auto deceleration 3: Auto acceleration/deceleration 4: Linear acceleration/deceleration, but conduct the stall prevention throughout the auto acceleration/deceleration function.	0	
★	0-13	Time unit for Acceleration Deceleration and S curve	0: Unit 0.01 Sec 1: Unit 0.1 Sec 2: Unit 1 Sec	0	
	0-14	Carrier Frequency Upper Bound	0：0.7kHz 1～18kHz	10	
	0-15	Carrier Frequency Lower Bound	0：0.7kHz 1～18kHz	10	
	0-16	Auto Voltage Regulation (AVR) Function	0: AVR function enabled 1: AVR function disabled 2: AVR function disabled during deceleration	0	
	0-17	Automatic Energy-Saving Operation (AESO)	Bit0=0: Disable AESO Bit 0=1: Enable AESO Bit 1=0: Maximum output voltage could be higher than the input power voltage Bit 1=1: Maximum output voltage equals to the input power voltage Bit 2=0: OL (100%) constant torque operation Bit 2=1: OL (120%) variable torque operation Bit 3=0: Regen torque without slip compensation Bit 3=1: Regen torque with slip compensation Bit 4=0: Low noise mode operation Bit 4=1: Quiet mode operation	b00000	
	0-18	Source of the Frequency Command	0: The digital keypad 1: The RS485 communication port input 2: The external analog input 3: The external up/down pins	0	
	0-19	Source of the Operation Command	0: The RS485 communication port / digital Keypad 1: The external terminal / digital Keypad operation 2: The digital keypad operation 3: The external terminal operation	0	
	0-20	Stop Methods	Bit 0=0: Ramp to stop Bit 0=1: Coast to stop Bit 1=0: Not restart after reset	b00000	

			Bit 1=1: Restart after reset		
			Bit 2=0: Line Start Lockout is enabled		
			Bit 2=1: Line Start Lockout is disabled		
			Bit3=0: zero speed intervals enabled		
			Bit3=1: zero speed intervals disabled		
			Bit4=0: linear accel and decel at high speed zone		
			Bit4=1: S-curve accel and decel at high speed zone		
	0-21	Reverse Operation	0: REV enabled	0	
			1: REV disabled		
			2: FWD disabled		
	0-22	Stop timer	0.00~60.00sec	0.00	
	0-23	Fan control	Bit 0=0: when power is applied, the fan will turn on	b00000	
			Bit 0=1: When the run command is given, the fan will turn on		
	0-24	Setting resolution of frequency dial on PU	0=0.01 Hz	1	
			1=0.10Hz		
			2=1.00Hz		
			3=10.00 Hz		

1 Basic Parameter

	Para-meter	Functions	Settings		Factory Setting	User
★	1-00	Maximum Operation Frequency	50.0~600.00Hz		60.00/50.00	
★	1-01	Maximum Voltage frequency (Base Frequency)	0.00~600.00Hz		60.00/50.00	
	1-02	Maximum Output Voltage	230V models: 0.0～255.0	460V models: 0.0～510.0V	230V:220.0 460V:440.0	
★	1-03	Upper Midpoint Output Frequency	0.00~600.00Hz		0.50	
	1-04	Upper Midpoint Output Voltage	230V models: 0.0～255.0	460V models: 0.0～510.0V	230V:5.0 460V:10.0	
★	1-05	Lower Midpoint Output Frequency	0.00~600.00Hz		0.50	
	1-06	Lower Midpoint Output Voltage	230V models: 0.0～255.0	460V models: 0.0～510.0V	230V:5.0 460V:10.0	
	1-07	0Hz Output Voltage	230V models: 0.0～255.0	460V models: 0.0～510.0V	0.0	
	1-08	Startup Frequency	0.00~600.00Hz		0.50	
	1-09	Upper Bound Frequency	0.0～150.0%		110.0	
	1-10	Lower Bound Frequency	0.0～100.0%		0.0	
	1-11	The 1st Acceleration Time	0.00～60000 Sec		10.00/60.00	
	1-12	The 1st Deceleration Time	0.00～60000 Sec		10.00/60.00	
	1-13	The 2nd Acceleration Time	0.00～60000 Sec		10.00/60.00	
	1-14	The 2nd Deceleration Time	0.00～60000 Sec		10.00/60.00	

	1-18	1st/2nd Acceleration/Deceleration Frequency	0.00~600.00Hz		0.000	
	1-19	S-Curve for Acceleration Departure Time	0.00～12000 Sec		0.00	
	1-20	S-Curve for Acceleration Arrival Time	0.00～12000 Sec		0.00	
	1-21	S-Curve for Deceleration Departure Time	0.00～12000 Sec		0.00	
	1-22	S-Curve for Deceleration Arrival Time	0.00～12000 Sec		0.00	
★	1-23	Skip Frequency 1 (upper limit)	0.00~600.00Hz		0.00	
★	1-24	Skip Frequency 1 (lower limit)	0.00~600.00Hz		0.00	
★	1-25	Skip Frequency 2 (upper limit)	0.00~600.00Hz		0.00	
★	1-26	Skip Frequency 2 (lower limit)	0.00~600.00Hz		0.00	
★	1-27	Skip Frequency 3 (upper limit)	0.00~600.00Hz		0.00	
★	1-28	Skip Frequency 3 (lower limit)	0.00~600.00Hz		0.00	
	1-29	Offset voltage at decel	230V models: -50.0~50.0 V	460V models: -100.0~100.0V	0.0	

2 Digital Output/Input Parameters (Need Optional I/O card)

	Para-meter	Functions	Settings	Factory Setting	User
★	2-00	2-Wire/3-Wire Operation Control	0: 2-Wire (1)	0	
			1: 2-Wire (2)		
			2: 3-Wire (MI1)		
★	2-01	Multi-Function Input Command 1 (MI1)	1: multi-step speed command 1	1	
★	2-02	Multi-Function Input Command 2 (MI2)	2: multi-step speed command 2	2	
★	2-03	Multi-Function Input Command 3 (MI3)	3: multi-step speed command 3	3	
★	2-04	Multi-Function Input Command 4 (MI4)	4: multi-step speed command 4	4	
			5: Reset（NO）	5	
			6: clear counter	14	
			7: the 1st, 2nd acceleration/deceleration time selection		
			8: acceleration/deceleration speed inhibit		
			9: operation speed command form AVI		
			10: operation speed command form ACI		
			12: Emergency Stop		
			13: PID function disabled		
			14: EF input		
			15: B.B. traces from the bottom upward		
			16: B.B. traces from the top downward		
			17: Operation Command selection		

			18: Cancel the setting of the optimal acceleration/ deceleration time			
			22: Disable PLC RUN			
			23: Pause PLC RUN			
			24: Digital Up command			
			25: Digital Down command			
			26: Zero speed is replaced by DC current control			
			27: Pause Stop			
			28: Disable Dwell function			
			29: Disable Interfere jump function			
			30: Cancel Speed search			
			31: EEPROM write function disable			
			32: input the counter value			
	2-07	UP/DOWN key mode	0	UP/DOWM following the acceleration/ deceleration time	b00000	
			1	UP following the constant speed, and DOWN following the deceleration time following the deceleration time		
			2	UP following the acceleration time, and DOWN following the constant speed		
			3	UP/DOWN following the constant speed		
	2-08	The Acceleration /Deceleration Speed of the UP/DOWN Key with Constant Speed	0.01～1.00Hz/msec		0.01	
	2-09	Digital Input Responding Time	0.001～30.000 Sec		0.005	
	2-10	Digital Input Operation Direction	00000～000FF		h00000	
	2-11	Pre-set target Counter Values Achieved	0～65500		0	
	2-12	Pre-warn Counter Value Achieved	0～65500		0	
	2-14	Pre-set Arrival Frequency 1	0.00~600.00Hz		60.00/50.00	
	2-15	Pre-set Arrival Frequency 1 band width	0.00~600.00Hz		2.00	
	2-16	Pre-set Arrival Frequency 2	0.00~600.00Hz		60.00/50.00	

	2-17	Pre-set Arrival Frequency 2 band width	0.00~600.00Hz	2.00	
	2-18	Multi-Function Output Direction	Bit 0～Bit 3 separate setting	b00000	
	2-19	Multi-Function Output 1 R1A, R1B, R1C (Relay 1)	1: Drive running	11	
			2: Master frequency attained 1 (Both Forward and Reverse)	1	
	2-21	Multi-Function Output 3 (MO1)	3: Master frequency attained 2 (Both Forward and Reverse)	5	
			4: Pre-set speed attained 1 (Both Forward and Reverse)	9	
			5: Pre-set speed attained 1 (Forward only)		
			6: Pre-set speed attained 2 (Both Forward and Reverse)		
			7: Pre-set speed attained 2 (Forward only)		
			8 : Drive in decel		
			9: Drive ready for use		
			10: Low voltage alarm (LV)		
			11: Fault Indication		
			12: Base block (B.B.) Indication		
			13: Zero Speed (including shutdown)		
			14: Zero speed (while in run)		
			15: Pre-set target Count Value Attained		
			16: Pre-warn Count Value Attained		
			17: PLC RUN Command		
			18: PLC RUN paused		
			19: A step of PLC RUN completed		
			20: PLC RUN completed		
			21: Heatsink over-heat indication		
			22: Gear Gap Accel/Decel interruption		
			23: Operation Mode indication		
			24: over-torque (ot)		
			26: Software braking output(MO1, Pr2-21 only)		
			27: Auxiliary Motor no. 1		
			28: Auxiliary Motor no. 2		
			29: Auxiliary Motor no. 3		
			32~47: PLC RUN step indication		
			48~63: Multi-step indication		

3 Analog Output/Input Parameters (Need optional I/O card)

	Para-meter	Functions	Settings	Factory Setting	User
	3-00	Addition Function of the Analog Inputs	0: enable addition function 1: disable addition function (AVI,ACI)	0	
	3-01	Analog Input Noise Filter	0.00~2.00 Sec	0.10	
	3-02 Valid for ACI (Pr3-06)	AVI Analog Input	0: no functions	1	
			1: frequency command		
			2: Acceleration/deceleration time gain		
			3: Over-current stall prevention level during operation		
			4: Over-current stall prevention level during Acceleration		
			5: Over-torque current level		
			6: Torque compensation gain		
			7: AVI auxiliary frequency		
			8: ACI auxiliary frequency		
			9: (Factory Reserved)		
			10: Auxiliary frequency of master frequency		
			11: PID feedback		
			12: PID offset		
			13：DC level (same as Pr6-00)		
			14：Torque adjust during run. (AVI only)		
	3-03	AVI Analog Input Bias	-10.00～10.00V	0.00	
	3-04	AVI Analog Input Gain	-500.0～+500.0%	100.0	
	3-05	AVI Positive/Negative Bias Mode Mode	0: zero bias	0	
			1: value lower than bias = bias		
			2: value higher than bias = bias		
			3: the absolute value of the bias voltage while serving as the center		
	3-06	ACI Analog Input	Same as Pr. 03-02	0.00	
	3-07	ACI Analog Input Bias	0.00～20.00Ma	4.00	
	3-08	ACI Analog Input Gain	-500.0～+500.0%	100.0	
	3-09	ACI Positive/Negative Bias Mode	0：zero bias	1	
			1: value lower than bias = bias		
			2: value higher than bias = bias		
			3: the absolute value of the bias voltage while serving as the center		
	3-10	Loss of the ACI signal	0: disabled	0	
			1: continue operation at last known frequenc		
			2: decelerate to a stop		
			3: stop immediately and display AcI		

	3-15	AVO Analog Output 1 Selection	0: output frequency 1: command frequency 2: Speed 3: Current 4: Output voltage 5: DC BUS voltage 6: Power factor 7: Power 8: AVI 9: ACI 13: voltage command 14: counter 15: Analog Output Value (Pr. 3-21)	0	
	3-17	AVO Analog Output Gain	-900.0～900.0%	100.0	
	3-19	AVO Analog Output Bias Voltage	-10.00～10.00V	0.00	
	3-21	Analog Output Value	0.0～100.0%	0.0	

4 Multi-Step Speed Run (MSS Run) and Process Control Run (PLC Run)

	Para-meter	Functions	Settings	Factory Setting	User
	4-00	The 1st Step Speed	0.00~600.00Hz	0.00	
	4-01	The 2nd Step Speed	0.00~600.00Hz	0.00	
	4-02	The 3rd Step Speed	0.00~600.00Hz	0.00	
	4-03	The 4th Step Speed	0.00~600.00Hz	0.00	
	4-04	The 5th Step Speed	0.00~600.00Hz	0.00	
	4-05	The 6th Step Speed	0.00~600.00Hz	0.00	
	4-06	The 7th Step Speed	0.00~600.00Hz	0.00	
	4-07	The 8th Step Speed	0.00~600.00Hz	0.00	
	4-08	The 9th Step Speed	0.00~600.00Hz	0.00	
	4-09	The 10th Step Speed	0.00~600.00Hz	0.00	
	4-10	The 11th Step Speed	0.00~600.00Hz	0.00	
	4-11	The 12th Step Speed	0.00~600.00Hz	0.00	
	4-12	The 13th Step Speed	0.00~600.00Hz	0.00	
	4-13	The 14th Step Speed	0.00~600.00Hz	0.00	
	4-14	The 15th Step Speed	0.00~600.00Hz	0.00	
	4-15	Time Duration of the PLC RUN Master Speed	0.0～65500 Sec	0.0	
	4-16	Time Duration of PLC RUN Step 1	0.0～65500 Sec	0.0	
	4-17	Time Duration of PLC RUN Step 2	0.0～65500 Sec	0.0	
	4-18	Time Duration of PLC RUN Step 3	0.0～65500 Sec	0.0	

	4-19	Time Duration of PLC RUN Step 4	0.0～65500 Sec	0.0	
	4-20	Time Duration of PLC RUN Step 5	0.0～65500 Sec	0.0	
	4-21	Time Duration of PLC RUN Step 6	0.0～65500 Sec	0.0	
	4-22	Time Duration of PLC RUN Step 7	0.0～65500 Sec	0.0	
	4-23	Time Duration of PLC RUN Step 8	0.0～65500 Sec	0.0	
	4-24	Time Duration of PLC RUN Step 9	0.0～65500 Sec	0.0	
	4-25	Time Duration of PLC RUN Step 10	0.0～65500 Sec	0.0	
	4-26	Time Duration of PLC RUN Step 11	0.0～65500 Sec	0.0	
	4-27	Time Duration of PLC RUN Step 12	0.0～65500 Sec	0.0	
	4-28	Time Duration of PLC RUN Step 13	0.0～65500 Sec	0.0	
	4-29	Time Duration of PLC RUN Step 14	0.0～65500 Sec	0.0	
	4-30	Time Duration of PLC RUN Step 15	0.0～65500 Sec	0.0	
	4-31	The PLC RUN Time Multiplier	1～10	10	
	4-32	The PLC RUN Operation Direction	00000～07FFF（0：forward；1：reverse）	h00000	
	4-33	Process Control Operation Mode (PLC RUN)	Bit 0=0：direction determined by Pr4-32 Bit 0=1：direction determined by the master speed control Bit 1=0：continuously execute the process control operation Bit 1=1：zero speed intervals enabled Bit 2=0：operate at zero speed upon time extension Bit 2=1：operate at a constant speed upon time extension	b00000	
	4-34	Process Control operation Cycle (PLC RUN)	0: PLC RUN disabled 1~60000 cycle 60001 endless	0	
	4-35	What to do after Process Control Operation (PLC RUN) finished	0~15：step speed 16：stop	16	
	4-36	Multi-Step Speed Operation Mode (MSS RUN)	Bit 0=0：direction determined by Pr4-32 Bit 0=1：direction determined by the master speed Bit 1=0：continuously execute multi-step speed Bit 1=1：execute only one process control operation cycle Bit 2=0：zero speed intervals disabled Bit 2=1：zero speed intervals enabled Bit 3=0：PID offset no use Bit 3=1：multi-speed + PID offset	b00001	

5 Motor and Protection Parameter

	Para-meter	Functions	Settings		Factory Setting	User
★	5-00	Full-Load Current of Motor	****A（10~120%）		A（100%）	
	5-01	Torque Compensation of Motor	0.0～25.0%		0.0	
	5-02	Slip Compensation of Motor	0.0～20.0%		0.0	
	5-03	Number of Poles for Motor	2～20		4	
	5-04	Line to Line resistance R1 of Motor	Ω		0	
★	5-05	auto-tuning	0= No function 1= Measure R1 by 5-00 current 2= reset		0	
★	5-06	Low Voltage Level	230V models: 160～220VAC	460V models: 320～440VAC	230V:180 460V:360	
	5-07	Over-Voltage Stall Prevention	230V models: 320～500VAC	460V models: 640～1000VAC	230V:380 460V:760	
	5-08	Software Setting of the Braking Level	230V models: 320～500VAC	460V models: 640～1000VAC	230V:373 460V:746	
	5-09	Phase-Loss Protection	0: Warn and keep operating (below 50%)		0	
			1: warn and ramp to stop			
			2: warn and coast to stop			
	5-10	Over-Current Stall Prevention during Acceleration	Amp (10～250%)		A(170%)	
	5-11	Over-Current Stall Prevention during Acceleration	Amp (0~250%)		A(120%)	
	5-12	Over-Current Stall Prevention during Operation	Amp (10～250%)		A(170%)	
	5-13	Over-Current Stall Prevention during Operation (Lower limit)	Amp (0~250%)		A(120%)	
	5-14	Over-Current Deceleration Time during Operation	0.05～600.00 Sec		3.00	
	5-15	Over-Torque Detection Selection	0：disabled		0	
			1：Over-torque detection during constant speed Operation, stop operation after detection.			
			2：Over-torque detection during constant speed operation, continue to operate after detection.			
			3：Over-torque detection during entire			
			4：Over-torque detection during entire			
	5-16	Over-Torque Detection Level	Amp(20～250%)		A(150%)	
	5-17	Over-Torque Detection Time	0.0～60.0 Sec		0.1	

	5-18	Electronic Thermal Relay Selection	0 ： Electronic thermal relay function disabled 1 ： Inverter/vector motor 2 ： Standard motor	0	
	5-19	Electronic Thermal Relay Time	30～600 Sec	60	
	5-20	Heat Sink Over-Heat Warning	0.0～110.0℃	85.0	
	5-21	Most Recent Fault Record	0: no fault	0	
	5-22	2nd Most Recent Fault Record	1: oc (over-current)	0	
	5-23	3rd Most Recent Fault Record	2: ov (over-voltage)	0	
	5-24	4th Most Recent Fault Record	3: GF (ground fault)	0	
			4: sc (IGBT failure)		
			5: oL (drive overload)		
			6: oL1 (electronic thermal relay)		
			7: ot (Over-Torque)		
			8: OCN (over-current during constant speed)		
			9: OCA (over-current during accel)		
			10: OCD (over-current during decel)		
			11: OCD (over-current during decel)		
			12: EP2 (EPROM error 2)		
			13: EF (external fault)		
			14: CT1 (current sensor 1)		
			15: CT2 (current sensor 2)		
			16: HPF (protection circuit fault)		
			17: oH1 (IGBT overheat)		
			18: oH2 (brake overheat)		
			19: Soft start (Inrush limit)		
			20: ACI (ACI error)		
			21: ASC (RS-485 error)		
			22: PID (PID error)		
			23: PU (KEYPAD communication overtime)		
			24: Tune (Motor auto tuning failure)		
			25: brake (braking transistor failure)		
			26: PG (PG loose wires)		
			27: PHL (Phase loss)		
			29: CPU (CPU error)		
			30: FAN (FAN failure)		
			31.ANI fault (Analog Input Error)		
			37.OVd (Decel over Voltage)		

			38.COPY Fault (Parameter Copy Error)		
			39: LV (Low Voltage)		
			40: BB (External Base Block)		

6 Special Parameters

	Para-meter	Functions	Settings	Factory Setting	User
	6-00	DC Braking Current Level	Amp (0 ~125%)	A(0%)	
	6-01	DC Braking Time at Start-up	0.00～60.00 Sec	0.00	
	6-02	DC Braking Time during stopping	0.00～60.00 Sec	0.00	
	6-03	Start-point for DC Braking	0.00~600.00Hz	0.00	
	6-04	Increasing Rate of the DC Voltage	0.01~300.00%	50.00%	
	6-05	Re-activate after Momentary Power Loss	0：disable 1：begins from command frequency 2：begins from minimum output frequency	0	
	6-06	Maximum Allowable Power Loss Time	0.1～5.0 Sec	2.0	
	6-07	Base Block Time for Speed Search	0.1～5.0 Sec	0.5	
	6-08	Maximum Current Level for Speed Search	Amp(20～200%)	A(120%)	
	6-09	Deceleration Time for Speed Search	0.50～120.00 Sec	3.00	
	6-10	Auto Restart after Fault	0～10	0	
	6-11	Speed Search Type	0：speed search disabled 1：speed search through the frequency command 2：FWD-speed search only (motor only runs in FWD direction) 3：REV-speed search only (motor only runs in REV direction) 4：FWD/REV speed search enabled in both directions (fwd first) 5：REV/FWD speed search enabled in both directions (rev first)	0	
	6-12	Speed Search Frequency (FWD direction)	0.00~600.00Hz	60.00/50.00	
	6-13	Speed Search Frequency (REV direction)	0.00~600.00Hz	60.00/50.00	
	6-14	Gear Gap Acceleration-Interruption Time	0.00～60.00 Sec	0.00	
	6-15	Gear Gap Acceleration-Interruption Frequency	0.00~600.00Hz	6.00	
	6-16	Gear Gap Deceleration-Interruption Time	0.00～60.00 Sec	0.00	

	6-17	Gear Gap Deceleration-Interruption Frequency	0.00~600.00Hz	6.00	
	6-18	Gear Gap current	Amp (0~150%)	A(0%)	
	6-19	Skip Frequency Width	0.00～100.00Hz	0.00	
	6-20	Bias Frequency Width	0.00～200.00Hz	0.00	

7 High Performances and Communication Parameter

A RS-485 serial port (option) is necessary for serial communication

	Para-meter	Functions	Settings	Factory Setting	User
	7-00	Proportional Gain (P)	0.0～500.0%	80.0	
	7-01	Integral Time (I)	0.00～100.00 Sec 0.00：no integral	1.00	
	7-02	Differential Time (D)	0.00～5.00 Sec	0.00	
	7-03	Integration's Upper Bound Frequency	0.0～100.0%	100.0	
	7-04	PID Frequency Output Command limit	0.0～100.0%	100.0	
	7-05	PID Deviation Range	-100.0~+100.0%	0.0	
	7-06	One-Time Delay	0.000~0.100 Sec	0.000	
	7-07	Detection Time of the Feedback Error	0.0～6000.0 Sec	0.0	
	7-08	Feedback Signal Fault Treatment	0: warn and keep operating 1: warn and RAMP to stop 2: warn and COAST to stop	0	
	7-9	Keypad Transmission Fault Treatment	0: warn and RAMP to stop 1: warn and COAST to stop	0	
	7-10	Keypad Transmission Fault detection	0.0 : Disable and keep operating 0.1～60.0 Sec	0.0	
	7-11	Communication Address	1～254	1	
	7-12	Transmission Speed of the Communication	1.2～125 k bit / Sec	9.6	
	7-13	Transmission Fault Treatment	0: warn and keep operating 1: warn and RAMP to stop 2: warn and COAST to stop 3: no treatment and no display	3	
	7-14	Overtime Detection	0.0：disabled 0.1~60.0 Sec	0.0	
	7-15	Communication Protocol	0：7，N，2 ASCII 1：7，E，1 ASCII 2：7，O，1 ASCII 3：7，E，2 ASCII 4：7，O，2 ASCII 5：8，N，1 ASCII	0	

			6：8，N，2 ASCII		
			7：8，E，1 ASCII		
			8：8，O，1 ASCII		
			9：8，E，2 ASCII		
			10：8，O，2 ASCII		
			11：8，N，1RTU		
			12：8，N，2 RTU		
			13：8，E，1 RTU		
			14：8，O，1 RTU		
			15：8，E，2 RTU		
			16：8，O，2 RTU		

8 Control Parameters for Fan and Water Pump

	Para-meter	Functions	Settings	Factory Setting	User
★	8-00	V/F Curve Selection	0: V/F Curve determined 1: 1.5 Power Curve 2: Square Curve	0	
	8-01	Start-Up Frequency of the Auxiliary Motor	0.00~600.00Hz	0.00	
	8-02	Start-Up Frequency width of the Auxiliary Motor	0.00~600.00Hz	5.00	
	8-03	Time Delay before Starting the Auxiliary Motor	0.0~6000.0Sec	0.00	
	8-04	Time Delay before Stopping the Auxiliary Motor	0.0~6000.0Sec	0.00	
	8-05	Dwell (sleep) frequency	0.00~600.00Hz	0.00	
	8-06	Revival Frequency	0.00~600.00Hz	0.00	
	8-07	Dwell (sleep) Period	0.0~6000.0 Sec	0.0	

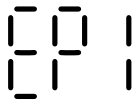
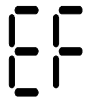
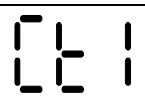
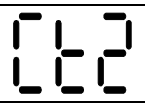
CHAPTER 7 ERROR MESSAGE AND TROUBLESHOOTING

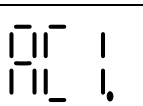
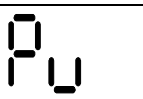
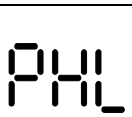
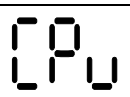
The Drive has a comprehensive fault diagnostic system that includes various alarms and fault messages such as over-voltage, low-voltage and over-current. Once a fault is detected, the corresponding protective functions will be activated, and the Drive will stop the output and the motor will then coast to stop. The following faults are displayed as shown on the Drive digital keypad panel. Once the fault occurred, eliminate it first, and 5 seconds later, press the RESET button to reactivate the operation.

Problems and Solutions

Fault name	Fault Descriptions	Treatments
	Over Current (OC): The Drive detects an abnormal increase in Output current.	1. Check whether the motors horsepower corresponds to the Drive output power. 2. Check the wiring connections between the Drive and motor for possible short circuits. 3. Increase the Acceleration time (Pr1-11, Pr1-12) 4. Check for possible excessive loading conditions at the motor. 5. If there are any abnormal conditions when operating the Drive after short-circuit being removed, it should be sent back to manufacturer.
	Over Voltage (OV): The Drive detects that the DC bus voltage has exceeded its maximum allowable value. 110/230 V class: about 800V 460 V class: about 800V	1. Check whether the input voltage falls within the rated Drive input voltage. 2. Check for possible voltage transients. 3. Bus over-voltage may also be caused by motor regeneration. Either increase the decel time or add an optional braking unit ana resistor. 4. Check whether the required braking power is within the specified limits.
	OVd: The Drive detects that the DC bus voltage has exceeded its maximum allowable value while in decal. 115/230 V class: about 400V 460 V class: about 800V	Bus over-voltage caused by motor regeneration. Either increase the decel time or add an optional braking resistor. Some model need to add a Dynamic Brake Unit (optional).

	Ground Fault (GF): The Drive output is abnormal. When the output terminal is grounded (short circuit current is 50% more than the drive rated current), the Drive power module may be damaged. The short circuit protection is provided for Drive protection, not for personnel protection.	1. Check whether the connection to the motor is short circuited or grounded 2. Check whether the IGBT power module is functioning right 3. Check whether the wiring on the output side is of poor insulation
	Short Circuit (SC): Output side of the AC drive is short circuited	1. Check whether the motor's resistance and insulation are functioning right 2. Check whether the connection to the motor is short circuited
	Over Load (OL): The Drive detects excessive drive output current. Note: The Drive can withstand up to 125% of the rated current for a maximum of 60 seconds.	1. Check whether the motor is overloaded 2. Reduce torque compensation setting as set in Pr5-01 3. Increase the acceleration time 4. Increase the Drive output capacity
	Over Load 1 (OL1): Motor overload Internal electronic thermal relay protections	1. Check for possible motor overload 2. Check electronic thermal overload setting or Increase motor capacity. 3. Reduce the current level so that the drive output current does not exceed the value set by the Full-Load Current of Motor Pr5-00
	Motor over torque (OT)	1. Check whether the loading of the motor is too heavy 2. Check the setting of the over-torque detection level (Pr5-15 to Pr5-17)
	Over-current during Steady State Operation (OCn)	1.Check for possible poor insulation at the output line 2. Check for possible motor stall 3. Replace with the Drive with one that has a higher output capacity (next Hp size)

	Over-current during Acceleration (OCA)	1.Check for possible poor insulation at the output line 2. Decrease the torque boost setting in Pr5-01 3. Increase the acceleration time 4. Replace with the Drive with one that has a higher output capacity (next Hp size)
	Over-current during Deceleration (OCd)	1. Check for possible poor insulation at the output line 2. Increase the deceleration time 3. Replace with the Drive with one that has a higher output capacity (next Hp size)
	Internal memory IC can not be programmed (EP1)	1. Switch off power supply. 2. Check whether the input voltage falls within the rated Drive input voltage. 3. Switch the Drive back on.return to the factory
	Internal memory IC can not be read (EP2)	1. Check the connections between the main control board and the power board. 2. Reset drive to factory defaults. 3.Return to the factory if the previous method is not working
	The external terminal EF-GND goes from OFF to ON (EF)	When external terminal EF-GND is closed, the output will be turned off (under N.O. E.F.). Eliminate the fault source and then press the RESET button
	The internal A/D 1 loop is defected (Ct1)	Return to the factory
	The internal A/D 2 loop is defected (Ct2)	Return to the factory
	Hardware Protection Failure (HPF)	1. Check every appliance that connects to the Drive 2. Return to the factory
	The Drive temperature sensor detects excessive heat (OH1)	1. Ensure that the ambient temperature falls within the specified temperature range. 2. Make sure that the ventilation holes are not obstructed. 3. Remove any foreign objects on the heat sinks and check for possible dirty heat sink fins. 4. Provide enough spacing for adequate ventilation.

	Braking transistor over-heat (OH2)	1. Check the fan and the ambient temperature 2. Review the braking time and the braking resistor's rate of usage
	Inrush limit resistor fault (SoFt)	Return to the factory
	ACI loose wires (ACI)	Check the wiring of ACI
	Communication Error (ASC)	Check the connection between the drive and computer for loose wires
	PID function error (PId)	1. Check whether the PID parameters setting is appropriate 2. Check the PID feedback wiring
	KEYPAD communication Overtime (Pu)	Check whether the keypad communication circuit is well-conducted
	Auto Tuning Error (tunE)	1. Check cabling between drive and motor 2. Retry again
	Braking Transistor Fault (bF)	Return to the factory
	PG loose wires (PG)	1. Check the PG connection 2. Whether the motor is blocked
	Phase Loss (PHL): Three phase imbalanced at the input voltage	1. Check whether the power voltage is normal 2. Check whether the screw at the input power terminal is tightened
	Current message error while the drive is stopped (CC)	Return to the factory
	Electronics Circuit Fault (CPu)	Return to the factory
	Fan Fault (Fan)	1. Check whether the fan is blocked 2. Return to the factory
	The Drive detects that the DC bus voltage has fallen below its minimum value (LU)	1. Check whether the input power voltage is normal 2. Check whether the loading will be put on another unexpected heavy loading 3. Whether the 3-phase model is ofthe single-phase power input or the phase-lacking
	External Base Block (bb): Drive output is turned off.	1. When the external input terminal (B.B) is active, the Drive output will be turned off. 2. Disable this connection and the Drive will begin to work again.

CHAPTER 8 STANDARD SPECIFICATIONS

Max. Applicable Motor Output Range			1-Phase, 100 ~ 120VAC, 50/60Hz: 0.2 ~ 0.75kW (0.25 ~ 1Hp)
			1-Phase, 200 ~ 240VAC, 50/60Hz: 0.4 ~ 2.2kW (0.5 ~ 3Hp)
			3-Phase, 200 ~ 230VAC, 50/60Hz: 0.4 ~ 3.7kW (0.5 ~ 5Hp)
			3-Phase, 380 ~ 480VAC, 50/60Hz: 0.4 ~ 3.7kW (0.5 ~ 5Hp)
Output	Output Frequency		0.1 - 600Hz
	Overload Endurance		150% of rated current for 1 minute/10 minutes, Ta <=40; 200% of rated current for 2 seconds
	Maximum Output Voltage		Proportional to Input Voltage, 3-Phase (For 100V class, output voltage is twice of the input voltage)
	Power factor/Efficiency		Power factor no lower than 0.95. Efficiency no lower than 95% at full load
Control Characteristics	Control System		SPWM (Sinusoidal Pulse Width Modulation), V/F control and Sensorless Vector Control
	Speed Control		V/F Control 1:20; Sensorless Control 1:50
	Output Frequency		0.1 - 600Hz,Programable
	Output Frequency Resolution		0.01Hz
	PWM Carrier Frequency		1kHz -18kHz Adjustable (Some models are limited)
	Torque Characteristics		Including the auto-torque, auto-slip compensation; starting torque can be 150% at 1.0Hz
	Skip Frequency		Setting range 0.1-600Hz, Max. 3 points
	Accel/Decel Time		0.1-6000 seconds (2 Independent settings for Accel/Decel Time)
	Stall Prevention Level		10 to 250%, Setting of Rated Current. Setting range 0.1-600Hz while stop.
	DC Braking		DC Braking Current Level: 0 to 125% of rated output current. DC Braking time: 0 to 60 seconds. Start-Point for DC Braking: 0.1-600Hz both when start up and stop.
	Dynamic Braking Torque		Approx. 20%. Dynamic Brake chopper built-in.
	V/F Pattern		Adjustable V/F curve using 4 independent points.
Operating Characteristics	Frequency Setting	Keypad	By a rotary encoder (setting resolution 0.01Hz/step)
		External Signal	0 ~ +10VDC (Input impedance 20kΩ), 4 ~20mA DC (Input impedance 250Ω), Multi-Function Inputs 1 ~ 6 (15 Steps Jog, up/down), PLC run, (Option) RS-485 Interface MODBUS protocol.
	Operation Setting	Keypad	Set by RUN and STOP
		External Signal	FWD, REV, MI1 to MI6 can be combined to offer various modes of operation, (Option) RS-485 serial interface MODBUS protocol
	Multi-Function Input Signal (6 signals)		Multi-step selection 0 to 15, first to second accel/decel switches, accel/decel inhibit, EF Input, Emergency Stop, auxiliary motor control is invalid, ACI/AVI/AUI speed command selection, Reset, PLC Run, Up/Down command, Sink/Source selection
	Multi-Function Output Indication, (2 signals, extra 3 signals as option)		Drive Operating, Frequency Attained, Non-zero, Base Block, Fault Indication, Local/Remote indication, PLC Operation indication, and Auxiliary Motor Output
	Analog Output Signal (Option)		Analog signal output proportional to output frequency, output current, voltage, frequency command or motor's speed.
	Fault Indication		The output will be activated when faults occur (1 Relay contact point RA, RB, RC. or 2 Open-collector output)
Communication			(Option) RS-485 serial interface MODBUS protocol
Other Functions			PID feedback control, automatic voltage regulation, Momentary Power Loss restart, S-Curve, External Fault, Fault Reset, Auto Restart, Fault Records, Frequency Limits, Fan & Pump Control, Parameter Lock/Reset, Auto Tuning, Reverse Inhibition, Over-Voltage/ Over-Current Stall Prevention, automatic energy-saving, DC Braking, Speed Search during Start-up, PLC, MODBUS Communication,
Protection			Self-testing, AC source Over Voltage, Over Voltage, Over Current, Under Voltage, Over Load, Overheating, External Fault, Electronic thermal, Ground Fault, Stall Prevention, Output short circuit, IGBT short circuit
Digital Keypad (6 digits,non-detachable)	6 Function keys		Access Run, Stop, Reset/ Digit Shift, Display mode, Keypad Enable, Programming data operation.
	360 degree Rotary Encoder		Sets the parameter number and changes the numerical data
	6 digits 7 segment display		Display the Setting frequency/actual operation frequency, Output current/Voltage, User defined unit.
	Six LED Display for status indication		Display the AC drive's run/stop status, forward/Reverse run status, Keypad enable, and Frequency command source.
Environment	CE Safety		Meet LVD: EN50178 standards; When combining with the company's filter, meet EMC: EN61800-3 standards
	UL Safety		Meet UL508C standards
	Temperature		Ambient: -10℃ ~ +50℃(Non-Condensing and not frozen). Storage: -20℃ ~ +60℃
	Humidity		Below 98%RH (Non-Condensing)
	Vibration		Below 20Hz: 1G, above 20Hz: 0.6G
	Installation Location		Altitude 1,000 m or lower, keep away from corrosive gasses, liquid and dust

*TOPVERT S1 series are designed and manufactured base on CNS, IEC, CE and UL standards.

1-Phase, 100 ~ 120VAC, 50/60 Hz (Tolerance Range: 90 ~ 132V, 47 ~ 63Hz) Output Voltage :200~240VAC											
Model	Applicable Motor (230V 4 P)		Rated Output				Source	Enclosure Construction			
TOPVERT **S1-xxxxx**	Power (kW)	Horse Power (Hp)	Capacity (kVA)	Current (A)	Voltage (V)	Frequency (Hz)	Current (A)	Cooling Methods	Protection Methods (IP/NEMA)	Net Weight (kg)	Frame Code
110P2	0.2	0.25	0.6	1.6	3-Phase, 0-240 (Max)	0.1- 600	6.1	Fan-cooled	IP 20 NEMA 1		S1-A
110P4	0.4	0.5	1.2	3			11.4				
110P7	0.75	1	2	5			19.1				

1-Phase, 200 ~ 240VAC, 50/60 Hz (Tolerance Range: 180 ~ 264V,47 ~ 63Hz)											
Model	Applicable Motor (230V 4 P)		Rated Output				Source	Enclosure Construction			
TOPVERT **S1-xxxxx**	Power (kW)	Horse Power (Hp)	Capacity (kVA)	Current (A)	Voltage (V)	Frequency (Hz)	Current (A)	Cooling Methods	Protection Methods (IP/NEMA)	Net Weight (kg)	Frame Code
210P4	0.4	0.5	1.2	3	3-Phase, 0-240 (Max)	0.2- 600	5.7	Fan-cooled	IP 20 NEMA 1	0.92	S1-A
210P7	0.75	1	2	5			9.5			0.92	
211P5	1.5	2	3	7.5			14.3			1.10	
212P2	2.2	3	4.4	11			21				S1-B

3-Phase, 200 ~ 240VAC, 50/60 Hz (Tolerance Range:180 ~ 264V,47 ~ 63Hz))											
Model	Applicable Motor (230V 4 P)		Rated Output				Source	Enclosure Construction			
TOPVERT **S1-xxxxx**	Power (kW)	Horse Power (Hp)	Capacity (kVA)	Current (A)	Voltage (V)	Frequency (Hz)	Current (A)	Cooling Methods	Protection Methods (IP/NEMA)	Net Weight (kg)	Frame Code
230P4	0.4	0.5	1.2	3	3-Phase, 0-240 (Max)	0.1-600	3.3	Fan-cooled	IP 20 NEMA 1	0.93	S1-A
230P7	0.75	1	2	5			5.5			0.93	
231P5	1.5	2	3	7.5			8.3			1.20	
232P2	2.2	3	4.4	11			12.1				S1-B
233P7	3.7	5	6.8	17			18.7				

3-Phase, 380 ~ 480VAC, 50/60 Hz (Tolerance Range: 342 ~ 528V,47 ~ 63Hz)											
Model	Applicable Motor (460V 4 P)		Rated Output				Source	Enclosure Construction			
TOPVERT **S1-xxxxx**	Power (kW)	Horse Power (Hp)	Capacity (kVA)	Current (A)	Voltage (V)	Frequency (Hz)	Current (A)	Cooling Methods	Protection Methods (IP/NEMA)	Net Weight (kg)	Frame Code
430P4	0.4	0.5	1.3	1.6	3-Phase, 0-460 (Max)	0.1-600	1.8	Fan-cooled	IP 20 NEMA 1	0.89	S1-A
430P7	0.75	1	2.4	3			3.3			0.89	
431P5	1.5	2	3.3	4.2			4.6			0.89	
432P2	2.2	3	4.8	6			6.6				S1-B
433P7	3.7	5	6.8	8.5			9.4				

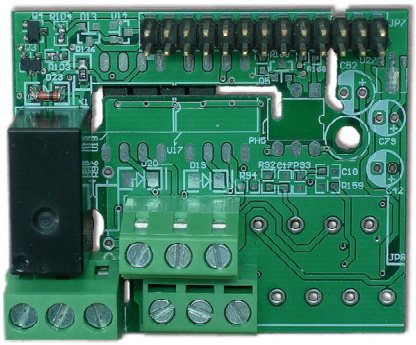
CHAPTER 9 BRAKING RESISTORS AND BRAKING UNITS

Voltage	Applicable Motor (kW) S1	Full Load Torque KG-M	Equivalent resistors specification for each drive	Dynamic Brake Unit	Braking Resistors Model (DBR-xxxxxxx) No. of Units Used		Braking Torque 10% E.D.	Minimum resistance for each drive
230V Class	0.2	0.108	80W 200Ω	Built-in	080W200	1	440	80Ω
	0.4	0.216	80W 200Ω		080W200	1	220	80Ω
	0.75	0.427	80W 200Ω		080W200	1	125	80Ω
	1.5	0.849	300W 100Ω		300W100	1	125	55Ω
	2.2	1.262	300W 70Ω		300W070	1	125	35Ω
	3.7	2.080	400W 40Ω		400W040	1	125	25Ω
460V Class	0.4	0.216	80W 750Ω	Built-in	080W750	1	220	6.8Ω
	0.75	0.427	80W 750Ω		080W750	1	125	6.8Ω
	1.5	0.849	300W 400Ω		300W400	1	125	190Ω
	2.2	1.262	300W 250Ω		300W250	1	125	145Ω
	3.7	2.080	400W 150Ω		400W150	1	125	95Ω

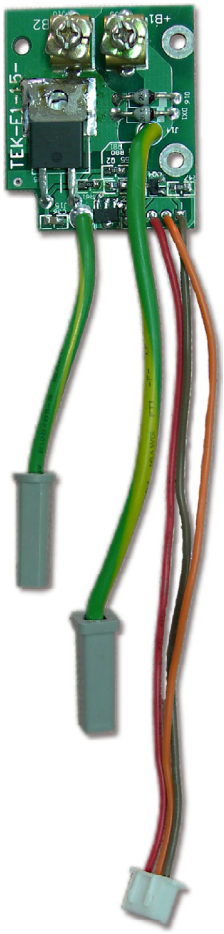
Note:

1. Please select the factory default resistance value (Watt) and the duty cycle (E.D. %).
2. If damage resulted in the inverter or other equipments due to the fact that the braking resistors and the braking modules in use are not provided by Toptek, the warranty will be void.
3. Take into consideration the safety of the environment when installing the braking resistors.
4. If the minimum resistance value is to be utilized, consult local dealers for the calculation of the Watt figures.
5. Please select thermal relay trip contact to prevent resistor over load.

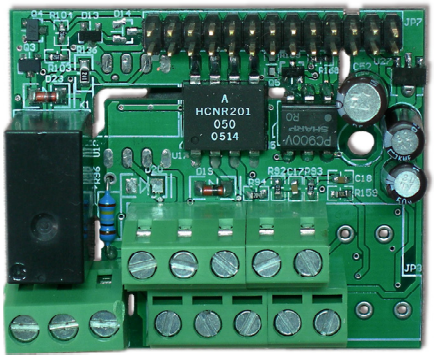
Options



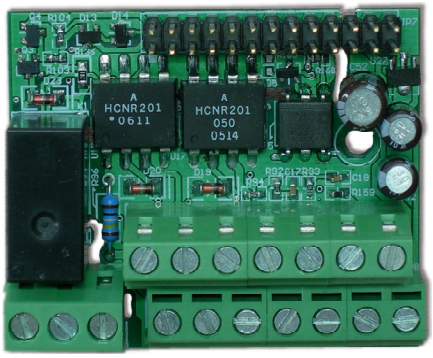
Standard I/O Card (Option A)
(include FWD/REV/MI1/MI2/DCM/E/
R1A/R1B/R1C terminals)



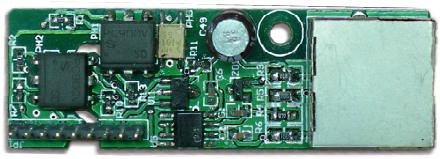
Dynamic Braking
Resistor
(Option #1)



Advanced I/O Card (Option B)
(include FWD/REV/MI1/MI2/MI3/DCM/E/
+12V/AVI/DCM/R1A/R1B/R1C/AVO terminals)



Full-function I/O Card (Option C)
(include FWD/REV/MI1/MI2/MI3/MI4/
DCM/E/+12V/AVI/ACI/DCM/
R1A/R1B/R1C/MO1/MCM/AVO terminals)



RS-485 Commucication
Series Port (Option #2)

TOPTEK

ML-S1E01C 61218

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