



## Instruction Manual

### Variable Frequency Drive 7.5 - 20 HP Controls



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### SAFETY and PRECAUTIONS


Before installation, wiring, maintenance, or trouble shooting, please read this manual thoroughly and pay attention to the safety precautions marked with “**Danger**” or “**Caution**” in this manual. Information that be helpful in certain sections will have “**Note:**” or “**Warning:**” if there is potential for harm or equipment failure. Only qualified personnel should install, wire, test, setup, or troubleshoot.

※ **Qualified Personnel:** must be familiar with the fundamentals, structures, characteristics, operating procedures, for the installation of electrical and specifically VFD installations information. This person must read the manual in detail and follow the steps of security measures to prevent possible danger.



 <b>DANGER</b>	User may cause the casualty or serious damages if user does not abide by the instructions of the manual to execute the tasks.
 <b>CAUTION</b>	User may cause injuries to the people or damage the equipment if user does not abide by the instructions of the manual to execute the tasks,

※ The “” mark indicate less serious potential for damage or injuries however the user should be aware and consider the warning information.

#### OV-1 Installation Considerations

 <b>CAUTION</b>
<ol style="list-style-type: none"><li>1. The installation shall take place only on metal surface or materials that are fire resistant. Locations with high ambient (above 50°C), moisture, oil and gas fumes, cotton fiber, metal powder and corrosive fumes must be avoided.</li><li>2. If the product specification indicates IP00 (the protective level of the equipment structure), the installation location must prevent human contact when power is applied to avoid the electric shock. The installation of Reactors, Filters or additional braking should be done only when there is no power to the drive.</li><li>3. Ambient temperature shall not exceed 50°C (122°F) including inside an enclosure.</li></ol>

#### OV-2 Wiring Considerations

 <b>DANGER</b>
<ol style="list-style-type: none"><li>1. When wiring the drive disconnect all power to avoid electric shock.</li><li>2. L1, L2, and L3 are power inputs and T1, T2, and T3 are the drive's outputs to the motor. <u>Do Not</u> connect input and output leads to terminals DC+, DC- and PR.</li><li>3. Once the wiring is complete, the drive terminal cover must be replaced to protect from accidental contact.</li><li>4. 230V drive must not be connected to an electric source of 346 – 600 Volts.</li><li>5. G .  terminal must be properly grounded. Grounding must be confirmed with the requirements of the National and local electric code.</li><li>6. Please refer to “UL” in the Overview Section OV 4 of the manual for Wire size and tightening torque, and terminal screw size.</li><li>7. Please refer to the National and local electric codes for the appropriate wire Specification.</li><li>8. The appropriate Molded Case Circuit Breaker (MCCB) or Fuse <u>must</u> be installed on the drives input power leads (L1, L2, L3).</li><li>9. For multiple motors powered by a single drive a Thermal Overload Relay must be installed for each motor.</li><li>10. Do not connect power factor correction capacitor, surge arrestor, or Single Phase motor to the drive's output (T1, T2, T3).</li><li>11. If the input transformer is 500kVA or 10 times or more than the drive rated capacity and input reactor is recommended.</li><li>12. Do not touch the drive or perform any wiring actions before drive indicator light turns off. Wait at least 5 minutes or use a multi-meter with it set to DC voltage measuring between DC(+) and DC(-) terminal (The voltage must be less than 50V).</li></ol> <p><b>Note:</b> the meter must be suitable for 1000VDC</p>



## Overview

### CAUTION

13. Do not use the drive for any other purpose than to drive a three phase AC Induction Motor.
14. The Power Leads and Control Circuit wires must be kept separated crossing at right angles. Control circuit wiring must use shielded or twisted-pair shielded wires to avoid possible interferences resulting in erratic drive operation.

## OV-3 Operation Considerations

### DANGER

1. Do not open or remove the terminal cover while power is "On" or during the drive operation. Close the terminal cover before applying power to the drive. Do not remove the cover except for wiring or periodic inspection and only when power is "off".
2. At the function F\_078= "1" or "3", the drive will automatically restart when faulted or power is restored. Setting this parameter to "Auto restart" should only be considered if it can be done safely and the drive can be "locked out" when being serviced.
3. At the function F\_003=0 and F\_001=0 or 1, the **STOP** key on the keypad is "disabled". An Emergency Stop must be connected and its operation confirmed.
4. The drive can generate extremely high-speeds for a standard AC motor. Before adjusting the drive's max speed, confirm the motor can operate without damage to the new max speed setting.
5. If any protective functions have been activated, check the run command inputs are "Off" (this may require opening the case) only then "Reset" the drive.
6. Do not touch the heat sink or brake resistors due to the potential High Operating Temperatures.
7. The DC brake functions (F\_075~077) is not a substitute for a mechanical holding brake.

## OV-4 UL Standards

### CAUTION

1. "Risk of Electric Shock"  
Before starting or inspection, turn OFF the power and wait at least 5 minutes, and check for residual voltage between terminal DC+ and DC- with a multi-meter or similar instrument has dropped to the safe level (50 VDC or below), to avoid a hazard of electric shock.
2. These devices are intended for use in Pollution Degree 2 environments. (non conductive dust)
3. Maximum Ambient Air Temperature 50°C (122°F).
4. Short circuit rating  
"Suitable For Use On A Circuit Capable Of Delivering Not More Than 5000 rms Symmetrical Amperes, 240V Maximum for 230V class" Models WWE-VFD6; rated for 230V class input. "Suitable For Use On A Circuit Capable Of Delivering Not More Than 5000 rms Symmetrical Amperes, 480V Maximum for 460V class" Models WWE-VFD6; rated for 460V class input. "Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the National Electrical Code and any additional local codes."
5. Install UL certified branch circuit fuse between the power supply and the inverter, referring to the table below.

#### 230V Three-Phase Series

WWEVFD6	Fuse type	Fuse	Amp
WWEVFD6-7.5-230	Class T 300 Vac, 200kA.I.C.	JJN-50	50
WWEVFD6-10-230		JJN-80	80
WWEVFD6-15-230		JJN-100	100

#### 460V Three-Phase Series

WWEVFD6	Fuse type	Fuse	Amp
WWEVFD6-7.5-460	Class T 600 Vac, 200kA.I.C.	JJS-30	30
WWEVFD6-10-460		JJS-30	30
WWEVFD6-15-460		JJS-40	40
WWEVFD6-20-460		JJS-60	60

## Overview



### CAUTION

6. Main circuit terminal wiring - "Use 65/75°C Cu wire only." Recommend using UL-listed closed-loop connectors or CSA-certified ring connector's size, use the correct crimp tool to install connectors per manufacturer recommendation. Suitable closed-loop connectors manufactured by K S TERMINALS INC. See table below for main circuit wire size.

#### 230V Three-Phase Series

WWEVFD6	Terminal screw	Tightening torque lb-in	Wire size AWG	
			L1, L2, L3, Grounding (⊕)	T1, T2, T3
WWEVFD6-7.5-230	M5* or #10	20.8	8, 8, 8, 10	8
WWEVFD6-10-230			6, 6, 6, 8	6
WWEVFD6-15-230			4, 4, 4, 8	4

#### 460V Three-Phase Series

WWEVFD6	Terminal screw	Tightening torque lb-in	Wire size AWG	
			L1, L2, L3, Grounding (⊕)	T1, T2, T3
WWEVFD6-7.5-460	M5* or #10	20.8	12, 12, 12, 12	12
WWEVFD6-10-460			10, 10, 10, 10	10
WWEVFD6-15-460			8, 8, 8, 10	10
WWEVFD6-20-460			8, 8, 8, 10	8

\*Grounding terminal size is No. 10 (0.189 in).

#### Closed-loop crimp terminals size

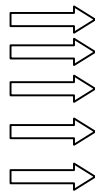
Wire gauge AWG (mm <sup>2</sup> )	Terminal screw	Crimp terminal model numbers
12	M5 (or # 10)	RD5-5
10		RD5-5
8		RNBL8-5
6		RNB14-5
4		RNBS22-5

## Overview

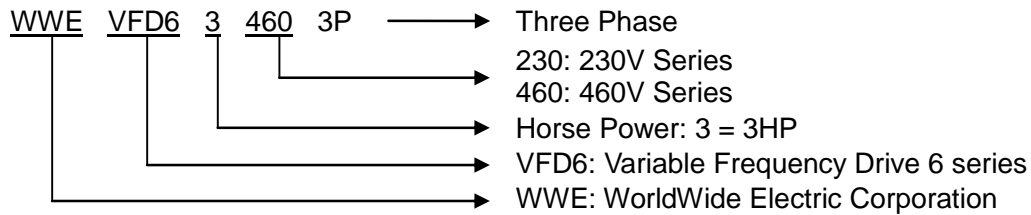
### OV-5 Product Verification

- Confirm the drive's model number is identical with the model number on the carton.
- Confirm the drive nameplate (figure below) to verify the product is correct.

Model number  
Input power source  
Output current capacity  
Software version  
Series number



### Part number explanation



### OV-6 WWEVFD6 Output Ratings

#### WWEVFD6 - 230V Three-Phase Series

Type Name	WWEVFD6-7.5-230	WWEVFD6-10-230	WWEVFD6-15-230
Maximum applicable motor(HP/kW)	7.5/5.5	10/7.5	15/11
Rated output capacity (kVA)	9.5	13	18
Rated output current (A)	25	33	46
Range of output frequency (Hz)	0.1~400.00 Hz		
Overload protection	150% over rated output current / 1 min.		
Input current (A)	30	40	60
AC Input Range	Three-phase 200~240 V 50/60 Hz		
Cooling system	Fan cooling		
Applicable safety standards	UL508C, CSA C22.2 No.14-05		
Enclosure Rating	IP20		
Weight / Mass (Lbs/kg)	5.3	5.4	5.7

#### WWEVFD6 - 460V Three-Phase Series

Type Name	WWEVFD6-7.5-460	WWEVFD6-10-460	WWEVFD6-15-460	WWEVFD6-20-460
Maximum applicable motor(HP/kW)	7.5/5.5	10/7.5	15/11	20/15
Rated output capacity (kVA)	11	14	18	23
Rated output current (A)	14	18	24	30
Range of output frequency (Hz)	0.1~400.00 Hz			
Input current (A)	16	22	28	38
AC Input Range	Three-phase 380~480 V 50/60 Hz			
Overload protection	150% over rated output current / 1 min.			
Cooling method	Fan cooling			
Applicable safety standards	UL508C, CSA C22.2 No.14-05			
Enclosure Rating	IP20			
Weight / (Lbs)	5.3	5.4	5.6	5.7

## Overview

### OV-7 WVEVFD6 General Specifications

Item		Description
User interface		Digital keypad with remote control
Control resolution	Control method	Voltage vector sinusoidal PWM control
	Range of frequency setting	0.1~400.00 Hz
	Resolution of frequency setting	Digital keypad: 0.01 Hz Analog input: 0.06/60 Hz
	Resolution of output frequency	0.01 Hz
	Analog Input for frequency setting	DC 0~10 V (20 kΩ), 4~20 mA (250 Ω)
	Overload protection	150% drive rated current for 1 minute (inverse time characteristics)
	Five steps acc. / dec. times	0 second (coast to stop), 0.1~3200.0 seconds (each setting of acc. and dec.) 0.015 ~ 3200 sec (Acceleration from 0 to 60Hz)
	Braking torque	Approx. 20% (with build-in braking transistor can reach 100%)
	V/F curve	Adjustable V/F curve can be set.
	Stall prevention	Adjustable setting for fold back preventing stall or drive trip
Input/output	Input	Start method
		Multi-function inputs
		Analog inputs
	Output	Multi-function outputs
		Analog outputs
Display	Keypad display	
	External display (external connection)	
Protection	Fault Protection	
Environment	Atmosphere	
	Surrounding temperature	
	Storage temperature	
	Relative humidity	
	Vibration	
	Altitude	

## Overview

### OV-8 Wire Size Specification

#### WWEVFD6-230V Three-Phase Series

Model No. WWEVFD6	Input current (A)	MCCB (A)	Main circuit wire size		Control circuit wire size (AWG)	Grounding wire size (AWG)
			Input(L1, L2, L3) (AWG)	Output(T1, T2, T3) (AWG)		
WWEVFD6-7.5-230	30	50	8	8	22~16	10
WWEVFD6-10-230	40	75	6	6		8
WWEVFD6-15-230	60	100	4	4		8

#### WWEVFD6-460V Three-Phase Series

Model No. WWEVFD6	Input current (A)	MCCB (A)	Main circuit wire size		Control circuit wire size (AWG)	Grounding wire size (AWG)
			Input(L1, L2, L3) (AWG)	Output(T1, T2, T3) (AWG)		
WWEVFD6-7.5-460	16	30	12	12	22~16	12
WWEVFD6-10-460	22	30	10	10		10
WWEVFD6-15-460	28	40	8	10		10
WWEVFD6-20-460	38	50	8	8		10

Note : 1. Please refer to the local electric code with respect to the wiring.

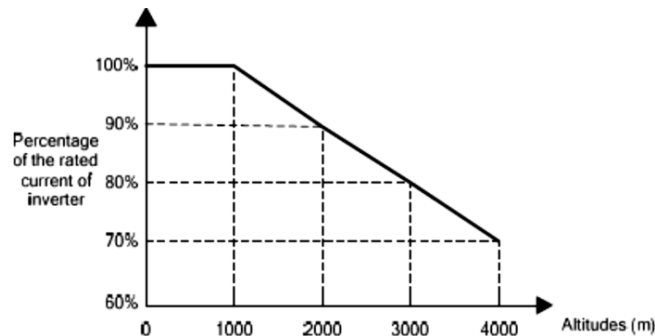
2. Please use cable that is suitable for 600 V 75°C above.

3. This chart is for reference only.

### OV-9 Derate - Altitude / Switching Frequency

#### Altitude Derate

If the drive is used at the altitude greater than 1000 m, the relationship of drive's rated current and altitude is shown in the below figure.



Example if a drive is used at 3000 Meters (+10,000Ft) it will only be rated for 80% of the amperage on the nameplate.

#### Switching Frequency Verse Cable Length

Using higher switching frequency increases leakage current in cabling from the drive to the motor. To minimize the leakage current reduces the switching frequency with increased cable length per the table below.

Distance Rated power	10 m	20 m	30 m	50 m	100 m	Over 100 m
7.5~10Hp	10kHz	7.5kHz	5kHz	2.5kHz	800Hz	800Hz
F_081 Setting	4	3	2	1*	0	0

Distance Rated power	10 m	20 m	30 m	50 m	100 m	Over 100 m
15~20Hp	7.5kHz	5kHz	2.5kHz	2.5kHz	800Hz	800Hz
F_081 Setting	3	2	1*	1*	0	0

#### \*Factory Setting

##### Notes:

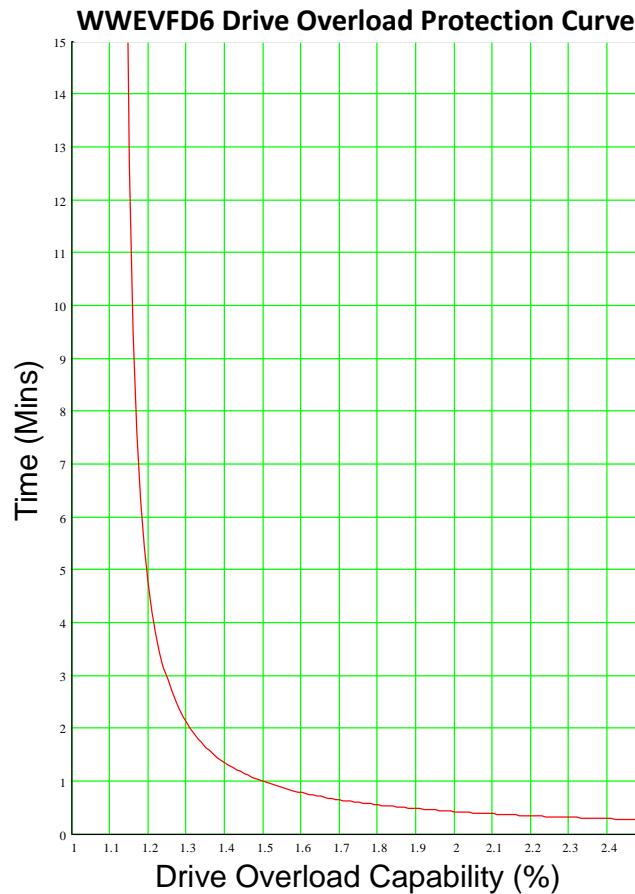
When F\_081 sets the PWM switching frequency from 0-6, as the switching frequency is increased motor noise will decrease. The output transistors heating will increase as well. Occupying the higher switching frequency can shorten transistor's life of a drive. Unless necessary, keep the switching frequency as low as possible.

### OV-10 Drive Overload Protection Curve

#### Drive Overload Protection

The drive overload protection curve is shown in the chart below. RM6 series designed with the overload protection maximum capability of 150% of drive rated output current for 1 minute.

The protection operates like an Overload Relay. The actual curve is based on the Motor FLA programmed in F\_048. **Warning:** to prevent motor damage do not program F\_048 above the motor name plated amps.





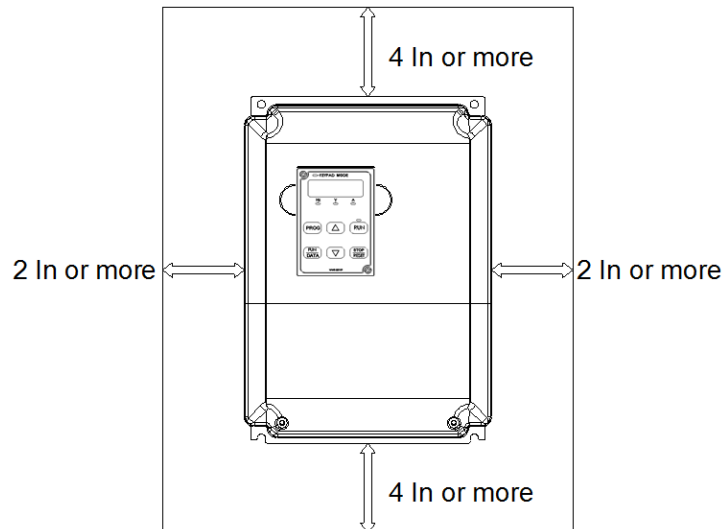
## Section A Installation

### A-1 Mounting Consideration

The drive must have a proper short circuit protection from a Molded Case Circuit Breaker (MCCB) or Fuse – See OV-4. The drive should be mounted in an environment that is dry, without dust, oily or flammable material to ensure the proper drive operations.

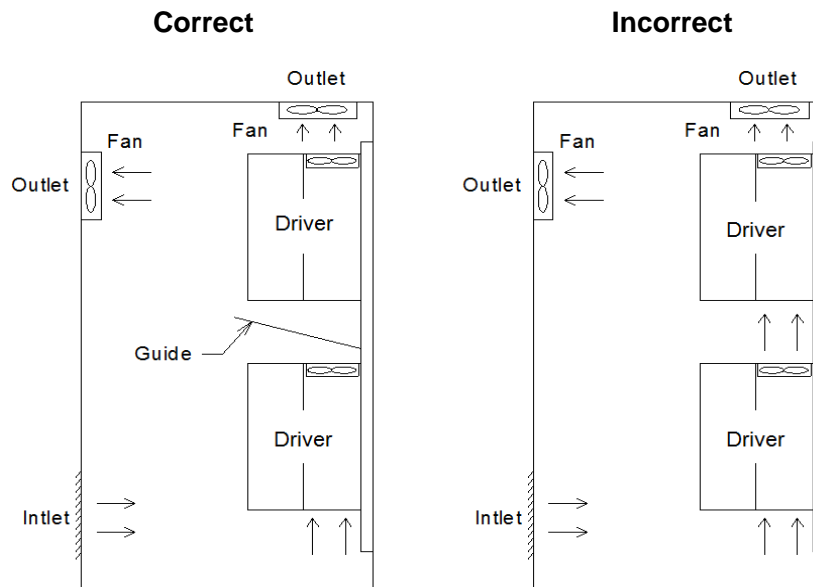
#### Installing the Drive

Proper Mounting – the drive does create heat during operation. Provide proper air circulation, with a minimum clearance (shown in the below figure) for proper operations.



#### Additional Consideration for Mounting

Mounting inside an enclosure does require proper ventilation. The drive does create heat, and forced ventilation is recommended to prevent overheating. Heat from other drives or other equipment must not be vented in to another drive. Vent and divert exhaust heat from other devices.

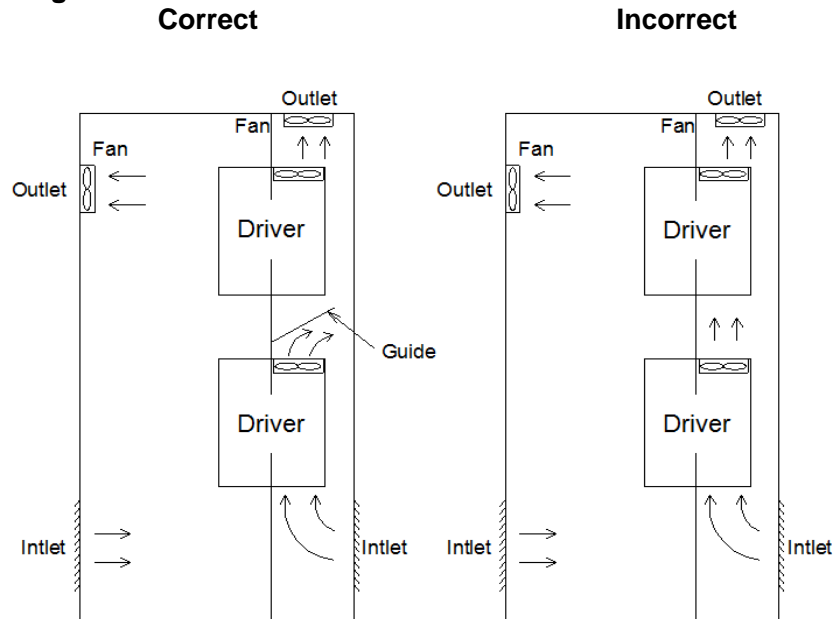


**Warning:** DO NOT put Power Factor Capacitors on the output of the drive.

**Note:** The drive should be in a clean, non-condensing environment.

## Section A Installation

### b. External Venting



#### A-1-1 Drive Heat Loss

When placing the drives in an enclosure it is important to note the drive has about 5% loss in heat. When mounting the drive or drives in a panel the ventilation or cooling must be sufficient to maintain the drive within its operating temperature range.

#### 1. Mounting the Heat Sink Internally

The heat loss by the drive is listed in the chart for calculating the enclosure size and ventilation requirements. The following tables show the heat loss for the 230V and 460V series.

Model	Watts lost at Full Load
2001/2	19
2001	37
2002	75
2003	110
2005	185
2007	275
2010	375
2015	550

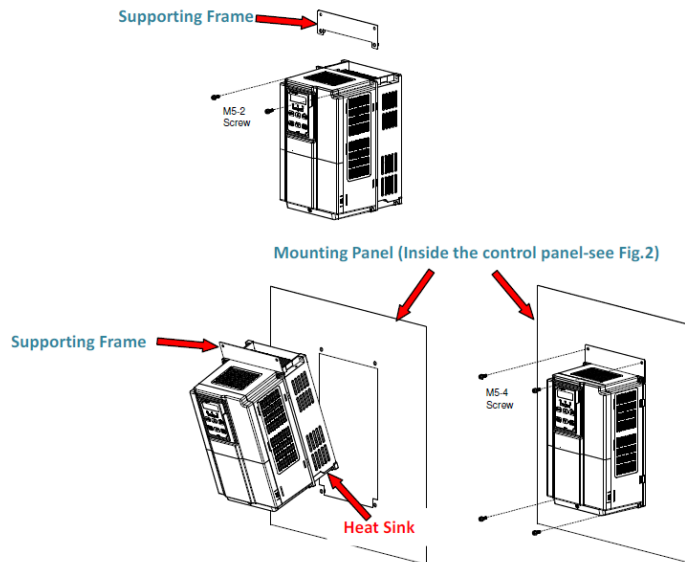
Model.	Watts lost at Full Load
4001	37
4002	75
4003	110
4005	185
4007	275
4010	375
4015	550
4020	750

#### 2. Mounting the Heat Sink Externally

Mounting the heat sink puts the majority of the heat loss by the drive outside the enclosure reducing ventilation requirements.

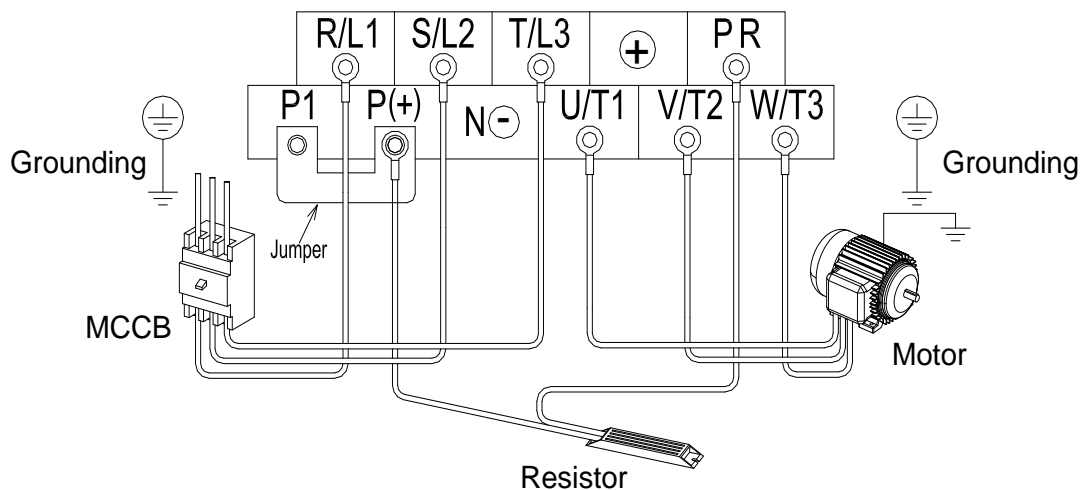
Installing the heat sink externally requires the Supporting Frame (Part Number A-03 See Appendix I for more information) to support the drive. See figure 2 for drive installation for mounting the drive externally.

## Section A Installation



### A-2 Power Terminal Connections

#### Three-Phase Power Terminal Connection



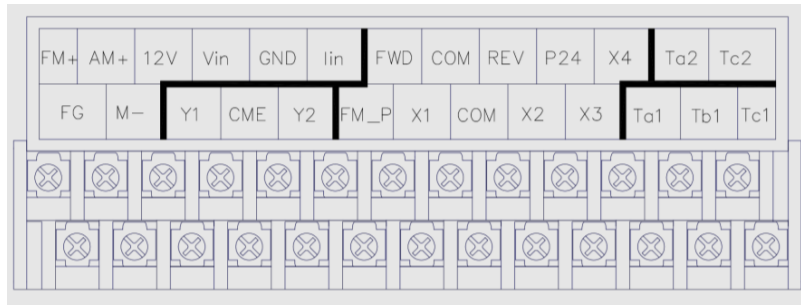
Model Number	Terminal screw size	Tightening torque lb-in	Grounding terminal size	Tightening torque lb-in
WWEVFD6-7.5-230 ~ WWEVFD6-15-230 WWEVFD6-7.5-460 ~ WWEVFD6-20-460	M5	20.8	M4	13.8

**Note:** Please see Overview Section OV-4 for more information on proper circuit protection, wire gauge, and torque tightening requirements.

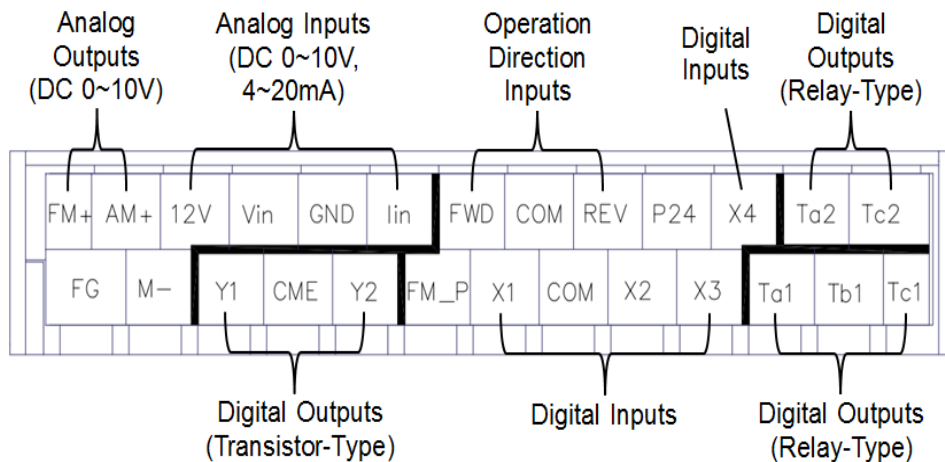
## Section A Installation

### A-3 Input and Output Terminals / RS-485 Terminals

#### WWEVFD6 series I/O terminal



#### Terminal Definition



**Note:** All input wires must be shielded with the shield terminated to the same “COM” or “GND” terminal that is associated with the input. **Example:** Y2 and Y1 shield must be terminated in CME.

**Warning:** Do NOT run Low voltage wires in the same conduit or wire way with High Voltage wires  
**Note:** See Overview Section OV-4 for wire gauges of input wires and power cables).

#### Input Terminals

**Digital Inputs Terminals X4 – FWD** - can be Sink or Source.

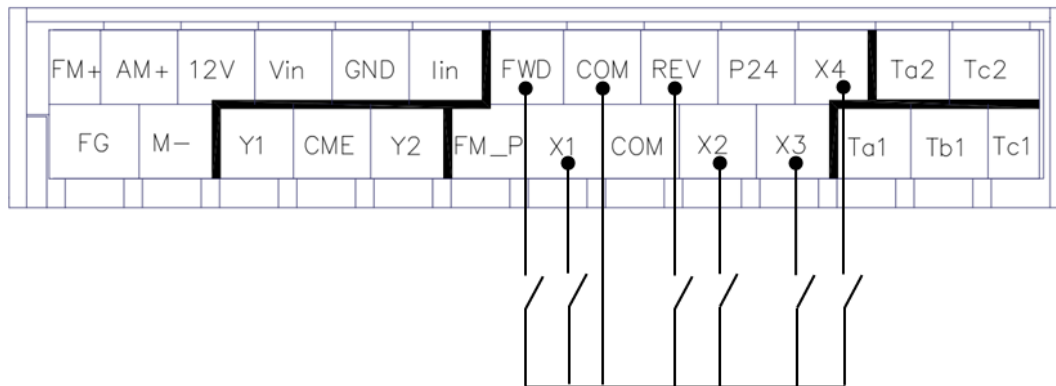
The Default is “Sink” – where a dry contact is used as the input and powered by the drive. See the connection diagrams below for sink and source connection options. To change from “Sink” to “Source” input, see section A-4 for info on changing “SW2” on the control board. Each input has multifunction capabilities including operating in reverse logic. **Example:** default of an input switch “Closing” sets an input if changed to reverse logic a switch “Open” sets an input. – see parameter F\_052 ~ F\_057 To change to reverse logic set the parameter to a “-“ setting.

## Section A Installation

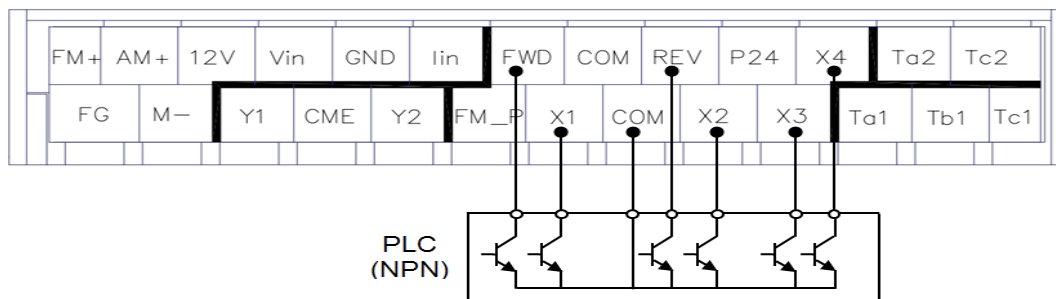
### Sink Examples : default

Power supplied by the drive for the input devices – **most common arrangement**.

See Section E for more input connection and operation examples.

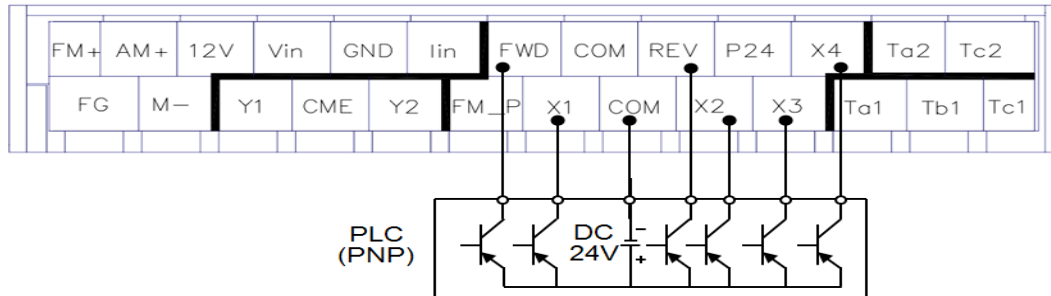


### Sink Example : Typical PLC (NPN)



### Source Examples : PLC (PNP)

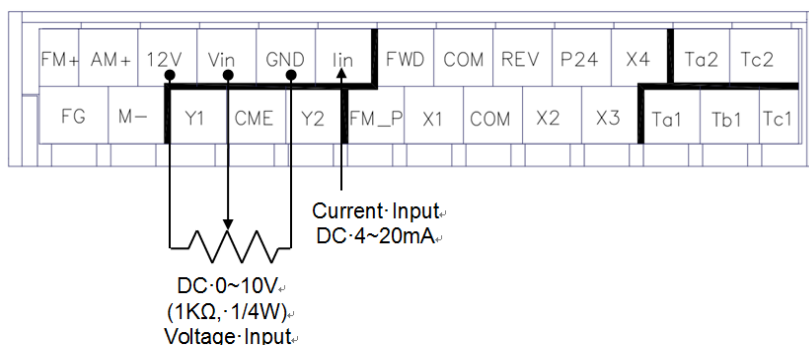
The terminal power is supplied by the external source. **Note SW2 must be changed**



**Analog Input Terminals “12V” to “Iin”** – provide for a current or voltage analog input.

**Current Input** – The default is current input (4-20mA) using “Iin” and “GND”. To program the analog inputs, see section C for parameter F\_124 ~ F\_128 setting.

**Voltage Input** – To use a Pot or 0-10VDC for input. To program the voltage input, see section C for parameter F\_123 and F\_124. **Note:** To change the drive for voltage input switch “SW1” on the control board – see Section A-4



**Note: Voltage input** – Use 12V, Vin and GND with a 1KΩ, 1/4 Watt potentiometer.

For 0-10VDC input use “Vin” and “GND” terminals.

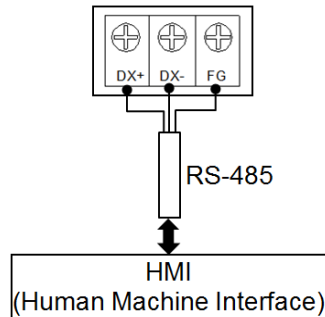
## Section A Installation

### Output Terminals

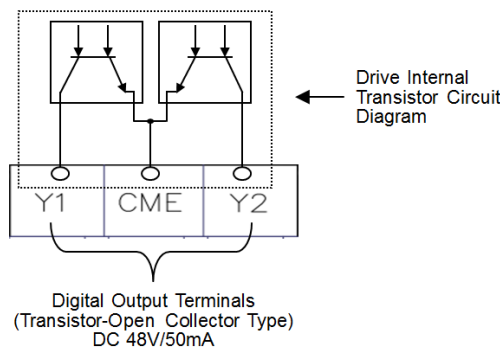
**Digital outputs – Relay – Ta1, Tb1 and Tc1** – is a form “C” SPDT contact and **Ta2**, and **Tc2** is a N.O. contact all are rated AC 250V, 0.5 Amps. **Note:** These contacts are NOT suitable for operating contactor coils and should be used for interfacing only.

These are digital outputs - see parameter F\_060 and F\_131. They can also be changed to have reverse operation by changing the parameter from F\_060 and F\_131. The default output configuration is shown the diagram below.

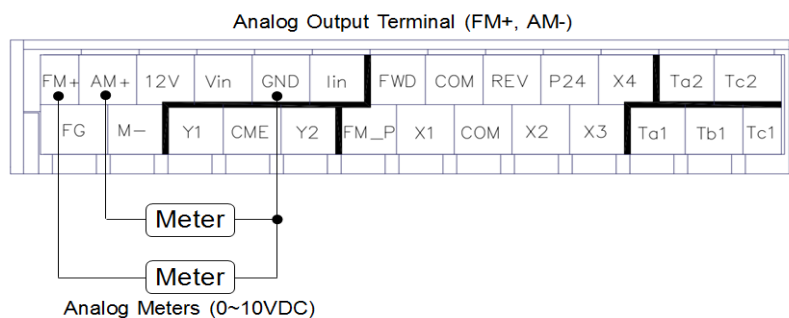
**RS-485 Communication Terminals** – See board layout in Section A-4 for terminal locations



**Digital Outputs Terminal Y2- CME** – Two solid state outputs “Open Collector” that can be programmed using F\_058 ~ F\_059. **Note:** Maximum rating is 48VDC/ 50mA and should not be used to drive any inductive loads such as coils.



**Analog Output Terminals - AM+, FM+, and GND** – These are multifunction analog outputs with a range from 0~10VDC. See parameters F\_129 and F\_130 settings for “AM+” and see parameter F\_044 and F\_045 for settings for “FM+”. **Note:** Typical usage is for analog meters such as a Frequency Meter and Amp Meter.



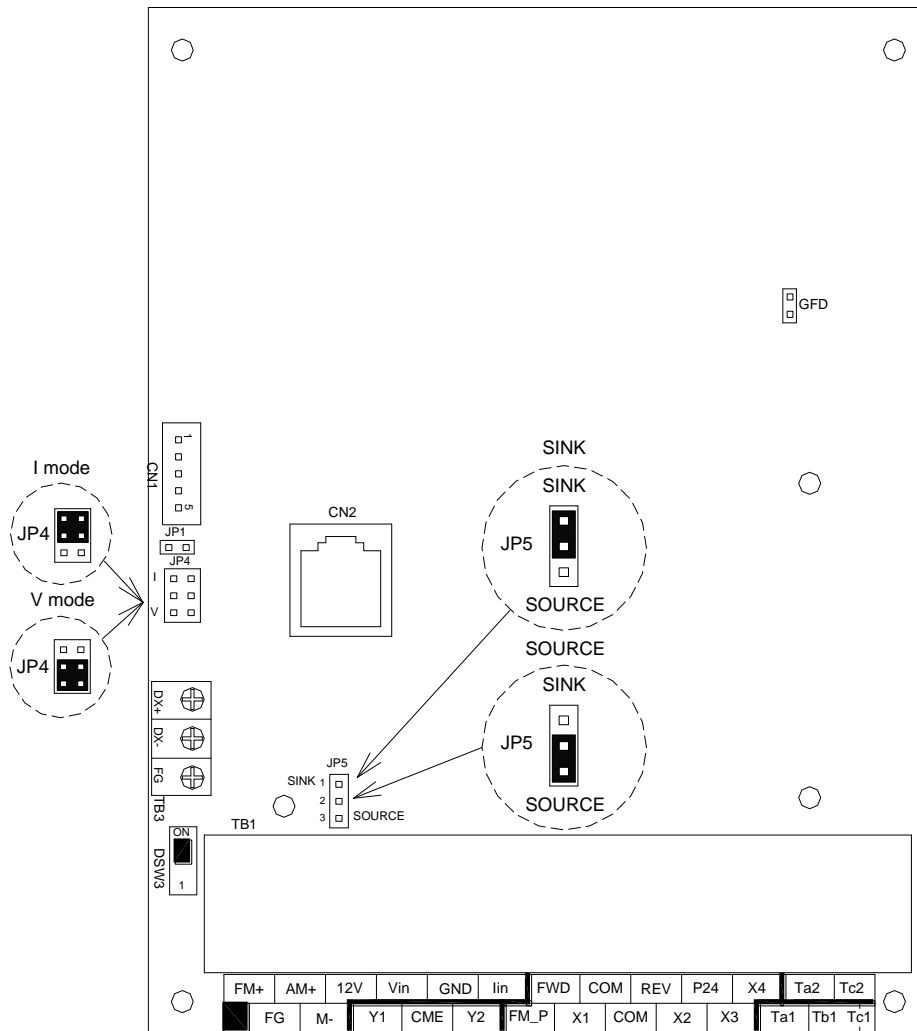


## Section A Installation

### A-4 Control Board Layout

**230V Series :** WWEVFD6-7.5-230 ~ WWEVFD6-15-230

**460V Series :** WWEVFD6-7.5-460 ~ WWEVFD6-20-460



**CN1:** Connector for external displays.

**CN3:** RJ-45 connector for keypad

**TB1:** Analog and digital input and output terminals

**JP1:** lin input impedance select jumper (1 and 2 short: impedance = 250Ω, 1 and 2 open: impedance = 500Ω. The factory setting is for 250Ω)

**JP4:** lin select jumper (for choosing I and V modes for analog inputs)

**JP5:** Multi-function Input terminal (X1~X4, FWD, REV) SINK/SOURCE select jumper (please refer to page 16 for JP5 selection)

**DX+:** RS-485 communications port

**DX- :** RS-485 communications port

**DSW3:** Terminal resistor – this terminal is used for the first and last drive on the RS-485 circuit.

**FG:** Ground terminal for RS-485 communication

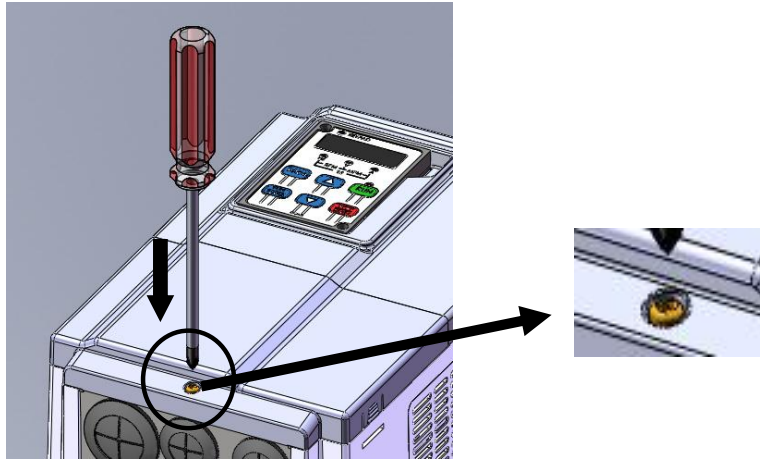
## Section A Installation

### A-5 Drive Case Removal to Change JP5 Jumper

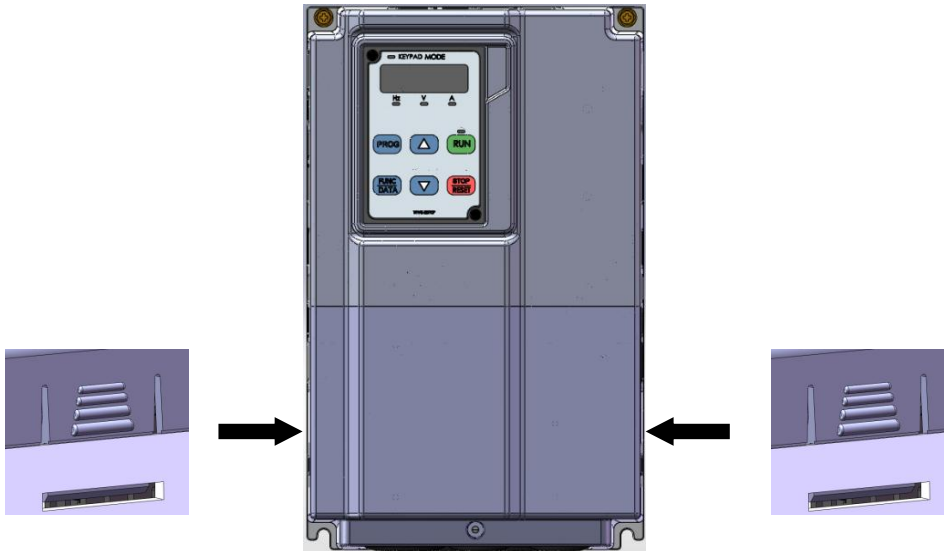
**Warning:** This should only be done with all power lead disconnected and the bus completely discharge. Severe shock hazardous would be otherwise present!! Do not reconnect power leads until case is full reinstalled.

#### Remove the upper cover

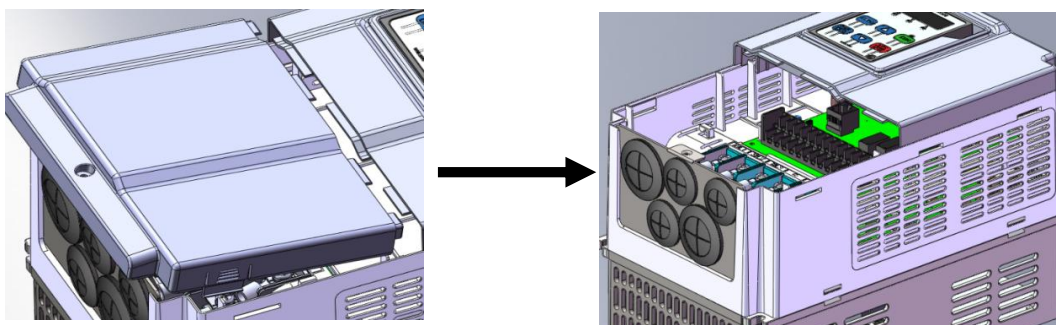
**Step 1:** Use a screw driver to remove the main circuit terminal cover.



**Step 2:** Press the two sides latches on the main circuit terminal cover.

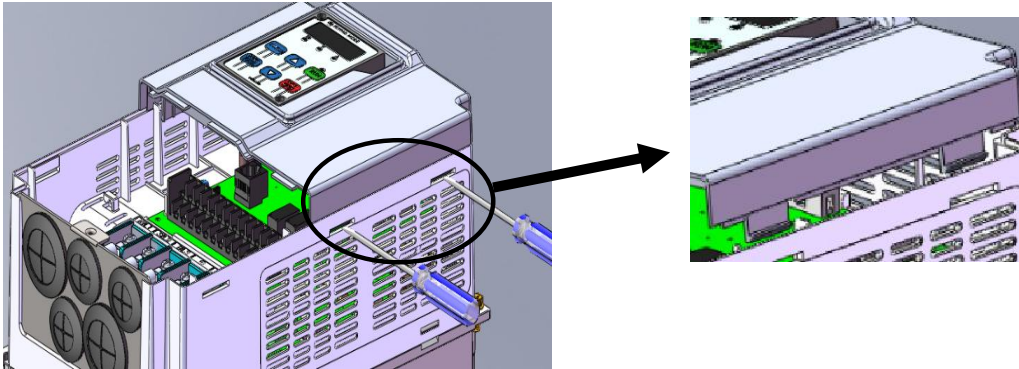


**Step 3:** Pull up the cover and remove it.

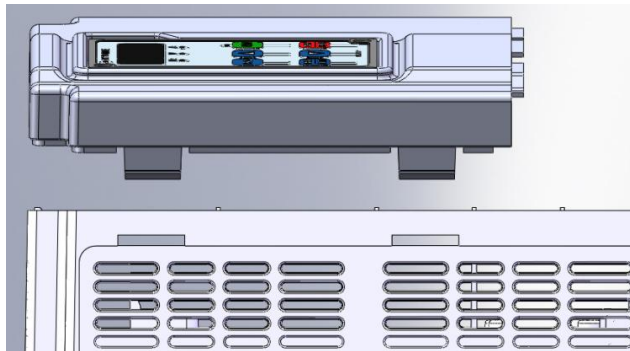


## Section A Installation

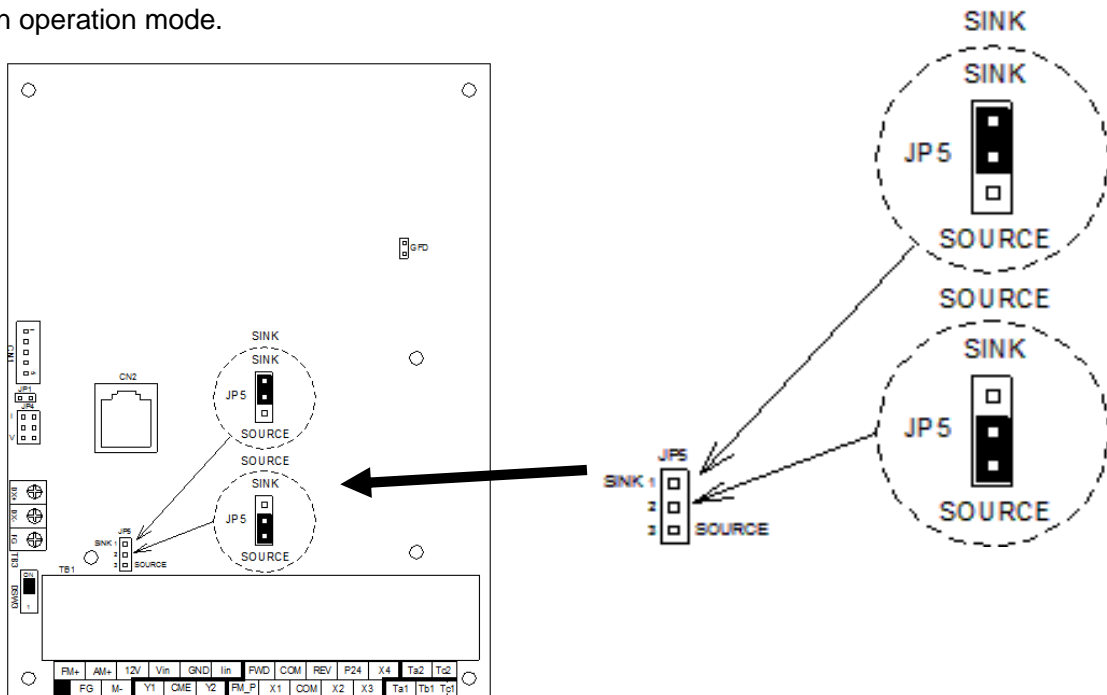
**Step 4:** Insert a screw driver into the latch holes of the drive upper cover and pull up the right side of the cover.



**Step 5:** Remove the upper cover from the left site.



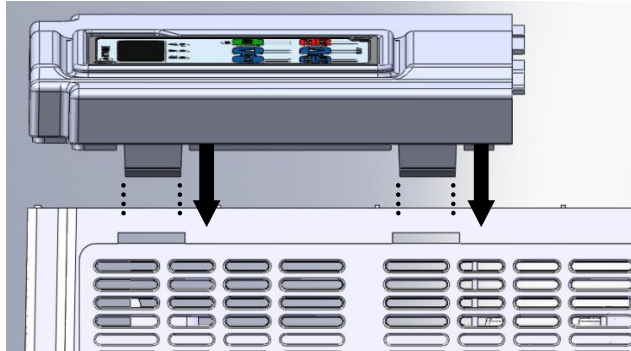
**Step 6:** Find the JP5 jumper on the control board and insert the jumper to the SINK/SOURCE base on operation mode.



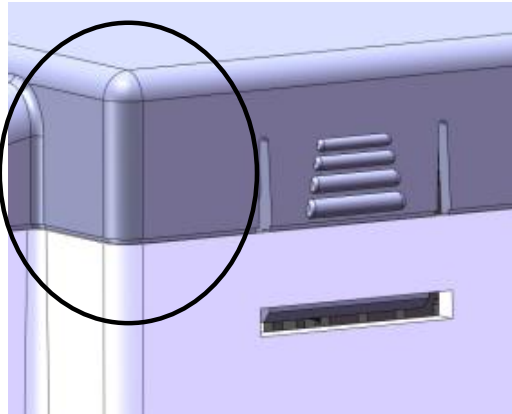
## Section A Installation

### Install the upper cover

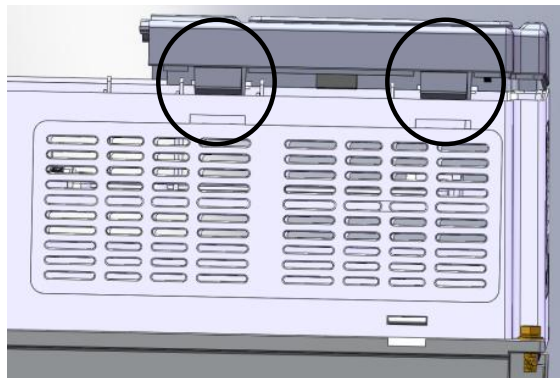
**Step 1:** Align the two latches of left site.



**Note:** Please align the left corner of the upper cover with the edge of drive case.

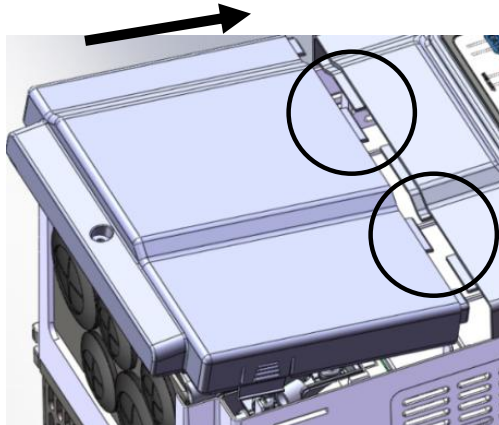


**Step 2:** Press the right side of the upper cover.

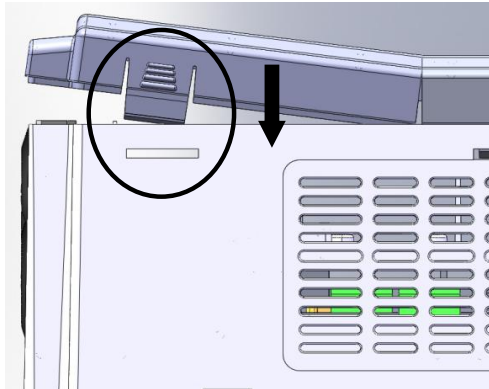


## Section A Installation

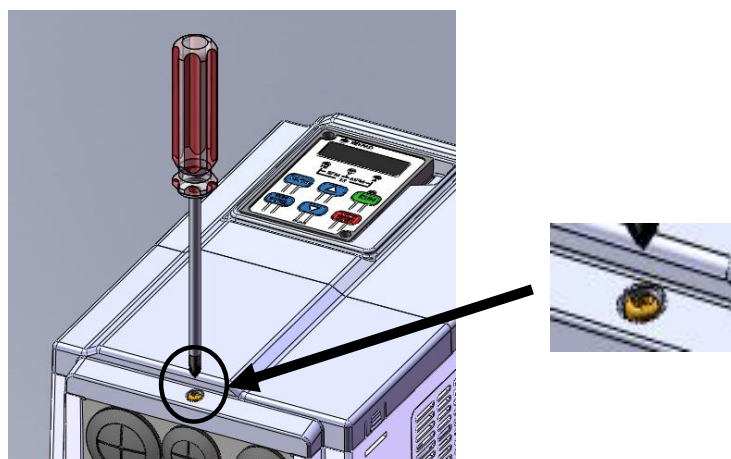
**Step 3:** Insert the latches of main terminal cover into the upper cover



**Step 4:** Press down the main circuit terminal cover.



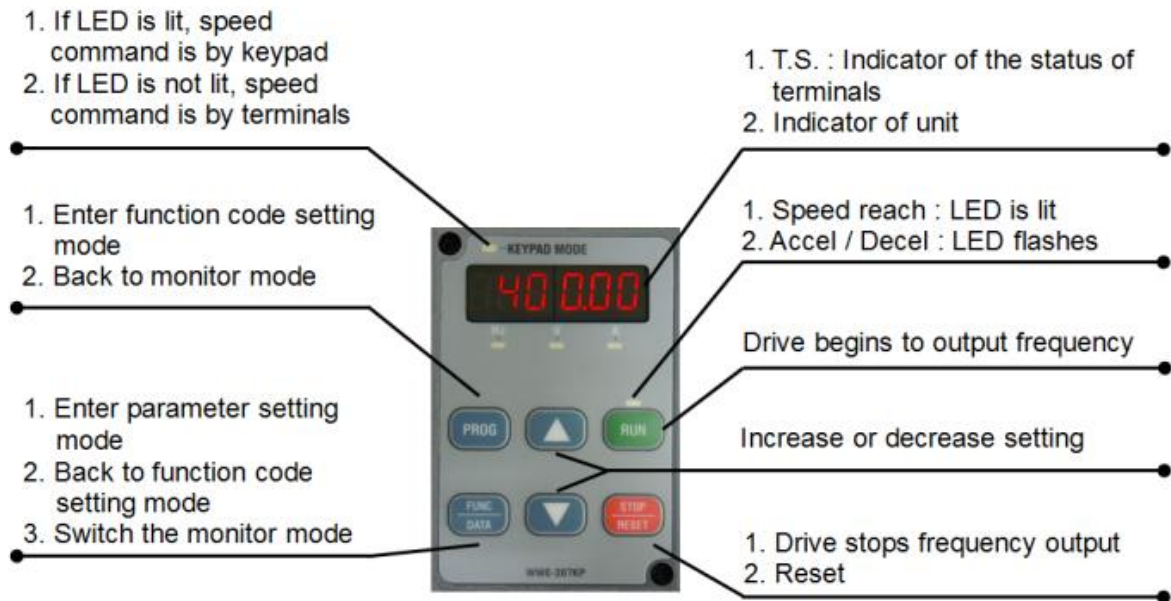
**Step 5:** Fasten the screw of the main circuit terminal cover.



## Section B Keypad Programming and Operation

### B-1 Keypad Overview

This sections will show how the Digital keypad can change parameters, monitor output, and troubleshoot drive Faults and Warnings. Use this section for keypad programming basics.



### B-2 Digital keypad Overview

	Enter the Parameter setting Mode and save a "New" value setting. Will also return the Keypad to Monitor Mode.
	Starts output to the motor (" <b>Start</b> " Button). Run LED "On" : Drive under operation LED "Blinking" : Drive under Accel/Decel or Keypad Upload / Download
	Enter a New Parameter value (but does not save the setting). Return to the monitor mode.
	Drive begins the " <b>Stop</b> " Cycle. Reset / fault message : clears the message.
	LED indicator : indicating the keypad under power and operational.

### B-3 Display Options

	The LEDS marked "Hz","V","A" under the Display show which Mode the Keypad display is operating. as programmed in F_006
	<b>Hz</b> - Hertz's – Default
	<b>V</b> - Voltage
	<b>A</b> - Amps
	<b>RPM</b> - Default for 1800 RPM – to adjust motor see F_051
	<b>Line speed</b> - To establish ratio see F_007 and F_008
	<b>Terminal Status Display</b> - See Section B-4



## Section B Keypad Programming and Operation

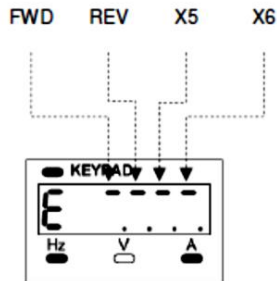
### B-4 Terminal Status Display

Terminal status display allows users to verify the digital inputs as seen by the drive if the input is “open” or “closed” and will confirm the drives digital output status.

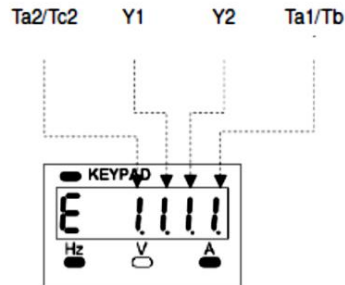
**Note:** This is an extremely valuable tool to confirm or troubleshooting wiring.

#### Terminal Status Display Description

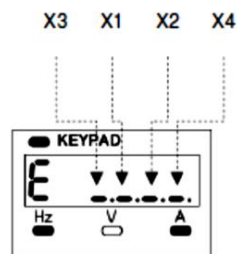
Digital Input and Direction Terminals



Digital Output Terminals



Digital Input Terminals



**Note:**

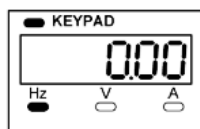
- Terminal Status Display displays the terminal signal status when a wire properly connects to the terminal.
- If a wire is properly connected to a terminal, the keypad display under Terminal Status Display shows “-” or “1” when the input or output terminal has a signal

### B-5 Examples of Parameter Programming

#### 1. Parameter Programming using the Digital Keypad – Start Command

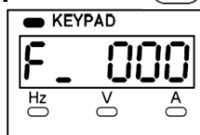
**Step 1:** Apply appropriate Power to L1, L2 and L3

**Note :** not all parameters can be adjusted during operation

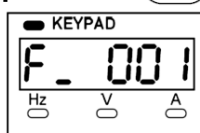


(default display)

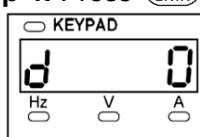
**Step 2:** Press **PROG** and the keypad displays (Starts **Program Mode**)



**Step 3:** Press **▲** or **▼** if the desired parameter is displayed





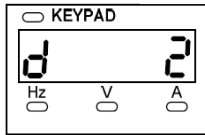
**Step 4:** Press **FUNC DATA** and the drive will show current value for this Parameter




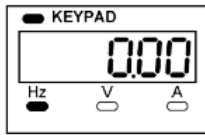
**Note:** If the Parameter is not to be changed Press **PROG** or **FUNC DATA** to return to the Monitor mode.

## Section B Keypad Programming and Operation

**Step 5:** Press  or ; changes the value displayed (but not stored)

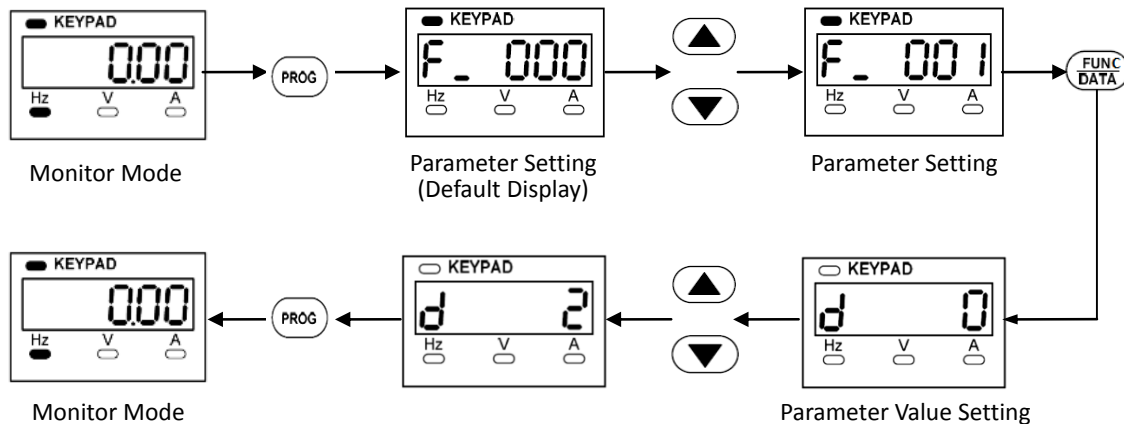


**Step 6:** Press  to save the program change and return to the monitor mode.



The drive is ready to “run” or “change” another parameter.


Parameter programming sequence - Recap:

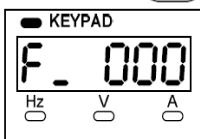


### 2. Acceleration Setup / Change the Acceleration Time (Change from 5 Sec to 15 Sec)

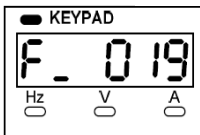
In the monitor mode, the keypad displays:




**Step 1:** Press  and the keypad displays:




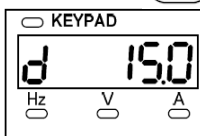
**Step 2:** Press  to select the parameter F\_019 (Primary Acceleration Time)



Primary Acceleration Time)

**Step 3:** Press  to enter the parameter value setting

**Step 4:** Press  to change the value from “5” to “15”



Acceleration Time Setting)

## Section B Keypad Programming and Operation

**Step 5:** To complete the acceleration time change, press **PROG** to save the change and return to the monitor mode.

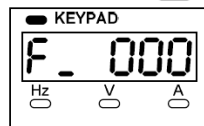


### 3. Reset to Factory Setting

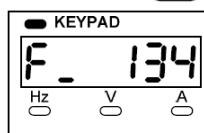
In the monitor mode - **Note: Drive cannot be operating when resetting**



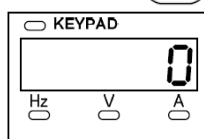
**Step 1:** Press **PROG** to put the Drive in "Program" Mode



**Step 2:** Press **▲** or **▼** till the display shows F\_134



**Step 3:** Press **FUNC DATA** shows F\_134 current setting



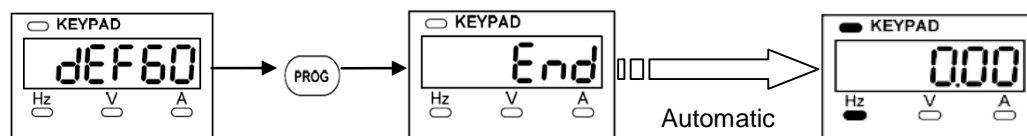
efault Display)

**Step 4:** Press **▲** till "dEF\_60" is displayed to rest for 60HZ operation



efault the factory setting 60Hz)

**Step 5:** Press **PROG** to reset all parameters back to the factory setting; the keypad displays "End" when the default the factory setting is completed and then return to the monitor mode automatically



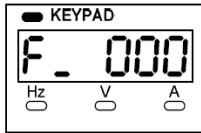
### 4. Upload the Program to the Keypad from the Drive

In the monitor mode, the keypad displays

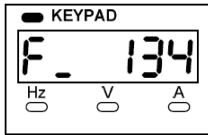


## Section B Keypad Programming and Operation

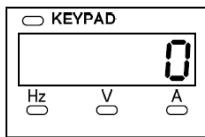
**Step1:** Press **PROG** to enter the parameter setting mode



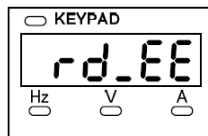
**Step 2:** Press **▲** or **▼** to select the parameter F\_134 (Default Setting)



**Step 3:** Press **FUNC DATA** to show the Default Setting

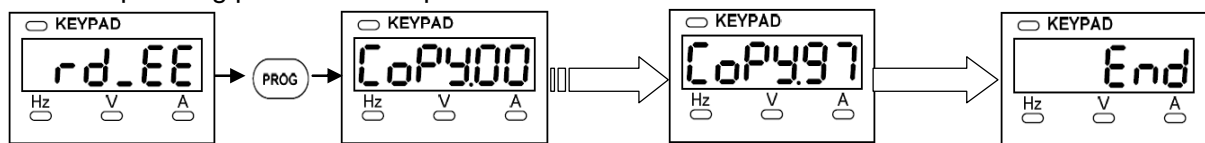


**Step 4:** Press **▲** to select "rd\_EE" (Read the parameter from the drive to the digital keypad)



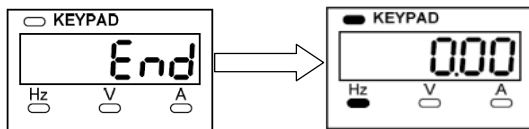
Read the parameter from the drive to the digital keypad)

**Step 5:** Press **PROG** to start the upload from the drive to the digital keypad. The keypad will display the running number from "CoPY.00" to "CoPY.97" and then displays "End" when the uploading process is completed.



Auto-Counting

The keypad returns to the monitor mode automatically after the uploading process is completed.



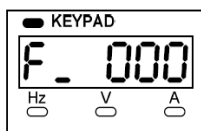
Automatic

### 5. Download a Program to a Different Drive from the Keypad

In the monitor mode, the keypad displays

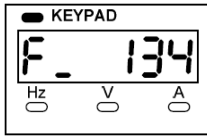



**Step1:** Press **PROG** to enter the parameter setting mode

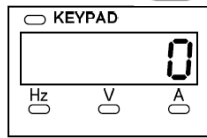



## Section B Keypad Programming and Operation

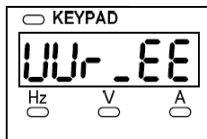
**Step 2:** Press  or  select the parameter F\_134




**Step 3:** Press  to show the Default Setting

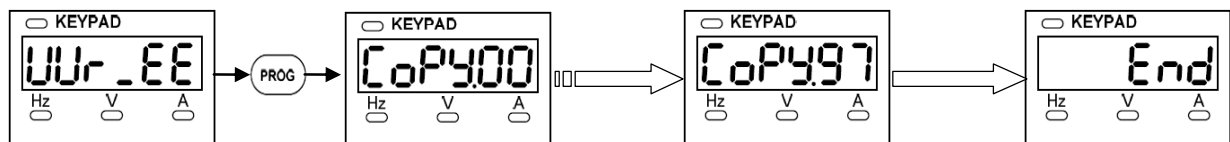


**Step 4:** Press  to select "Wr\_EE" (Write the parameter from the digital keypad to the drive)



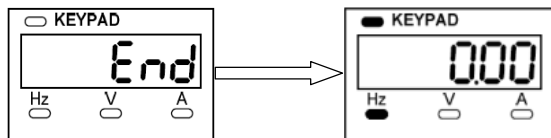
Write the parameters from keypad to the drive)

**Step 5:** Press  to start downloading the program from the keypad to the drive. The keypad displays the running number from "CoPY.00" to "CoPY.97" and then displays "End" when the downloading process is completed



Auto-Counting

The keypad returns to the monitor mode after the downloading process is completed.

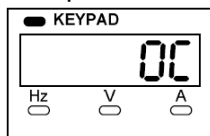


Automatic


### 6. Clearing Faults

When the drive is tripped due to error or fault occurrence, the keypad displays the error trip message.


Example: The drive is tripped to "Over Current - OC", the keypad displays



To clear the faults:

**Step 1:** Press  to clear the fault message (Error Trip Message)

**Step 2:** Change the parameter setting and perform the troubleshooting in hardware or software (please refer to the section E - Troubleshooting)

**Step 3:** Complete the troubleshooting and re-start the operation by pressing 

## Section B Keypad Programming and Operation

### 7. Change the Display to RPM from the default HZ setting

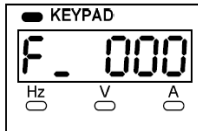
In the monitor mode, the keypad displays



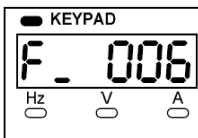
Default Setting - Displaying the Drive Output Frequency to Motor)

To change the display from the frequency display to the motor speed (RPM):

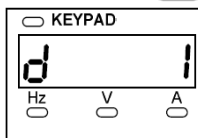
**Step 1:** Press **PROG** to enter the parameter setting



**Step 2:** Press **▲** or **▼** to select the parameter F\_006 (Main Display Setting)

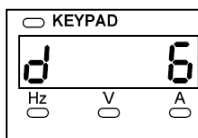


**Step 3:** Press **FUNC DATA** to enter the parameter value setting

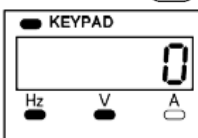


(Default Setting : Display the Drive Output Frequency)

**Step 4:** Press **▲** or **▼** to select the value "6" (Display Motor Speed RPM)



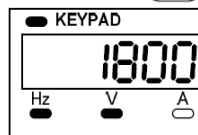
**Step 5:** Press **PROG** to store the setting and return to the monitor mode



**Note:** the default motor is set for 4 Pole or 1800 RPM at 60HZ. If the motor is not a 4 pole (1800RPM) motor go to F\_051 using the same process to change the parameter to "2" (3600 RPM), "6" (1200 RPM) up to 10 poles.

To improve the accuracy of the display and if the information is known: Adjust F\_050 Motor Slip Compensation and F\_049 Motor No Load Amps.

**Step 6:** Press **RUN** to start the motor and now the keypad will display motor speed in RPM's.





## Section C Parameter Table

### C-1 Keypad Parameters that Change the Keypad Operation

Func	Name	Descriptions		Range	Unit	Default
F_000	Drive Info	Software Version and drive information Software Version Drive Model Number Drive Running hours Drive "Power Applied" in Hours Software "Check Sum"		—	—	P6100
F_001	Start		<b>Start command</b>	0~11 — 3		
		0:	Enables "FWD" and "REV" input terminals.			
		1:	FWD input enables drive but does not determine direction.			
		2:				
		3:	Keypad RUN key enables drives but does not determine direction			
		4:				
		5~7:	Reserved			
		8:	Communication control (Modbus Communication)			
		9:	Communication control (Modbus Communication)			
		10:	Enables "FWD" and "REV" input terminals			
		11:	Keypad RUN key enables drives but does not determine direction			
F_002	Speed Input	0: Speed is set by input analog terminal per function F_123. 1: Speed is set by keypad ( <b>display Frequency</b> ). 2: Speed is set by keypad ( <b>display RPM</b> ). 3: User Units setting from the keypad (Use F_007 and F_008). 4: Speed setting by momentary switches closer. See F_056, 57 and 58 to program inputs. 5: Speed setting by external control devices with RS-485 communication.		0~4	—	1

## Section C Parameter Table

Func	Name	Descriptions	Range	Unit	Default
F_003	STOP	0: STOP key disabled on Keypad. <b>WARNING:</b> Disabling Stop Button on Keypad should only be considered if no danger to operator and/or to machine. 1: STOP Key Enabled on the keypad.	0, 1	—	1
F_004	Keypad Speed Control	0: The speed cannot be changed from the keypad. 1: Keypad can adjust speed.	0, 1	—	1
F_005	Speed Command Auto Store	0: If F_004 is set to “0” the speed setting is not stored in the keypad. 1: If F_004 is set to “1” the speed setting will store after 3 minutes. Once the drive is restarted, it will return to the stored speed.	0, 1	—	1
F_006	Keypad Display	1: Output Frequency 2: Frequency that has been commanded. 3: Output Voltage. 4: DC Bus Voltage (Troubleshooting tool). 5: Output Current. 6: Motor Speed (default is 1800RPM motor - use F_051 change motor speed ). 7: Line Speed/User Units (Use F_007 and F_008 to define Ratio. 8: Terminal Status (Troubleshooting tool). See Section F-4.	1~8	—	1
F_007	User Units	When “Line Speed” or “User defined Units” are to be displayed on the Keypad (F_006), use the ratio to calibrate the display process speed.	0.00~500.00	0.01	20.00
F_008	User Units Decimal	The display will show decimal values of F_007 up to three places	0~3	—	0

## Section C Parameter Table

### C-2 Preset Speeds

Func	Name	Descriptions				Range	Unit	Default
		Jog Speed =±1	Preset 1 =±3	Preset 2 =±4	Preset 3 =±5			
F_009	Primary Speed	Off	Off	Off	Off	0.00~400.00	0.01Hz	60.00
F_010	Preset Speed 1	Off	Set	Off	Off			10.00
F_011	Preset Speed 2	Off	Off	Set	Off			20.00
F_012	Preset Speed 3	Off	Set	Set	Off			30.00
F_013	Preset Speed 4	Off	Off	Off	Set			0.00
F_014	Preset Speed 5	Off	Set	Off	Set			0.00
F_015	Preset Speed 6	Off	Off	Set	Set			0.00
F_016	Preset Speed 7	Off	Set	Set	Set			0.00
F_017	Jog Speed	Set	-	-	-			6.0

#### Note:

1. Parameter Value is Positive  
 “Set” = Contact Closed  
 “Off” = Contact is Open
2. If the parameter is negative (“-”) value  
 “Set” = Contact Open  
 “Off” = Contact Closed.
3. Jog Speed - will override all other inputs
4. Primary Speed - is the speed set from keypad ordinarily or from Vin or lin (analog inputs)

**Note:** Shaded Parameters cannot be changed while the drive is running.

## Section C Parameter Table

### C-3 Acceleration / Deceleration

Func	Name	Descriptions	Range	Unit	Default
F_018	Accel/Decel Base Freq.	Determines how the drive calculates Accel/Decel rates.	0.01~400.00	0.01Hz	60.00
F_019	Primary Accel Time	Primary Accel time including preset speeds 4~7, and jog speed.	0.0~3200.0	0.1sec	15.0
F_020	Primary Decel Time	Primary Decel time including preset speeds 4~7, and jog speed.			
F_021	Accel Time – Preset 1	Acceleration time of preset speed 1.			
F_022	Decel Time – Preset 1	Deceleration time of preset speed 1.			
F_023	Accel Time – Preset 2	Acceleration time of preset speed 2.			
F_024	Decel Time – Preset 2	Deceleration time of preset speed 2.			
F_025	Accel Time – Preset 3	Acceleration time of preset speed 3.			
F_026	Decel Time – Preset 3	Deceleration time of preset speed 3.	0.0~3200.0	0.1sec	15.0
F_027	Secondary Accel Time	Secondary acceleration time when input terminal is “set” (F_052 – F_057; “2” or “-2”).			
F_028	Secondary Decel Time	Secondary deceleration time when input terminal is “set” (F_052 – F_057; “2” or “-2”).			
F_029	S-curve for Accel/Decel Time	S-curve acceleration and deceleration time at start and stop	0.0~5.0	0.1sec	0.0

**Note:** Shaded Parameters cannot be changed while the drive is running.

### C-4 Drive Output Parameters

Func	Name	Descriptions	Range	Unit	Default
F_031	Max Output Frequency	Max frequency for the drive. <b>Warning:</b> Do not set above safe operating speed for the motor or machine as damage to the machine and possible injury may result.	0.1~400	0.1Hz	60.0
F_032	Starting Frequency	Starting frequency of the V/Hz curve.	0.1~10	0.1Hz	0.5
F_033	Starting Voltage	The starting voltage of the V/Hz curve.	0.1~50 0.1~100	0.1V	8.0 (230Volt) 12.0 (460Volt)
F_034	Base Frequency	The base frequency for the V/F curve.	0.1~400	0.1Hz	60.0
F_035	Motor Nameplate Voltage	This set the V/F ratio for proper motor operation	0.1~255 0.1~510	0.1V	230 Volt 460 Volt
F_042	Max Freq(Upper Limit)	Used to define a different Max Freq based on F_031 (1.00 = Max Freq)	0.00~1.00	.001	1.00
F_043	Starting Freq (Lower Limit)	Used to define a different Starting Freq F_033 (1.00 = Max output Freq)	0.00~1.00	0.01	0.00

**Note:** Shaded Parameters cannot be changed while the drive is running.

## Section C Parameter Table

Func	Name	Descriptions	Range	Unit	Default
F_075	DC Braking Force	DC braking force (increases the braking force) <b>Warning:</b> Increasing braking force can increase heat in the motor and can cause motor and/or machine damage.	0~150% of drive rated current	1%	50
F_076	DC Braking Time at "Stop"	DC braking time when the motor "Stops". <b>Warning:</b> Increasing braking time can increase heat in the motor and/or cause motor damage.	0.0~20.0	0.1sec	0.5
F_077	DC Braking Time at "Start"	DC Braking time at motor "Start"	0.0~20.0	0.1sec	0
F_132	DC Braking Frequency at "Stop"	Drive is commanded to "Stop". This determines the frequency that DC Braking will begin.	0.1~60.0	0.1Hz	0.5
F_081	Switching Frequency	The higher the value = higher switching frequency.	0~6	1	1
F_082	Stop Mode	0: Ramp to stop 1: Coast to stop 2: Coast to stop + DC braking	0~2	—	0
F_083	Reverse Lockout	0: Reverse rotation allowed 1: Reversal rotation NOT allowed	0, 1	—	0
F_084	Skip Frequency 1	Frequency that drive will not operate to prevent Machine Vibration or Resonance	0.0~400.	0.1Hz	0.0
F_085	Skip Frequency 2	Frequency that drive will not operate to prevent Machine Vibration or Resonance	0.0~400.	0.1Hz	0.0
F_086	Skip Frequency 3	Frequency that drive will not operate to prevent Machine Vibration or Resonance	0.0~400.	0.1Hz	0.0
F_087	Skip Frequency Range	The frequency band above and below the skip frequency the drive will not operate to prevent Machine Vibration or Resonance	0.0~25.5	0.1Hz	0.0

**Note:** Shaded Parameters cannot be changed while the drive is running.

## Section C Parameter Table

### C-5 Analog Inputs

Func	Name	Descriptions	Range	Unit	Default
F_040	Vin Gain	Vin analog input scaling corrects the max analog speed input to command max speed.	0.00~2.00	0.01	1.00
F_041	Vin Bias	Vin analog input to correct the min commanded speed to minimum analog input.	-1.00~1.0	0.01	0.00
F_047	Analog Input Filter	Increasing filtering time to smooth out the input signal by delaying or dampening the response (used with F_002=0).	0~255	—	20
F_107	Analog Input Dead Band	Use when there is a high signal to noise ratio on the input to stabilize drive input. Use with F_047 when F_002 = "0".	0.00~2.55	0.1 HZ	0.00
F_123	Analog Input Source	0: Vin+lin 2: lin-Vin 3: Vin or lin (select from X1~X4 terminals)	0~3	—	0
F_124	Analog Input (Vin) Option	0: Analog input gain 1: Frequency command	0~3	—	1
F_125	Analog Input (lin) Option	2: Current limit (Current can be viewed at F_133) 3: Output voltage adjustment of V/F pattern			
F_126	lin Selection	Current Input "0" = 4~20mA "1" = 0~20mA	0, 1	—	0
F_127	lin Gain	lin analog input scaling corrects the max analog speed input to command max speed	0.00~2.00	0.01	1.00
F_128	lin Bias	lin analog input to correct the minimum commanded speed to minimum analog input	-1.00~1.00	0.01	0.00

**Note:** Shaded Parameters cannot be changed while the drive is running.

### C-6 Analog Outputs

Func	Name	Descriptions	Range	Unit	Default
F_044	"Frequency Meter" FM+ Analog Output Signal Selection(DC 0~10V)	0: Output frequency. 1: Speed command. 2: Output current.	0~4	—	0
F_045	FM+ Analog Output Gain	Analog output ratio adjustment.			
F_129	AM+ Analog Output Signal Selection(DC 0~10V)	0: Output frequency. 1: Frequency command. 2: Output current. 3: Vin: analog input speed command (F_124 must be set to "1"). 4: lin : analog input speed command (F_125 must be set to "1").	0~4	—	2
F_130	AM+ Analog Output Gain	Analog output ratio adjustment			

## Section C Parameter Table

### C-7 Motor Data and Protection

Func	Name	Descriptions	Range	Unit	Default
F_046	Motor Overload Protection Selections	0: Motor overload protection – Disabled. 1: Motor overload protection – Enabled. 2: Motor overload protection of separate cooling fans Enabled. <b>Warning:</b> Disabling should only be done if a separate overload is used and wired to a drive input – see C-8.	0~2		1
F_048	Motor Rated Current	Current setting according to the motor Full Load Amps (FLA).	10~150% of drive rating	0.1A	230V 7.5 10 15 18.7 24.9 34.2 460V 7.5 10 15 20 9.3 12.5 17.1 24.0
F_049	Motor No-Load Current	Current setting per motor data or estimated by using 50% of Motor Full Load Amps (Amps).	0~ Motor rated current	0.1A	230V 7.5 10 15 8.4 10.5 14.4 460V 7.5 10 15 20 4.2 5.3 7.2 8.6
F_050	Motor Slip Compensation	Correction for slip of the induction motor as the motor is loaded. Improves the accuracy of the display RPM's.	-9.9~10.0	0.1Hz	0.0
F_051	Number of Motor Poles	Change the motor sync speed (used with F_006).	2~10	2P	4P



## Section C Parameter Table

**C-8 Digital Inputs** Note: Each input has 18 programmable inputs and one that is unique to a input terminal.

Func	Name	Descriptions	Range	Unit	Default
F_052	Input Terminal X1	<b>Unique Option for input</b> <b>X1 = 0</b> UP/DOWN command enter key			3
		<b>Shared Input Options</b> ±1: Jog command. ±2: Switch between the secondary accel/decel. ±3: Preset 1. ±4: Preset 2. ±5: Preset 3. ±6: Drive "Reset" input. ±7: External fault input. ±8: Drive output disable. ±9: Coasting "Stop" (E-Stop). ±10: Starting into a Spinning Load Speed search. ±11: Search starts from Max Freq. ±12: Starting into a Spinning Load Speed search. ±13: Hold – when "Set" the ramp up or down is stopped, the speed maintained. ±14: Speed "UP". ±15: Speed "DOWN". ±16: Reset UP/DOWN frequency setting to 0.00 HZ. ±17: Select analog input source ±18: Stop command for 3-wire start/stop circuit ±19: Select communication command (including drive start and frequency command) <b>Note:</b> Setting the option to "+" value the input is "set" when input is made. Setting the "-" value the input is set when the input is "open".			
F_053	Input Terminal X2	<b>X2 = 0</b> DC braking enable (stop)	-18~+18	—	4
F_054	Input Terminal X3	<b>X3 = 0</b> Current limit enable			1
F_055	Input Terminal X4	<b>X4 = 0</b> Primary and secondary speed command select			2

**Note:** Shaded Parameters cannot be changed while the drive is running.

## Section C Parameter Table

### C-9 Digital Outputs

Func	Name	Descriptions	Range	Unit	Default
F_058	Output Terminal Y1	<b>Optional Settings for each Terminal</b> ±1: Motor power “on” (power to the motor AC or DC). ±2: Drive is “At” Commanded speed ±3: Zero speed. ±4: Drive run (AC output only) ±5: Overload alarm. ±6: Overload detection. ±7: Low voltage detection. ±8: Braking detection. ±9: Alarm for restart after instantaneous power failure. ±10: Alarm for restart after drive fault. ±11: Drive fault.	-11~+11	—	3
F_059	Output Terminal Y2				2
F_060	Relay Output Terminal				11
	T1 Relay Output				
	Ta1, Tb1, Tc1 SPDT				
	Ta1 = N.O. Tb1 = N.C. Tc1 = Common				
F_131	Relay Output Terminal	<b>Note:</b> Setting the option to “+” value the input is “set” when input is made. Setting the “-” value the input is set when the input is “opened”.			1
	T2 Relay Output				
	Ta2 = N.O.				
	Tc2 = Common				
F_061	“At” Commanded Dead Band	Dead Band to prevent contact status change with load variations (Digital Output option “±2”).	0.0~10.0	0.1Hz	2.0
F_062	“Drive Run” Output Threshold Level	Output will not “set” till above this threshold (Output option “±4”).	0.0~10.0	0.1Hz	2.0
F_063	“Drive Run” Dead band	F_062 output dead band. The frequency above and below F_062.	0.0~400	0.1Hz	0.0

**Note:** Shaded Parameters cannot be changed while the drive is running.

## Section C Parameter Table

### C-10 Modbus Communication Setup (See Appendix III for more information on Modbus)

Func	Name	Descriptions	Range	Unit	Default
F_110	Communication address	0 to 254 (setting value to "0" the drive is disabled for RS-485)	0~254	—	0
F_111	Communication transmission speed (Baud rate)	0: 4800bps 1: 9600bps 2: 19200bps 3: 38400bps	0~3	—	1
F_112	Modbus Communication protocol	0: 8N2 1: 8E1 2: 8O1	0~2	—	1
F_113	Communication "time out" detection	Set the detection time for communication "time out" detection setting the value to "0.0": no communication "time out" detection	0.0~100.0	0.1sec	0.0
F_114	Communication error processing	0: Warning: continue running 1: Warning: ramp to stop 2: Warning: coast to stop	0~2	—	0
F_115	Multi-function input control selection	0: Drive control by multi-function input terminal or Keypad 1: Drive control by communication port (enables RS-485)	0, 1	—	0

### C-11 Miscellaneous

Func	Name	Descriptions	Range	Unit	Default
F_091	Fault Records	Display the last 5 records of faults.	view only	—	no_Err
F_092	Parameter Locking	0: Parameters are changeable, and Max. Freq. <b>cannot</b> exceed 120.0 Hz. 1: Parameters are locked, Max. Freq. <b>cannot</b> exceed 120.0 Hz. 2: Parameters are changeable, Max. Freq. <b>can</b> exceed 120.0 Hz. 3: Parameters are locked, Max. Freq. <b>can</b> exceed 120.0 Hz.	0~3	—	0
F_133	Current Limit Level	Monitoring the Drive current limit level as a % and used with F_0124 or F_125 when set to "2".	view only	—	Monitor Value
F_134	Default Setting Reset Clear Fault Log Upload Parameters to Keypad	dEF60: Reset to 60Hz default settings. dEF50: Reset to 50Hz default settings. SAV: Store setting. rES: Resume setting. rd-EE: Read parameter from drive to digital keypad.(WWE-201KP) Wr-EE: Write parameter from the digital keypad to drive.	—	—	0

**Note:** Shaded Parameters cannot be changed while the drive is running.

## Section C Parameter Table

### C-12 Advanced

Func	Name	Descriptions	Range	Unit	Default
F_030	Limitation of Output Voltage	0: Output voltage of V/F pattern is not limited to the nameplate voltage 1: Output voltage of V/F pattern is limited to the nameplate voltage	0, 1	—	0
F_036	V/F Frequency 1	Frequency at the first point of V/F pattern	0.0~399.9	0.1Hz	0.0
F_037	V/F Voltage 1	Voltage at the first point of V/F pattern	0.0~255.0	0.1V	0.0
			0.0~510.0		
F_038	V/F Frequency 2	Frequency at the second point of V/F pattern	0.0~399.9	0.1Hz	0.0
F_039	V/F Voltage 2	Voltage at the second point of V/F pattern	0.0~255.0	0.1V	0.0
F_056	Reserved				
F_057	Reserved				
F_064	Automatic Boost Voltage Range	According to the load condition, adjust the output voltage of the V/F curve	0.0~25.5	0.1	1.0
F_065	Overload Detection	0: Disable 1: Enable (Note 6)	0, 1	—	0
F_066	Overload Detection Status	0: Detection during the constant speed only 1: Detection during the running only	0, 1	—	0
F_067	Output Setting of Overload	0: Drive is still running when the overload is detected 1: Drive is trip when the overload is detected	0, 1	—	0
F_068	Overload Detection Level	Setting the level of the current for overload detection	30~200% of drive rated current	1%	160
F_069	Overload Detection Time	The output current larger than the setting F_068 and exceed the time interval detects the overload	0.1~10.0	0.1sec	0.1
F_070	Stall Prevention Level at The Acceleration	If stall is detected during acceleration, the frequency is reduced so the motor continues to rotate preventing the stall	30~200% of drive rated current	1%	170
F_071	Stall Prevention Level at The Constant Speed	If stall is imminent while operating at a constant speed running, the motor speed is decreased till it stall potential threat is eliminated	30~200% of drive rated current	1%	160
F_072	Acceleration Time for Stall Prevention at The Constant Speed	Setting the acceleration time for the stall prevention of the constant speed	0.1~3200.0	0.1sec	15.0 (Note 5)
F_073	Deceleration Time for Stall Prevention at The Constant Speed	Setting the deceleration time at the stall prevention of the constant speed	0.1~3200.0	0.1sec	15.0 (Note 5)

## Section C Parameter Table

Func	Name	Descriptions	Range	Unit	Default
F_074	Deceleration Stall Prevention	0: Deceleration stall prevention: Disabled 1: Deceleration stall prevention: Enabled	0, 1	—	1
F_078	Operation Selection at Power Failure and Instantaneous Power Failure	<b>Instantaneous power failure/flying start</b> 0: Drive can not be restarted 1: Drive can be restarted	0~3	—	0
		<b>Power failure</b> 2: Ramp to stop 3: When power restored during the ramp to stop interval, the drive reacceleration again	150.0~192.0 300.0~384.0	0.1V	230V: 175.0 (Note 3) 460V: 320.0 (Note 4)
F_079	The Voltage Level Setting at The Power Failure	Setting the voltage of power source for ramp to stop	0~16	1	0
F_080	Number of Fault Restart	Numbers of restart at the fault occur	0~200% of drive rated current	1%	150
F_088	Speed Searching Current Level	When the current large then the searching current, the output frequency is searching downward	0.1~5.0	0.1sec	0.5
F_089	Delay Time for Speed Searching	Setting the output delay time before the speed searching	0~100%	1%	100
F_090	The V/F Pattern of Speed Searching	Setting the percentage of V/F output voltage at the speed searching	0, 1	—	1
F_093	Automatic Voltage Regulation (AVR)	0: Disable 1: Enable	0~3	—	3
F_094	Drive Overload (OL1)	0: Disable 1: Thermal protection 2: Current limit overload protection 3: Both protection	190.0~240.0 340.0~480.0	0.1V	230.0 (Note 3) 460.0 (Note 4)
F_095	Power Source	The value of setting according to the actual power source	0.0~400.0 0.0~25.5	0.1Hz 0.1sec	0.5 0.0
F_096	Holding Frequency	Setting the drive to accelerate to the holding frequency at the constant speed	0, 1	—	1
F_097	Holding Time Interval	Setting drive's time of the constant speed at the holding frequency	0~8	—	1 (Note 8)
F_098	Grounding Fault Protection (GF)	0: Disable 1: Enable			
F_099	External Indicator 1	Selecting indicated status of external indicator 1			

## Section C Parameter Table

Func	Name	Descriptions	Range	Unit	Default
F_100	External Indicator 2	Selecting indicated status of external indicator 2	0~8	—	2 (Note 8)
F_101	External Indicator 3	Selecting indicated status of external indicator 3	0~8	—	3 (Note 8)
F_102	V/F Curve Selection	0: Linear 1: Energy saving mode (auto-adjust V/F according to the loads) 2: Square of 2 curve 3: Square of 1.7 curve 4: Square of 1.5 curve	0~3	—	0
F_103	Subtracted Frequency at Deceleration Start	When the power failure, Frequency = Output freq.- subtracted freq.	0.0~20.0	0.1Hz	3.0
F_104	Power Failure Deceleration Time 1	Set a deceleration slope down to the frequency set in F_106	0.0~3200.0	0.1sec	15.0 (Note 5)
F_105	Power Failure Deceleration Time 2	Set a deceleration slope below the frequency set in F_106	0.0~3200.0	0.1sec	15.0 (Note 5)
F_106	Power Failure Deceleration Time Switchover Frequency	Set the frequency at which the deceleration slope is switched from the F_104 setting to the F_105 setting	0.0~400.0	0.1Hz	0.0
F_108	Digital Input De-Bounce Adjustment	When the input pulse width lower than the setting time, the software rejects	5~16	1ms	10
F_109	Reserved				
F_116	Current Limit Protection setting	Setting current limit active timing to protect drive (OL2)	0.0~10.0	0.1sec	4.0
F_117	Reserved				
F_118	UP/DOWN Memory Selection	0: Erase the UP/DOWN freq. when power off 1: Store UP/DOWN frequency when power off	0, 1	—	0
F_119	UP/DOWN Frequency Resolution	0: 0.01Hz 9: 0.5Hz 1~8: *0.05Hz 10~255: *0.1Hz	0~255	—	0
F_120	UP/DOWN Trigger Mode	1~5: Terminal adjust the response time. Continuous accel. or decel. When over setting time 6: Edge trigger	1~6	—	1
F_121	UP/DOWN Frequency Adjustment	Adjust UP/DOWN frequency on WWE-207KP keypad directly	0.00~400.00	0.01Hz	0.00
F_122	Secondary Speed Command Selection	0: Frequency setting by analog terminal 1: Frequency setting by keypad 2: Frequency setting by UP/DOWN terminal	0~2	—	0
F_132	DC Braking Frequency at Stop	Active frequency of DC braking at stop	0.1~60.0	0.1Hz	0.5



## Section D Parameter Description

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F_005	Speed Command Auto Store	D-1
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F_008	User Units Decimal	D-1
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F_012	Preset Speed 3	D-2
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F_022	Decel Time – Preset 1	D-3
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F_024	Decel Time – Preset 2	D-3
F_025	Accel Time – Preset 3	D-3
F_026	Decel Time – Preset 3	D-3
F_027	Secondary Accel Time	D-3
F_028	Secondary Decel Time	D-3
F_029	S-curve for Accel/Decel Time	D-3
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F_036	V/F frequency 1	D-12
F_037	V/F voltage 1	D-12
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F_040	Vin Gain	D-5

Fucn.	Name	Sect
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## Section D Parameter Description

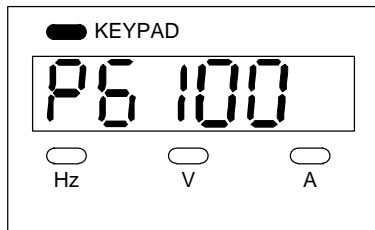
Fucn.	Name	Sect
F_075	DC Braking Force	D-4
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F_126	<b>Iin</b> Selection	D-5
F_127	<b>Iin</b> Gain	D-5
F_128	<b>Iin</b> Bias	D-5
F_129	<b>AM+</b> Analog Output Signal Selection(DC 0~10V)	D-6
F_130	<b>AM+</b> Analog Output Gain	D-6
F_131	T2 Relay Output	D-9
F_132	DC braking frequency at stop	D-4
F_133	Current Limit Level	D-11
F_134	Default Setting	D-11



## Section D Parameter Description

### D-1 Keypad

**F\_000 Drive Information** – this is a “view” only parameter



Hz	V	A	Software Version
Hz	V	A	Drive Model Number
Hz	V	A	Drive Running Hours
Hz	V	A	Drive Power Applied in Hours
Hz	V	A	Software Checksum
Hz	V	A	Reserved

Using the  or  key can switch displays. The three LEDS below the display labeled HZ”, “V” and “A” are used to confirm what is being displayed. See chart above.

**F\_001 Start Command** has 9 modes





- = **0** Terminal **FWD** and **REV** are active. Closing either input determines direction. If both inputs are “open” or both inputs “closed” drive turns “off”.
- = **1** Terminal **FWD** and **REV** are active. The **FWD** terminal acts as the “enable”; with direction from the **REV** terminal.  
**FWD** open drive stops so **REV** is irrelevant  
**FWD** closed drive “enabled” so **REV** will determine direction  
**REV** Open – Drive operates in the forward direction until **FWD** opens  
**REV** Closed – Drive operates in the reverse direction until **FWD** opens
- = **2** Terminal **FWD** and **REV** are active. Start control by the keypad “RUN”. Closing the **FWD** or **REV** input determines direction but does not start the drive. If both inputs are open or both inputs closed drive turns “off”.
- = **3** Terminal **FWD** and **REV** are inactive.  
Start control by the keypad “RUN” key; operation in forward direction only.
- = **4** Terminal **FWD** and **REV** are inactive.  
Start control by the keypad “RUN” key; operation in reverse direction only.
- = **5~7** Reserved
- = **8** Start/Stop/ Direction are controlled by Host through ModBus.
- = **9** Start/Stop set by the Host; Direction is from Terminal **FWD** and **REV**. Closing the **FWD** or **REV** input determines direction but does not start the drive. If both inputs are open or both inputs closed drive turns “off”.  
In ModBus control, the host device must give the commands such as “Start”/”Stop” See Section E-4 for an example and Appendix III for list of registers. The Host PLC or HMI program differently to achieve communications which is beyond the scope of this manual.
- = **10** Start/Stop Control by the Input Terminals Direction is determined by the Host.
- = **11** Start control by the keypad “Run” key and stop control by keypad “Stop” key or multi-function input terminal programmed as the “Stop” function. (see section D-8 Digital Input Terminal).  
Direction is determined by the Host through RS-485 communication interface for motor forward and reverse directions.

**Note:** If the display the most left digit shows “ – “ the drive is in Reverse direction




**Note:** When F\_001=0 or 2, If both inputs are open drive turns “off”, the display (when in the monitor mode) will flash “-----”. If both drive inputs are closed, the keypad will display (when in the monitor mode) “ dLF “.

## Section D Parameter Description

### F\_002 Speed Input selection has 6 modes

- = 0 Frequency is controlled by the analog input terminal (**Vin** or **lin** analog input(F\_123 selects the source)).
    - Vin-GND:** Input terminal range DC 0~10V. Adjust the drive to the input by parameter F\_040 and F\_041. See Section A-3
    - lin-GND:** Input terminals selecting the input mode via SW1.
      - SW1→**I** mode factory setting: Input current source range 4~20mA or 0~20mA (selecting by F\_126).
      - SW1→**V** mode: Input voltage sources range: 2~10V or 0~10V (selecting by F\_126).
  - Calibrate the drive to the input signal use by parameter F\_127 and F\_128.
  - = 1 Frequency (speed) is set from the keypad.
  - = 2 RPM is set by the keypad.
  - = 3 Line Speed or User Units is set by the keypad. See F\_007 and 008 to calibrate motor speed to display.
  - = 4 Speed is set by UP/DOWN input terminal. See C-8.
  - = 5 Speed is set by ModBus communications via the host controller.
- Note:** When F\_002=1~3, press the  or  key in the monitoring mode, the frequency setting will blink, but not changed. Press the key  or  again; then the frequency setting can be changed. Save the setting by hitting "Func/Data" if power is lost it will return to saved speed when power returns and "Run" pushed

### F\_003 Keypad "STOP"

- = 0 The Keypad "STOP" is **disabled**. **Warning:** Disabling "STOP" should only be considered if there is no danger to operator and/or machine.
  - = 1 The Keypad "STOP" is **enabled**
- Note:** The using the "STOP" key. "STOP" key for Emergency Stop:  
When the drive start command is via the input terminal (F\_001=0 or 1) and the "STOP" key is pressed during drive's operation, the output frequency will ramp to 0.00Hz. The keypad will show . To restart the drive, "open" the input between the terminals **FWD** and **REV**.
- Note:** Using the "STOP" key for normal stop:  
When F\_001=2 or 3, the start is controlled by the keypad  key and the stop is controlled by  key.

### F\_004 Speed Control from the keypad

- = 0 The keypad cannot change speed
- = 1 The keypad can change speed

### F\_005 Speed Command Auto Store

- = 0 Keypad the frequency setting will not be saved automatically after 3 minutes of operating at the same speed.
- = 1 If F\_004 is set "1", the frequency setting will be saved after 3 minutes automatically of operating at the same speed. If power is lost and then restored when the "Run" command is given, the drive will return to the saved speed.

### F\_006 Keypad Display has 8 modes to display drive information

- = 1 Output Frequency – Shows the current output frequency
- = 2 Frequency Setting – Frequency that has been commanded
- = 3 Output Voltage
- = 4 DC Bus Voltage
- = 5 Output Current
- = 6 Motor Speed (RPM) based on 1800RPM motor See F\_051 to change
- = 7 Line Speed/User units (customized display units). See F\_007 and F\_008 to calibrate the display so operator can set speed based on production or flow rate.
- = 8 Terminals Status - troubleshooting tool for inputs and outputs wiring. See Section F-4 to see the status of each input or output.

### F\_007 User Units (Machine speed ratio) for when using F\_006 = 7

Machine speed = machine speed ratio (F\_007) x output frequency

## Section D Parameter Description

### F\_008 User Units Decimals (Digits displayed) when F\_006 =7

Line speed or “user units” can be shown with up to three decimal place resolution (0.000).

### D-2 Preset Speeds

Using the multi-function inputs F\_052 – F\_057 and input terminals defined as **=3,4,5** up to 7, speeds can be defined by a contact closure or a combination of contact closures. Preset Speeds 1 and 3 have their own Accel and Decel per parameter F\_018 – F\_025 see D-3. Preset speeds 2, 4, 5, 6 and 7 use Accel and Decel rates F\_019 and F\_020.

**Note:** In F\_052 and F\_057, the preset modes have two options. If functions are programmed to “+” 3,4 or 5 value, the input is “set” on contact closure. If functions are programmed to a “-” value, the input is set when the contact “opens”.

**F\_009 Primary Speed (range 0.00~400.00Hz)**

**F\_010 Preset Speed 1 (range 0.00~400.00Hz)**

**F\_011 Preset Speed 2 (range 0.00~400.00Hz)**

**F\_012 Preset Speed 3 (range 0.00~400.00Hz)**

**F\_013 Preset Speed 4 (range 0.00~400.00Hz)**

**F\_014 Preset Speed 5 (range 0.00~400.00Hz)**

**F\_015 Preset Speed 6 (range 0.00~400.00Hz)**

**F\_016 Preset Speed 7 (range 0.00~400.00Hz)**

**F\_017 Jog Speed (range 0.00~400.00Hz)** overrides other preset speeds. Jog Accel and Decel is defined by F\_019 and F\_020.

**Note:** Max Speed is limited to maximum speed parameter F\_031

Switch Combination for Preset Speeds Input Terminals (see F_052 thru F_057)					
Jog =±1	Preset 1 =±3	Preset 2 =±4	Preset 3 =±5	Commanded Speed	Parameter To set Speed
Set	-	-	-	Jog speed	F_017
OFF	OFF	OFF	OFF	Primary Speed	F_009
OFF	Set	OFF	OFF	Preset speed 1	F_010
OFF	OFF	Set	OFF	Preset speed 2	F_011
OFF	Set	Set	OFF	Preset speed 3	F_012
OFF	OFF	OFF	Set	Preset speed 4	F_013
OFF	Set	OFF	Set	Preset speed 5	F_014
OFF	OFF	Set	Set	Preset speed 6	F_015
OFF	Set	Set	Set	Preset speed 7	F_016

**“Set” = contact closed, and “Off” = Contact open: Mode is a positive value**

**“Set” = contact open and “Off” = Contact closed: Mode is a “ - “ value.**

**Jog Speed** - will override all other inputs.

**Primary Speed** – is the speed with no inputs “set”

**Note:** Multi-speed and acceleration/deceleration time

- ※ When F\_001 = 1 and the drive is at stop, the jog command is set, and the motor will be started with the jog speed since the jog command also has “Start” function when F\_001 = 1.
- ※ Under the preset speed (primary speed excluded), analog input terminals (**Vin**, **lin**) are disabled.
- ※ Primary speed can be **Vin** or **lin** if F\_124 (**Vin**) = 1 (primary speed controlled by POT) or when F\_125 (**lin**) = 1 (primary speed controlled by current source input).

## Section D Parameter Description

### D-3 Acceleration and Deceleration

#### F\_018 Accel/Decel Base Frequency (range 0.01~400.00Hz)

This defines the rate of acceleration. The default frequency is 60HZ. If the acceleration time is set to 10 seconds, an output of 60HZ is achieved in 10 seconds. If the motor is commanded to 30HZ the acceleration time will be in 5 seconds.

#### F\_019 Primary Acceleration Time (range 0.0~3200.0 secs)

#### F\_020 Primary Deceleration Time (range 0.0~3200.0 secs)

#### F\_021 Acceleration Time – Preset 1 (range 0.0~3200.0 secs)

#### F\_022 Deceleration Time – Preset 1 (range 0.0~3200.0 secs)

#### F\_023 Acceleration Time – Preset 2 (range 0.0~3200.0 secs)

#### F\_024 Deceleration Time – Preset 2 (range 0.0~3200.0 secs)

#### F\_025 Acceleration Time – Preset 3 (range 0.0~3200.0 secs)

#### F\_026 Deceleration Time – Preset 3 (range 0.0~3200.0 secs)

**Note:** Preset Accel and Decel rates are based on the time to go from 0 output to Reference Frequency set in F\_018

**Note:** Preset Speeds 4-7 and Jog speed use the Primary Accel/Decel setting

#### Secondary Accel/Decel rates for Inputs F\_052 – F\_057 if set to $\pm 2$ .

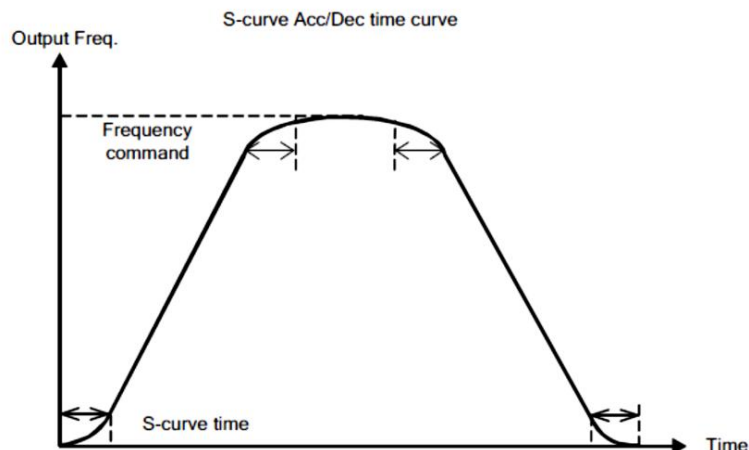
By “Setting” the Secondary Accel/Decel Input a different set of Accel/Decel rates.

#### F\_027 Secondary acceleration time (range 0.0~3200.0 secs)

#### F\_028 Secondary deceleration time (range 0.0~3200.0 secs)

**S-Curve Accel/Decel** – provides a softer to achieve faster accel/decel but preventing loads from toppling or loads that are being pulled from breaking.

#### F\_029 S-Curve for the Accel/Decel Time (range 0.0~5.0 secs)



### D-4 Drive Output Parameters

#### F\_031 Maximum Output Frequency (range 0.1~400.0Hz)

**Warning:** Do not set above safe operating speed for the motor or machine as damage to the and possible injury may result.

#### F\_032 Starting Frequency (range 0.1~10.0Hz)

This is the starting frequency, the drive will output at start to insure enough torque to start the load.

#### F\_033 Starting Voltage

This is the starting voltage, the drive will output at start to insure enough torque to start the load. Increasing this setting can create heat in the motor.

## Section D Parameter Description

### F\_034 Base Frequency (range 0.1~400.0Hz)

Motor base frequency (nameplate frequency)

### F\_035 Motor Nameplate Voltage

### F\_042 Maximum Frequency (Frequency Upper Limit)

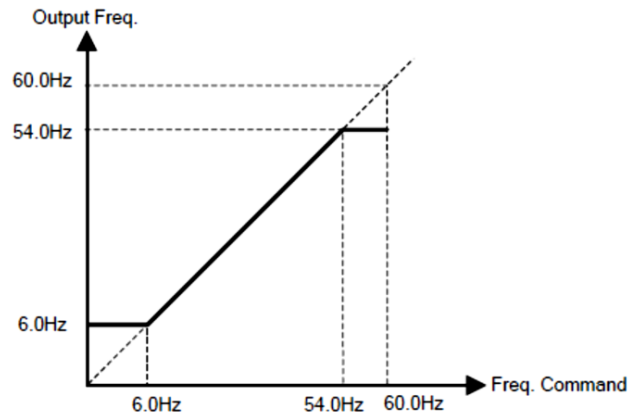
Drive output frequency will be limited to this set point.

### F\_043 Starting Frequency (Frequency Lower Limit)

The drive is starting frequency to the motor and its lower limit.

Frequency upper limit =  $F_{042} \times F_{031}$  (Max Output Frequency)

Frequency lower limit =  $F_{043} \times F_{031}$  (Max Output Frequency)



**DC Braking** is not a substitute for a holding brake but will create a braking force to the load to stop a load that is moving (wind milling fan) before “start” or help bring a load to faster stop.

**Warning:** This force can be set high enough to break the motor shaft or connected machine.

### F\_075 DC Braking Force (0~150% of drive rated current)

This function is to set the current level of the DC braking force.

**Warning:** Increasing the braking force can create excessive heat in the motor and can cause motor and/or machine damage.

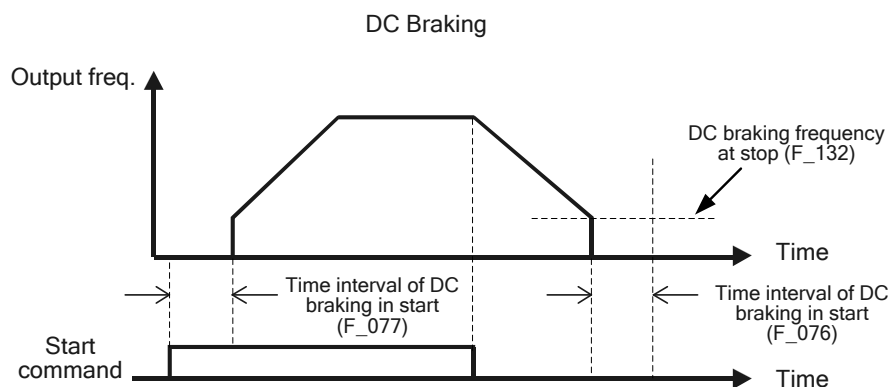
### F\_076 DC Braking Time at “Stop” (0.0~20.0 seconds)

**Warning:** Increasing the braking time can create heat in the motor and can cause motor damage.

### F\_077 DC Braking Time at “Start” (0.0~20.0 seconds)

### F\_132 DC Braking Frequency at “Stop”.

This is the frequency that braking will begin.



※ If the frequency command is set below  $F_{032}$  (starting frequency) during the operation, DC braking will be enabled when the output frequency is dropped below the start frequency  $F_{132}$  function is ineffective.



## Section D Parameter Description

### F\_081 Switching frequency (0~6)

Increasing the switching frequency will increase heating of the output transistors.

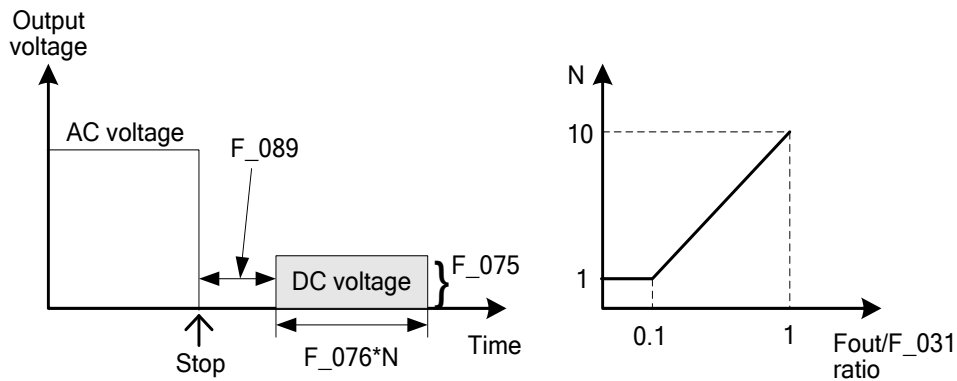
Mode	0	1	2	3	4	5	6
Switching Frequency	800Hz	2.5kHz	5kHz	7.5kHz	10kHz	12.5kHz	15kHz

Setting the proper switching frequency must consider the motor cable length (see section OV-9: Switching Frequency Versus Cable Length).

### F\_082 Stop Mode

- = 0 Ramp to stop
- = 1 Coast to stop
- = 2 Coast to stop + DC braking

When F\_082=2, the operation characteristics are as shown in figures below:



### F\_083 Reverse Lockout

- = 0 Reverse rotation allowed
- = 1 Reverse rotation NOT allowed

### F\_084 Skip Frequency 1 (0.0~400.0Hz)

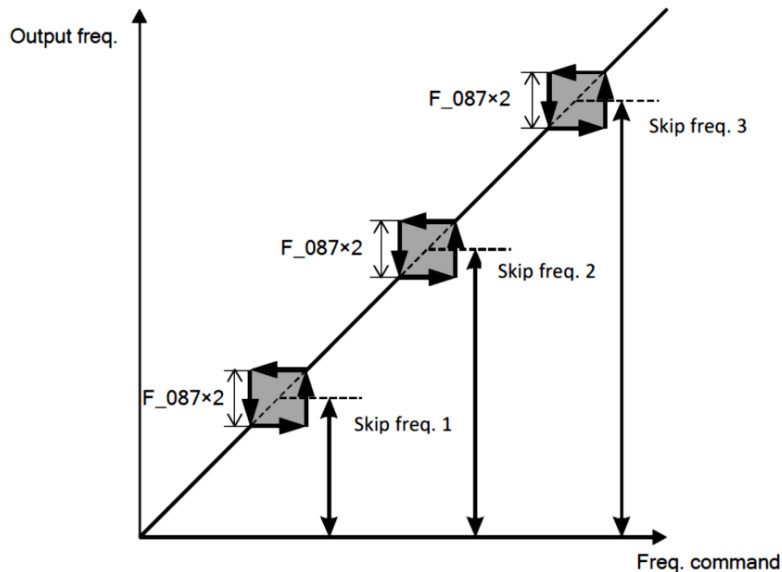
### F\_085 Skip Frequency 2 (0.0~400.0Hz)

### F\_086 Skip Frequency 3 (0.0~400.0Hz)

### F\_087 Skip Frequency Range of Skip Frequency 1, 2, 3 (0.0~25.5Hz)

In order to avoid the mechanical resonance, these parameters prevent the drive from operating at system resonant frequencies.

There are three skip frequencies and one skip frequency interval.





## Section D Parameter Description

### D-5 Analog Inputs

**F\_040 Vin Gain (range 0.00~2.00)**

**F\_127 lin Gain (range 0.00~2.00)**

a. Analog input terminal:

**Vin** → GND 0~10V

**Iin** → GND 4~20mA (2~10V) or 0~20mA (0~10V)

b. Maximum freq. setting = Maximum output freq. (F\_031) x analog input gain (F\_040 or F\_127)

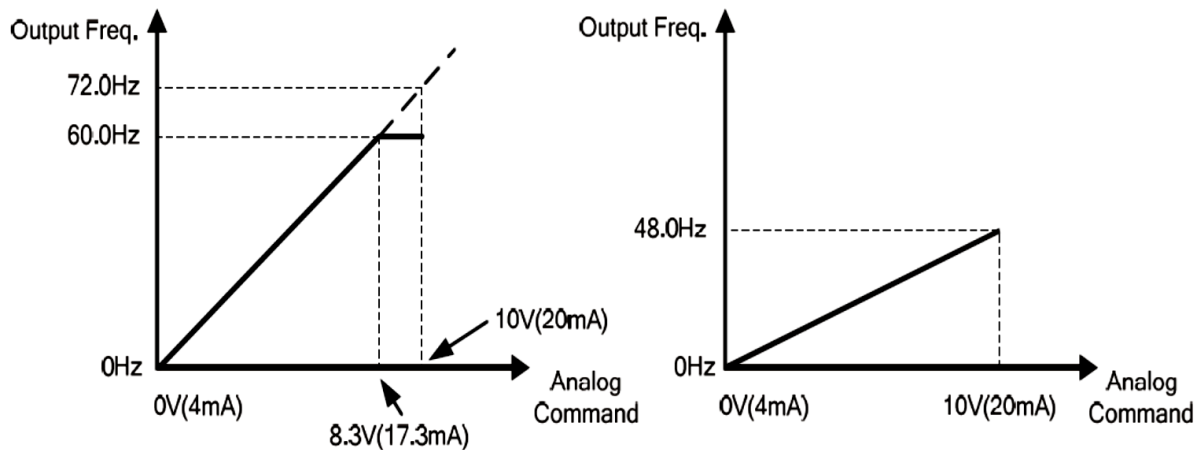
For example: if analog input bias = 0.00

Maximum output freq. 60.0Hz

Analog input gain = 1.20

Maximum output freq. 60.0Hz

Analog input gain = 0.80



**F\_041 Vin Bias (range -1.00~1.00)**

**F\_128 lin Bias (range -1.00~1.00)**

Bias frequency = Maximum output freq. (F\_031) X analog input bias (F\_041 or F\_128)

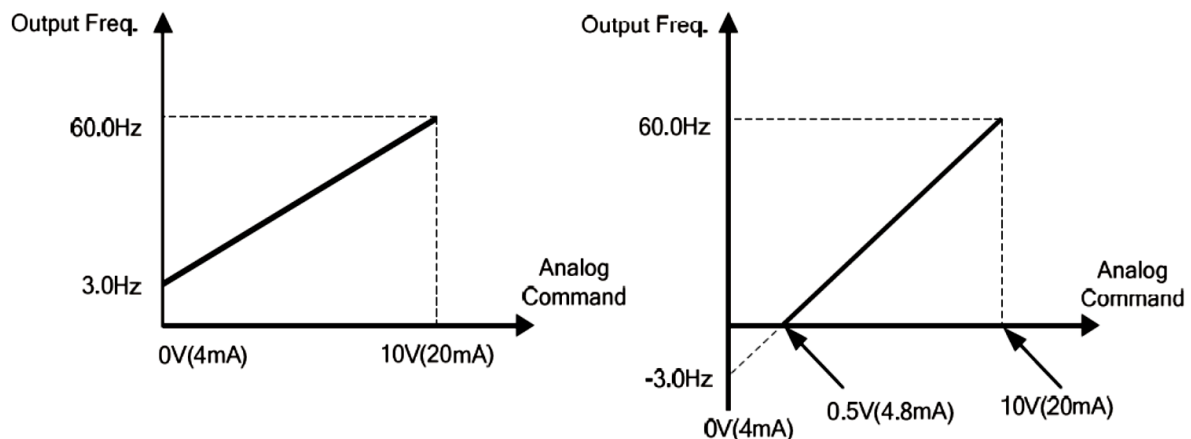
For example: if analog input gain = 1.00

Maximum output freq. 60.0Hz

Analog input bias = 0.05

Maximum output freq. 60.0Hz

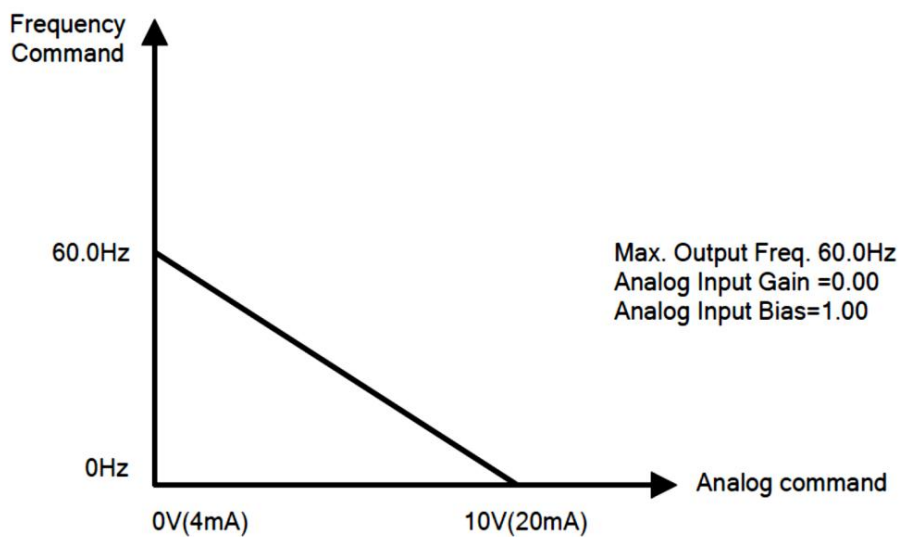
Analog input bias = -0.05



$$\text{Freq. Command} = \frac{(\text{Max. freq. setting} - \text{Bias freq.})}{10\text{V}(20\text{mA})} \times \text{analog command} + \text{freq. bias}$$

## Section D Parameter Description

### a. Example of reverse control application



#### **F\_047 Filter time of analog input (setting range 0 ~ 255)**

Filtering will reduce the effect of electrical noise on the input for frequency command (F\_002=0). A larger setting results in slower response. The setting value =0 is mean No filtering.

#### **F\_107 Analog input dead band (setting range 0.00 ~ 2.55)**

When the input has small variations in the signal, this setting can be used to stabilize the motor speed by increasing the dead band. This setting must be applied along with the F\_047.

#### **F\_123 Analog Input Source**

- 0: Vin+lin
- 1: Vin-lin
- 2: lin-Vin
- 3: Vin or lin (select from X1~X4 terminals)

#### **F\_124 Analog Input (Vin) Option**

- 0: Analog input gain
- 1: Frequency command
- 2: Current limit (Current can be viewed at F\_133)
- 3: Output voltage adjustment of V/F pattern

#### **F\_125 Analog Input (lin) Option**

- 0: Analog input gain
- 1: Frequency command
- 2: Current limit (Current can be viewed at F\_133)
- 3: Output voltage adjustment of V/F pattern

#### **F\_126 lin Selection**

Current input source selection

- 0: 4~20mA
- 1: 0~20mA

## Section D Parameter Description

### D-6 Analog Outputs

#### F\_044 FM+ analog output signal selection

#### F\_129 AM+ analog output signal selection

The analog output signal is DC 0~10V

0: Output frequency (only output under drive operation)

1: Frequency command (output at drive operation and stop)

2: Output current

3: Vin frequency setting

(output at drive operation and stop, enable at F\_124=1)

4: lin frequency setting

(output at drive operation and stop, enable at F\_125=1)

#### F\_045 FM+ analog output gain (range 0.00~2.00)

#### F\_130 AM+ analog output gain (range 0.00~2.00)

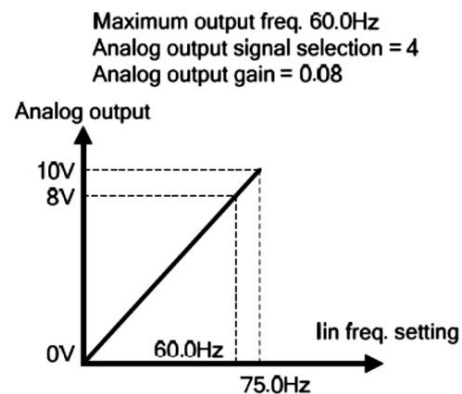
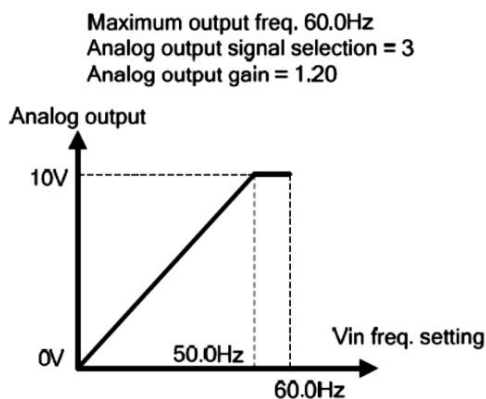
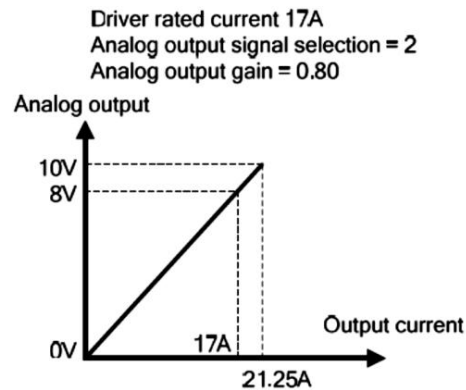
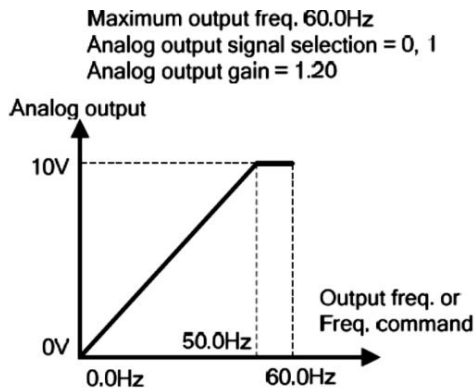
Analog output terminals are **FM+ – M-**, **AM+ – M-** (At 1/2 HP~5HP analog output terminals are

**FM+ – GND, AM+ – GND)**

The kinds of analog output signal is defined by F\_044 and F\_129

$$\text{Analog output gain} = \frac{\text{Maximum output freq.}}{\text{Output freq. (freq. command)}} \text{ or } \frac{\text{Drive rated current}}{\text{Output current}}$$

Analog output curve



## Section D Parameter Description

### D-7 Motor Data and Protection

#### F\_046 Motor Overload Protection Selections (OL)

- 0 : Motor overload protection: Disabled
- 1 : Motor overload protection: Enabled
- 2 : Motor overload protection of the independent cooling fans

#### F\_048 Motor Rated Current (range 10 to 150% of drive rated current )

#### F\_049 Motor No-Load Current (range 0 to motor rated current (F\_048))

#### F\_050 Motor Slip Compensation (range -9.9 to 10.0Hz)

Motor slips in terms changes with motor loading, the slip compensation corrects the motor RPM display. The compensation formula is as follows

Freq. compensation =

$$\frac{\text{Loading current} - \text{non-load current (F_049)}}{\text{Rated current (F_048)} - \text{non-load current (F_049)}} \times \text{slip compensation (F_050)}$$

#### F\_051 Motor Poles (2, 4, 6, 8, 10)

$$\text{Motor speed (RPM)} = \frac{120}{\text{Motor poles number (F_051)}} \times \text{output frequency}$$

### D-8 Digital Inputs

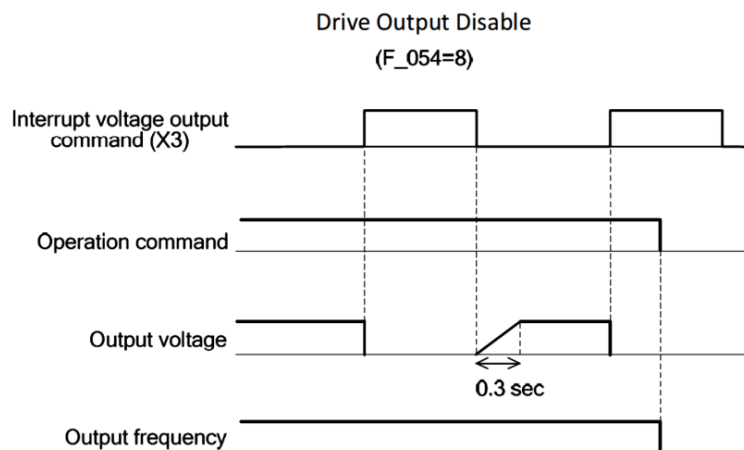
#### F\_052 Input Terminal X1

#### F\_053 Input Terminal X2

#### F\_054 Input Terminal X3

#### F\_055 Input Terminal X4

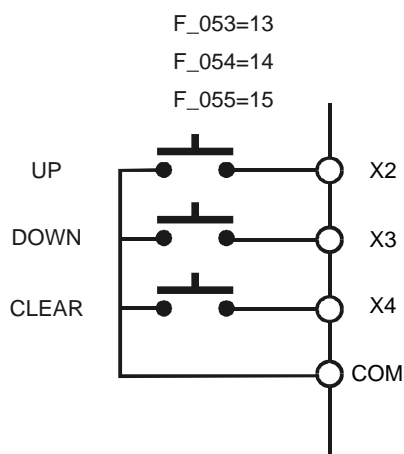
- a. “+” represents positive logic (normal open)
- b. “-” represents negative logic (normal close)
- c. Multi-function terminals X1~X6 can be set to perform any of the following functions:
  - ±1 Jog command (refer to F\_017)
  - ±2 Switch between the secondary accel/decel (refer to F\_027, F\_028)
  - ±3 Preset 1 (refer to F\_010~F\_016)
  - ±4 Preset 2 (refer to F\_010~F\_016)
  - ±5 Preset 3 (refer to F\_010~F\_016)
  - ±6 Drive “Reset” input - When the drive trips, “Setting” this input resets the drive so it can be restarted.
  - ±7 External fault input – When this input is “Set”, the drive will fault turning off the drive output.  
**Note:** This function does not work when the drive is off.
  - ±8 Drive output disable – when this input is “set”, the drive output is disabled or turned “off”. Once the input is “Released”, the drive output will ramp up the voltage.  
**Note:** the frequency remains as commanded.



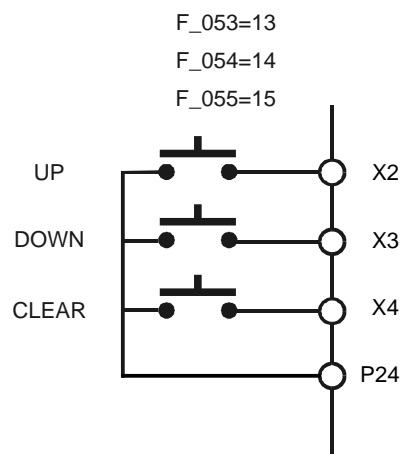
## Section D Parameter Description

- ±9 Coasting “Stop” (E-Stop) –when the input is “Set”, the drive output is disabled. The drive will ramp to the command speed when the input is “released”.
  - ±10 Drive to Sync to a motor speed starts at Max Frequency – if the input is “set” when the drive starts, the output will go to the max frequency and start the speed search. This input is used when the load is expected to be rotating WHEN the start command is given.
  - ±11 Drive to Sync to a motor speed starts at Commanded speed – If the input is “Set” when the drive starts the output will go to commanded speed and start the speed search. This input is used when the load is expected to be rotating WHEN the start command is given.
  - ±12 Holding command  
Motor is running at a constant speed without being affected by accel/decel or speed command.
  - ±13 Speed “UP” (frequency setting stepping increase)
  - ±14 Speed “DOWN” (frequency setting stepping decrease)
  - ±15 Reset UP/DOWN frequency setting to 0.00Hz (frequency command erase to 0.00Hz)
- Illustrated as follows:

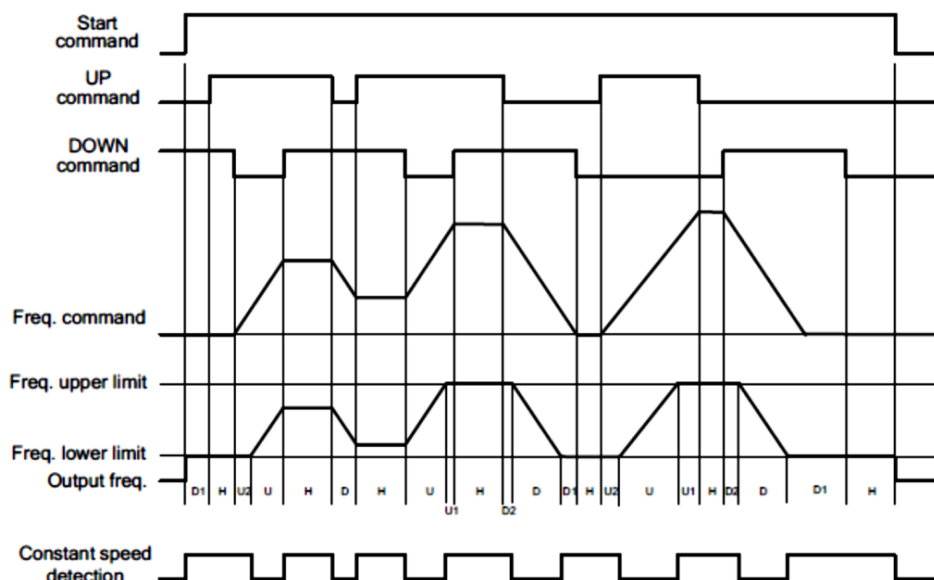
SINK (NPN) mode



SOURCE (PNP) mode



UP/DOWN command time chart



U=UP

(acceleration) status

D=DOWN (deceleration) status

H=HOLD (stall) status

U1=UP status bounded at the upper limit of the frequency

U2=UP status bounded at the lower limit of the frequency

D1=DOWN status bounded at the lower limit of the frequency

## Section D Parameter Description

D2=DOWN status bounded at the upper limit of the frequency

**±16** Select analog input source (F\_123 = 3 (Vin or lin))

Setting value is 16	Contact a, Vin input terminal as the analog input source
	Contact b, lin input terminal as the analog input source
Setting value is -16	Contact a, lin input terminal as the analog input source
	Contact b, Vin input terminal as the analog input source

**±17** Stop command with 3-wire start/stop circuit

Use the multi-function input terminal as “Stop” command for 3-wire start/stop circuit. This parameter enables the multi-function input terminal to be “Stop” command for external/remote control to the drive. **+**: Stop the drive operation by closing the switch to “Set”. **-**: Stop the drive operation by opening the switch to “Set”

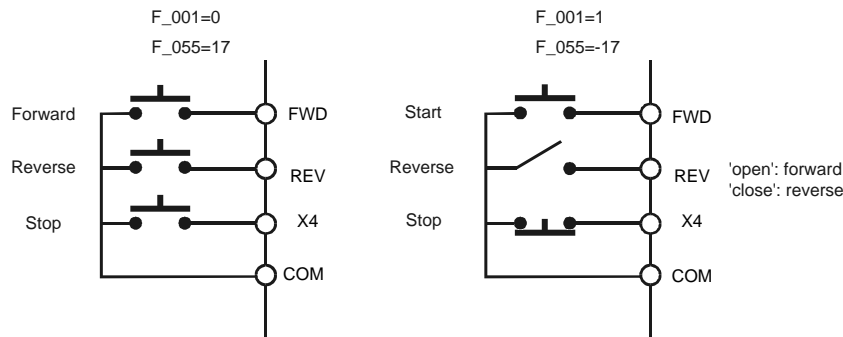
Example for using Stop command.

**X4 = +17**: Set the drive to stop by closing the switch

**X4 = -17**: Set the drive to stop by opening the switch

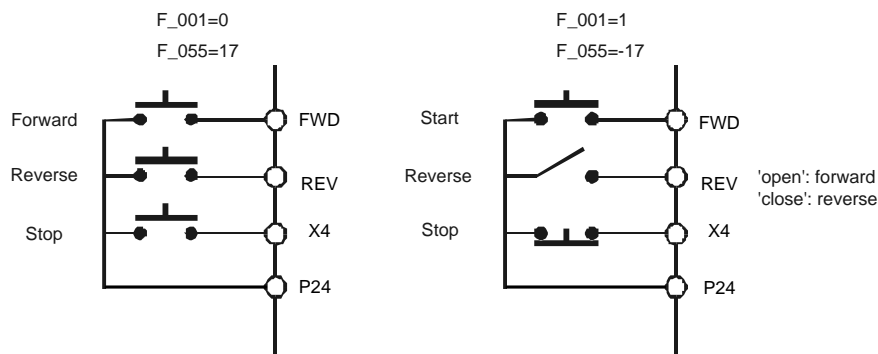
3-wire start/stop command example using “SINK/SOURCE” modes.

SINK (NPN) mode



**Example: 3-Wire Start/Stop Terminal Connection**

SOURCE (PNP) mode



**Example: 3-Wire Start/Stop Terminal Connection**

**±18** Selectable Host or Input terminals for control

Setting an input terminal to ±18 lets the Host control the drive via Modbus when the input is “set”. If the input is “released” then the drive is controlled but the keypad or input terminals See E-5 for examples. .

**F\_052~F\_055 = 0, the functions are described as follows:**

**F\_052** Setting input terminal X1

Confirm key of the UP/DOWN frequency setting.

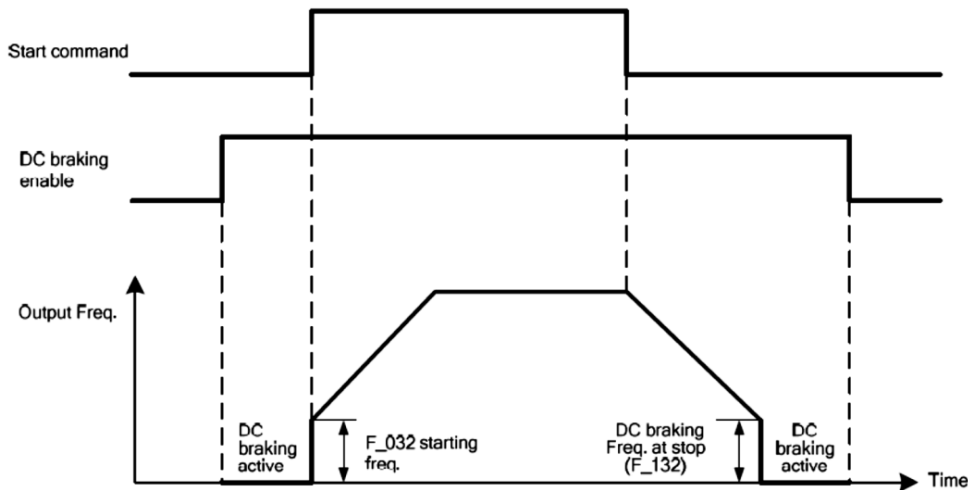
**X1** and **COM** disconnected → UP/DOWN command can adjust the frequency setting, but the output frequency is not changed and follows the frequency setting.

**X1** and **COM** connected → the output frequency starts to accelerate or decelerate until reaching the frequency setting.

## Section D Parameter Description

### F\_053 Setting input terminal X2

DC braking enabled command (when drive stops).



1. At drive stop and the DC braking command on: the DC braking enabled.
2. At the DC braking enabled: the output current is set by the F\_075 setting value.
3. At the start or jog command is enabled, the DC braking is disabled and motor starts running until reaches the commanded frequency.
4. At the start or jog command disabled, the output frequency will be decelerate to the DC braking frequency level, DC braking active.

### F\_054 Setting input terminal X3

Current limit enabled

F\_133: Setting the current limit

Using the keypad:

- a. **X3** and **COM** connected, either F\_124 or F\_125 is setting 2, the current limit enabled. The current limit level monitoring by F\_133 (range 1~150).
- b. **X3** and **COM** disconnected, the current limit disabled. The current limit level F\_133 monitoring level shall be identical with F\_071 (range 30~200).

For example: F\_054=0, X3 and **COM** connected, F\_124=2, F\_125=1 (Input Vin 0~10V corresponding to drive rated current 1~150%)

### F\_055 Setting input terminal X4

Primary and secondary frequency command selection.

When **X4** and **COM** connected is the secondary frequency command, **X4** and **COM** disconnected is the primary frequency command)

F\_002: primary frequency command selection

F\_122: secondary frequency command selection



### D-9 Digital Outputs

**F\_058 Output Terminal Y1**

**F\_059 Output Terminal Y2**

**F\_060 Relay Output Terminal Ta1 and Tb1**

**F\_131 Relay Output Terminal Ta2 and Tc2**

**Y1** and **Y2** are open-collector output terminals. The maximum output specification is below DC48V / 50mA.

**Ta1, Ta2** (normal open) and **Tb1** (normal close) are relay output terminals. The maximum output specification is AC 250V / 0.5A  $\cos\theta=0.3$ .

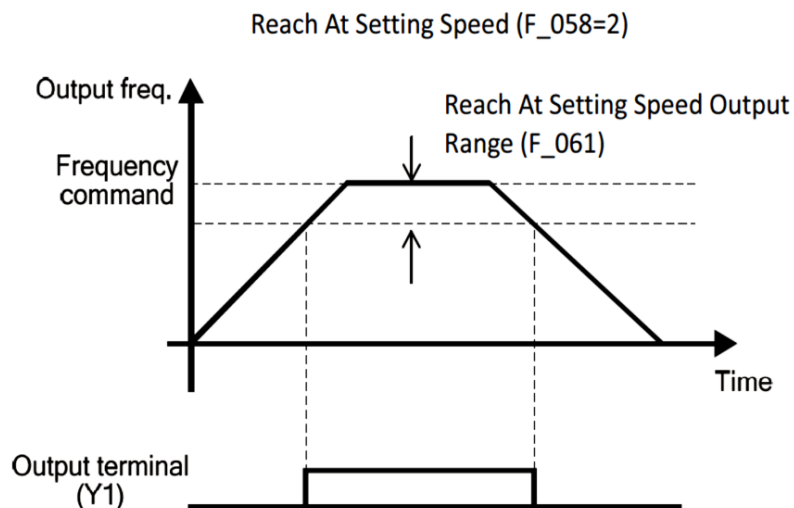
#### General Operation for outputs

'+' represents positive logic (normal open)

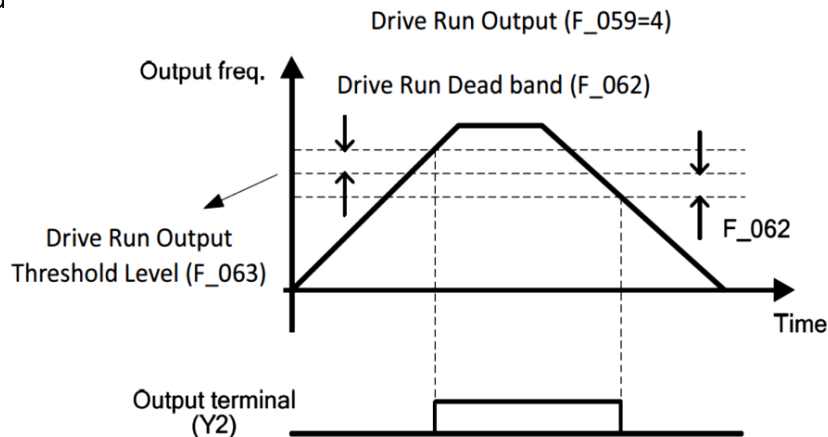
'-' represents negative logic (normal close)

Output terminal **Y1**, **Y2**, **Ta1**, **Ta2**, and **Tb1** can be set as one of below functions:

- 0** Disable (no function operated at terminals)
- ±1** Motor power "on"  
Detect at drive start.
- ±2** Reached "At Commanded speed"



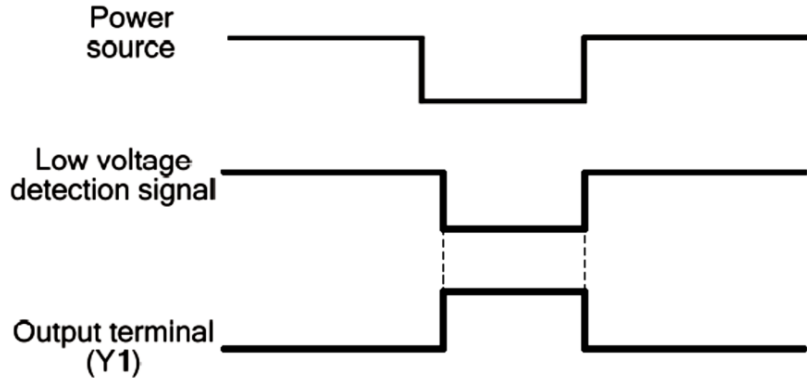
- ±3** Zero speed  
Detect at drive zero speed and no detect during the DC braking.
- ±4** Drive run output



## Section D Parameter Description

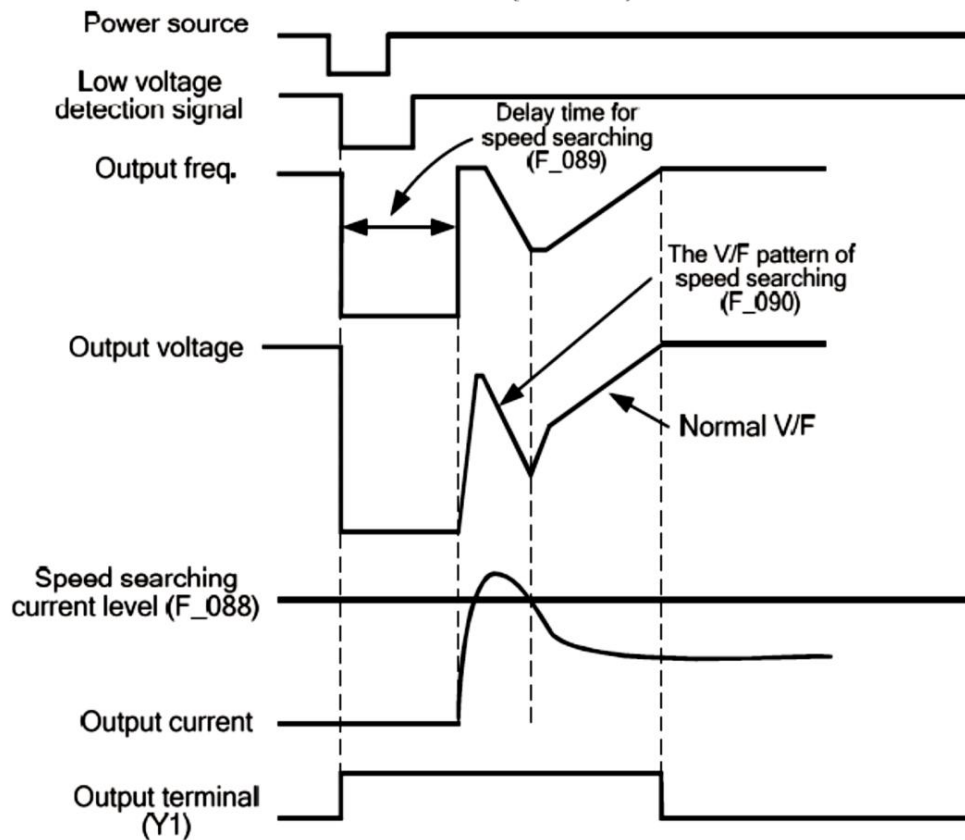
- ±5 Overload alarm
- ±6 Overload detection – Drive will lower the speed (frequency) to try and reduce load to prevent tripping of the drive.
- ±7 Low voltage detection

Low voltage detection (F\_058=7)



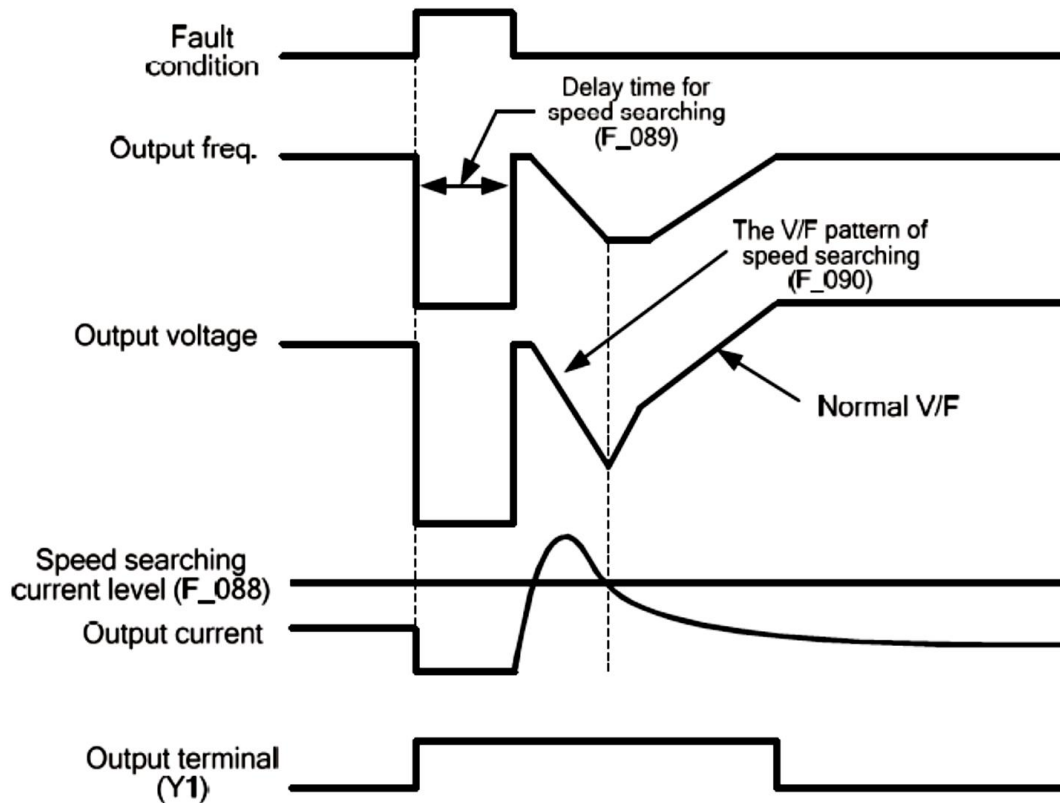
- ±8 Braking detection  
Detect at drive P, N voltage that is greater than dynamic brake voltage.
- ±9 Restart after the instantaneous power failure detection  
Enable when F\_078 set value is 1.

Restart after the instantaneous power failure detection (F\_058=9)



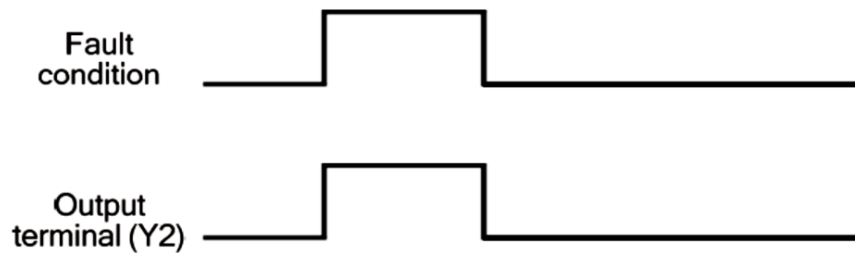
## Section D Parameter Description

### ±10 Restart after fault condition detection



### ±11 Fault detection

Drive Fault (F\_059=11)



F\_061 "At" Commanded Dead Band (range 0.0 ~10.0Hz)  
F\_062 Drive Run Output Threshold Level (range 0.0 ~10.0Hz)  
F\_063 Drive Run Dead Band (range 0.0~400.0Hz)

### D-10 ModBus Communication Setup

#### F\_110 Communication address

Select a unique address (1~254) for the drive. This is address become the “name” to the host for the drive.

Address Range: 0~254 (0: Communication disable)

**Note: The address of host and drive must be the same.**

#### F\_111 Communication transmission speed (Baud rate)

Set the Baud rate (0~3) of the drive for communication between drive and external control device using RS-485 communication. **The Baud rate of the drive must be the same setting rates as the Baud rate of the Host (HMI or PLC).**

0 : 4800bps

1 : 9600bps

2 : 19200bps

3 : 38400bps

#### F\_112 Communication protocol

**Default value : 1**

The Host (HMI or PLC) will have a protocol that it transmits its instructions. Check the manual or setting of the host device for the protocol and match the drives protocol.

0 : 8,N,2 for RTU → 1 start bit, 8 data bits, 2 stop bits

1 : 8,E,1 for RTU → 1 start bit, 8 data bits, 1 even, 1 stop bits

2 : 8,O,1 for RTU → 1 start bit, 8 data bits, 1 odd, 1 stop bits

#### F\_113 Communication “time out” detection

If the drive losses communication in excess of the “time out” parameter the drive will fault. A communication interruption between the drive and host device in excess of the time setting, of the drive will display an error message (see the section F-12 for “Cot” message). The drive will operate after the lost of communication based on the setting of parameter F\_114.

**Setting range:**

0.0 : Communication overtime detection disabled

0.1~100.0 : Setting the detecting time to detect the linking status between drive and host device.

Note: To prevent the communication link between drive and host device from any possible failures during the communication link, communication overtime detection is to ensure the communication between drive and host device is linking functionally to prevent any fault operations caused by this communication interruption.

#### F\_114 Communication error processing

If the Host and drive's communication is interrupted longer than the setting of F-113 the drive will fault and display a message. The options for the drives will be:

**0 : Warning – Continue running**

(Display “Cot” on the keypad of drive and the motor continue running)

**1 : Warning – Ramp to stop**

(Display “Cot” on the keypad of drive and the motor runs at “ramp to stop”)

**2 : Warning – Coast to stop**

(Display “Cot” on the keypad of drive and the motor runs at “coast to stop”)

※Need to restart the drive after the drive stops

※Warning message will be automatically terminated when the communication of the drive and the host device is recovered.

**Warning:** Consider the safety of personnel and machinery when selecting this parameter for when operating without communications to the host.



## Section D Parameter Description

### F\_115 Multi-function input control selection

- 0 : The drive is controlled by the keypad or input devices  
The host device is monitoring the drive status but not controlling the drive
- 1 : Enables Modbus communication

## D-11 Miscellaneous

### F\_091 Fault Records (view only)

Displaying five fault records, entry data first display is the latest fault record, press  and  key can be select other fault records.

### F\_092 Parameter Locking

- 0: Parameters are changeable, Max. freq. cannot exceed 120.0 Hz
- 1: Parameters are locked, Max. freq. cannot exceed 120.0 Hz
- 2: Parameters are changeable, Max. freq. can exceed 120.0 Hz
- 3: Parameters are locked, Max. freq. can exceed 120.0 Hz

### F\_133 Current Limit Level


**X3** and **COM** disconnected, the current limit disabled. The current limit level F\_133 monitoring level shall be identical with F\_071 (range 30~200).

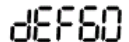
### F\_134 Default Setting

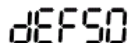
Drive general parameters are to reset all user settings back to the original factory setting as well as to store and resume all user settings (the last setting parameter).


The parameter setting functions of F\_134 are illustrated as follows:


 : Reserved


 : Clear fault records

 : Restore the factory settings of 60Hz

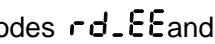
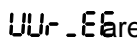
 : Restore the factory settings of 50Hz

 : Save settings – Parameters have been saved to keypad.

 : Restore previous settings

 : Upload parameters to the keypad

 : Write the parameter from the keypad to the drive.

**Note:** The codes  and  are copy function to be used for the case of several drive with the same setting.

### D-12 Advanced

#### F\_030 Limitation of the output voltage.

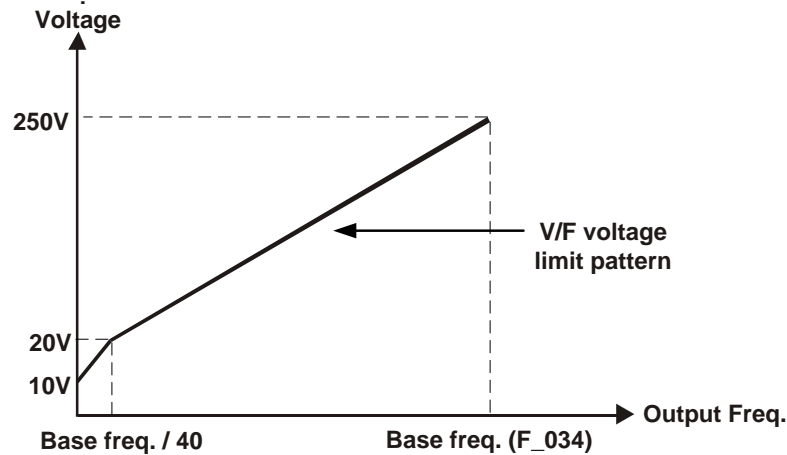
a. F\_030=0

V/F curve output voltage: No limit

b. F\_030=1

V/F curve output voltage has the limit: 200V series with 250.0V; 400V series with 500.0V

As the following figure :



#### F\_036 V/F frequency 1 (range 0.0~399.9Hz)

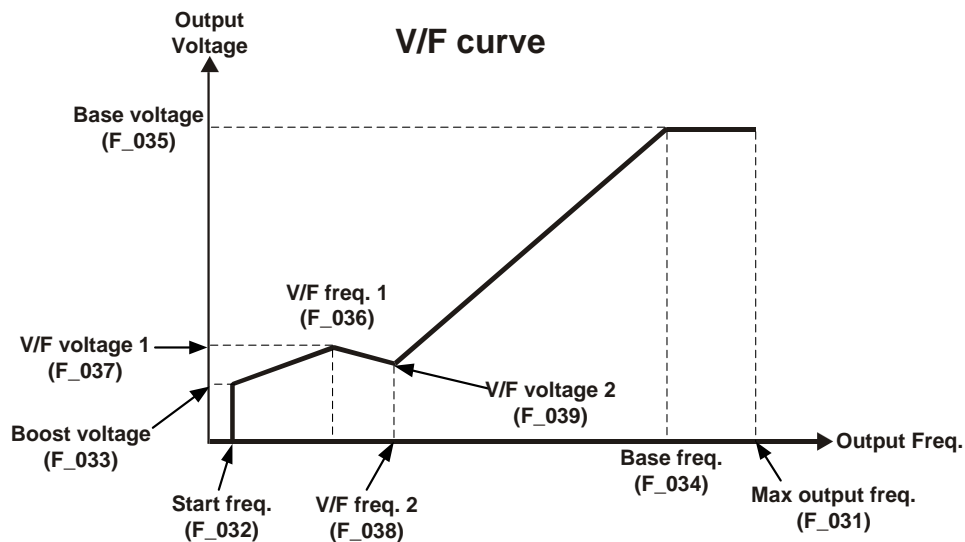
#### F\_037 V/F voltage 1

(200V series with the range 0.0~255.0V; 400V series with the range 0.0~510.0V)

#### F\_038 V/F frequency 2 (range 0.0~399.9Hz)

#### F\_039 V/F voltage 2

(200V series with the range 0.0~255.0V; 400V series with the range 0.0~510.0V) F\_031 ~ F\_039 shows the each parameter of the V/F curve with the interrelationship as follows :



Note: The interrelationships are as follows :

- Base frequency > V/F frequency 2 > V/F frequency 1 > start frequency
- When V/F frequency 2 < V/F frequency 1, the V/F frequency (voltage) 2 have no effect
- When V/F frequency 1 < start frequency, the V/F frequency (voltage) 1 and 2 have no effect
- No limitation between F\_033, F\_035, F\_037, F\_039

## Section D Parameter Description

### F\_064 Automatic boost voltage range (0.0~25.5)

- Mainly function used for dynamic voltage compensation avoids any insufficient voltage at heavy load.
- The adjustment method is to minimize the whole current consumption (maximum power factor).

### F\_065 Overload detection setting

- 0: No overload detection  
1: Overload detection

### F\_066 Overload detection status

- 0: Detect during the constant speed only  
1: Detect during the drive running

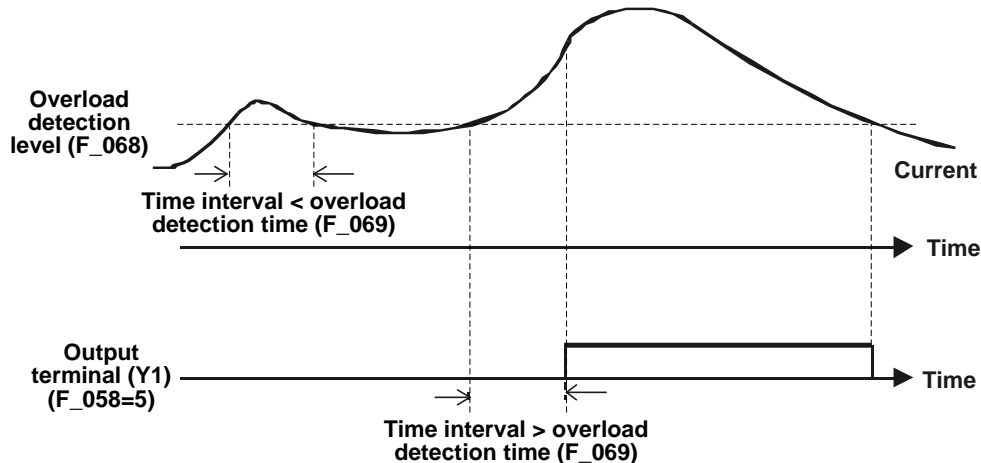
### F\_067 Output setting of the overload

- 0: Drive is still running when the overload is detected  
1: Drive is tripped when the overload is detected

### F\_068 Overload detection level (30~200% of drive rated current)

### F\_069 Overload detection time (0.1~10.0 seconds)

- Overload detection is as shown in a figure below:



- Detect the continuous overload exceeding the overload detection time, and the keypad displayed "OL".
- Detect during the drive running, including at acceleration, deceleration or constant speed.
- The purpose of overload detection is to prevent the system damages. The detection level and time can be set by user requirements.

### F\_070 Stall prevention level at the acceleration (30~200% of drive rated current)

### F\_071 Stall prevention level at the constant speed (30~200% of drive rated current)

- When the drive is P type, the setting range will be 30~160% of drive rated current.  
When the setting value is 160, the stall prevention is disabled.

### F\_072 Acceleration time for stall prevention at the constant speed (0.1~3200.0 seconds)

### F\_073 Deceleration time for stall prevention at the constant speed (0.1~3200.0 seconds)

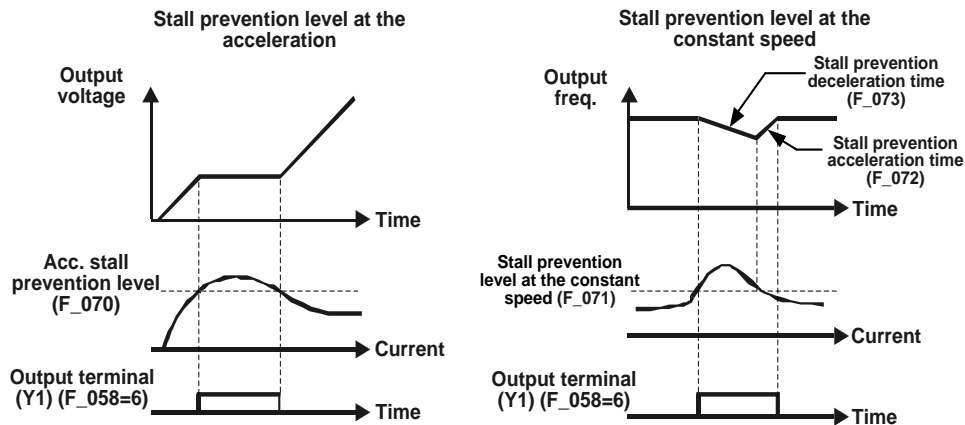
### F\_074 Deceleration stall prevention selection

- 0: Deceleration stall prevention: Disable  
1: Deceleration stall prevention: Enable



## Section D Parameter Description

a. The description is as shown in a figure below:



- The function of the stall prevention during the deceleration is to maintain a constant speed when the deceleration is stalling.
- When connecting a dynamic brake unit, F\_074 function can be disabled according to the actual requirement.
- If the drive DC bus voltage is higher than the dynamic brake voltage level when at drive stops, the keypad (WWE-207KP) will display “db”, pressing the RUN key can't start the drive. If the DC bus voltage is less than the dynamic brake voltage level, the drive will be automatically recovered and displaying will be back to the main display.

### F\_078 Operation selection at power failure and instantaneous power failure

#### **Drive restarted selection after instantaneous power failure/flying start.**

- 0: Drive can't be restarted
- 1: Drive can be restarted

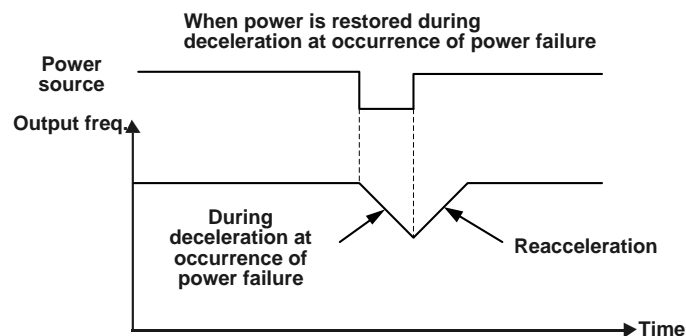
(Refer to the multi-function output setting for the restart after instantaneous power failure detection)

※Drive cannot be restarted simultaneously when the generator instantaneous power failure/flying start, must be waited to restart after the generator flying start the power.

#### **Drive status after power failure.**

- 2: Ramp to stop
- 3: When power restored during the ramp to stop interval, the drive acceleration again.

(Refer to the function F\_079, F\_103 ~ F\_106 power failure related setting )



### F\_079 The voltage level setting at the power failure

Set the voltage of power source for ramp to stop.

(200V series drive with the voltage range of 150.0~192.0V and 400 series drive with the voltage range of 300.0~384.0V)

### F\_080 Number of fault restart (0~16 fault)

### F\_088 Speed searching current level (range 0~200% of drive rated current)

### F\_089 Delay time for speed searching (0.1~5.0 seconds)

## Section D Parameter Description

### F\_090 The V/F pattern of speed searching (0~100%V/F voltage output)

- The speed searching function is mainly used for the speed search for the restart after instantaneous power failure/flying start, the fault restart, or the speed searching command is given by the input terminal.
- Refer to speed search for digital inputs (D-8).

### F\_093 Automatic voltage regulation (AVR)

- 0: Disable  
1: Enable

※When the dynamic braking or braking resistor is installed, AVR (F\_093) should be set as "0".

### F\_094 Drive overload (OL1)

- 0: Disable  
1: Thermal protection  
2: Current limit overload protection  
3: Both protection

※WWEVFD6 series drive overload capability 150% for 1 min.

### F\_095 Power source voltage

The value of setting according to the actual applied input voltage (200V series setting range is 190.0~240.0V, and 400V series setting range is 340.0~480.0V). The setting must be according to the actual power voltage due to the influence of the LE voltage level and the V/F output.

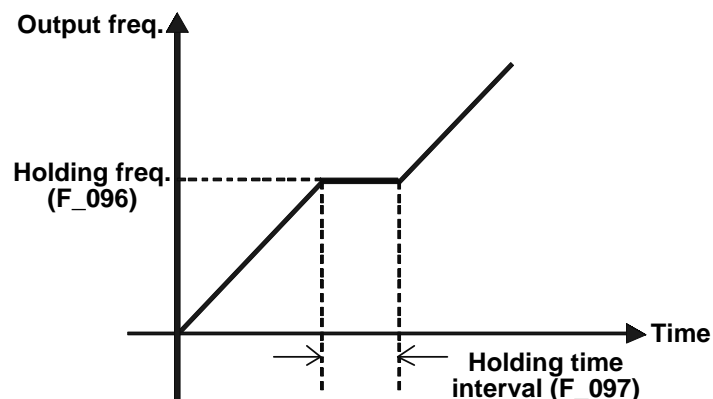
※Low-voltage (LE) detection:

- When the drive first power on, the voltage detected higher than 90% of F\_095 setting value, the drive is standby to works.
- Low voltage (LE) is detected during the operation, after the power restore to the normal, the program will perform 1 second ripple voltage detection and LE will disappear until voltage is stable. Then, the drive can normally output.
- The LE detect level is 67% of F\_095 setting value.

### F\_096 Holding frequency (0.0~400.0Hz)

### F\_097 Holding time interval (0.0~25.5 seconds)

※The mainly purpose of holding is to avoid the motor slip due to the rotational speed of a motor during acceleration.



### F\_098 Grounding fault protection (GF)

- 0: Disable  
1: Enable

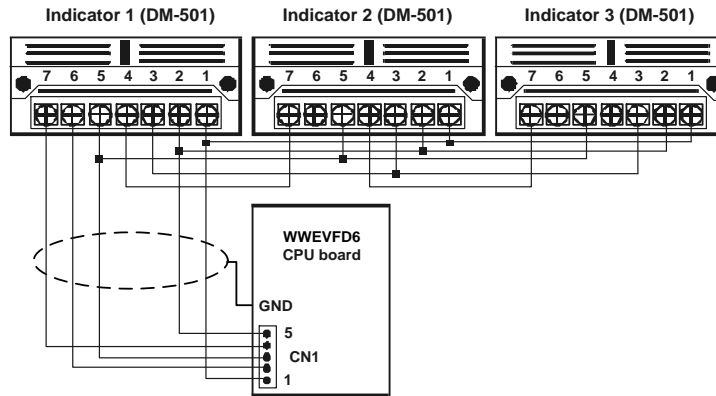
## Section D Parameter Description

### F\_099 External indicator 1 (0~8)

### F\_100 External indicator 2 (0~8)

### F\_101 External indicator 3 (0~8)

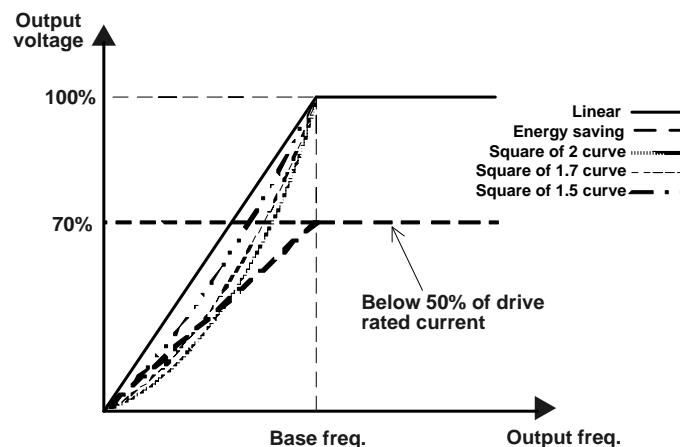
- F\_099~ F\_101 can be set according to the setting method for F\_006.
- Please use twisted-pair shield wiring and shielding connected to the GND side of drive CPU board.
- The wiring diagram of the external indicator s is as follows:



- The connector (CN1) position of external indicators, please refer to section A-4 Control Board Layout

### F\_102 V/F curve selection

- 0: Linear
- 1: Energy saving mode (auto-adjust V/F according to the loads)
- 2: Square of 2 curve
- 3: Square of 1.7 curve
- 4: Square of 1.5 curve



- ※ When using a fan, pump or light load, this function can be employed to achieve the purpose of energy saving. The drive output current is below 50% of rated current when F\_102 setting value is 1, energy saving is activated.

### F\_103 Subtracted frequency at deceleration start (0.0~20.0Hz)

When the power failure occur, Frequency = Output freq. – Subtracted Freq.

### F\_104 Power failure deceleration time 1 (0.0~3200.0 seconds)

### F\_105 Power failure deceleration time 2 (0.0~3200.0 seconds)

### F\_106 Power failure deceleration time switchover frequency (0.0~400.0Hz)

Set the frequency at which the deceleration slope is switched from the F\_104 setting to the F\_105 setting.

## Section D Parameter Description

### F\_108 Digital input de-bounce adjustment

- When input signal is less than the setting time, software will reject the input.
- Multi-function terminals X1~X6, FWD and REV digital de-bounce.

### F\_116 Current limit protection setting

Setting the active time of the current limit protection to trip drive (OL2) to protect Drive

### F\_118 Select UP/DOWN memory

- Erase the UP/DOWN frequency setting when the power off: The power off will erase the frequency settings as 0.00Hz.
- Store the UP/DOWN frequency setting when the power off: The frequency setting is stored by F\_121 at the power off, and the frequency setting is resumed as the stored frequency setting after the power interruption.

### F\_119 UP/DOWN frequency resolution

Select the UP/DOWN frequency setting resolution.

Setting value	Unit	Frequency setting resolution
0	0.01Hz	0.01Hz
1~8	×0.05Hz	Freq. setting resolution = Setting value × Unit
9	0.05Hz	0.05Hz
10~250	×0.1Hz	Freq. setting resolution = Setting value × Unit

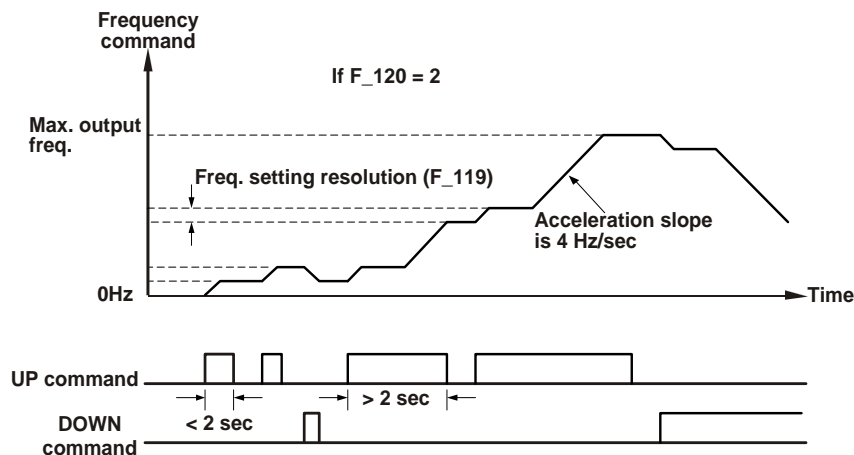
### F\_120 UP/DOWN trigger mode

- The terminal trigger response time (unit: second).

When UP/DOWN terminal ON exceeds the setting time, frequency command accelerate (decelerate) to maximum (minimum) output frequency or to the UP/DOWN terminal OFF.

The acceleration (deceleration) slope is 4 Hz per sec.

Illustrated as follows:



- Edge trigger :

The trigger mode uses the input signal edge as the operation trigger without being controlled by the trigger response time. The signal responding time is 30ms.

### F\_121 UP/DOWN frequency adjustment

The frequency setting is adjusted directly by the Keypad as the frequency setting.

UP/DOWN command can modify the frequency setting and the setting is saved to F\_121 after 5 seconds.

### F\_122 Secondary frequency command selection

- Frequency setting by analog terminal
- Frequency setting by keypad
- Frequency setting by UP/DOWN terminal

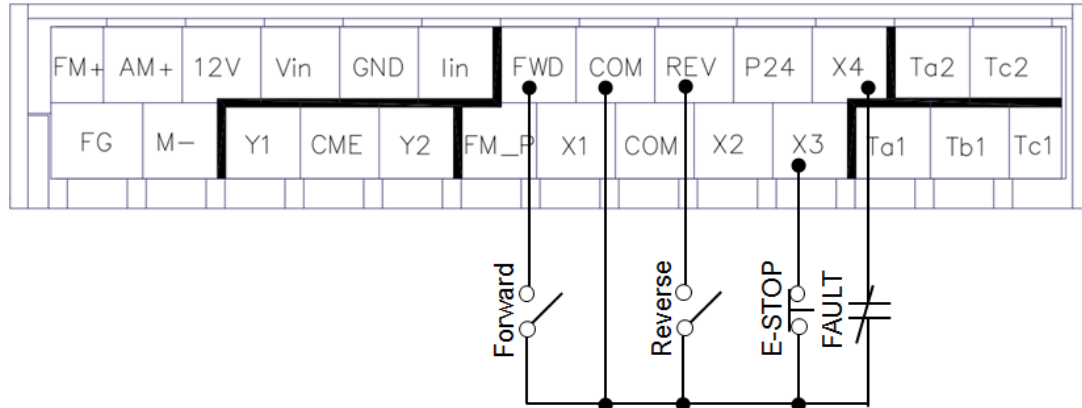
## Section E Terminal Wiring Connection for Operation

This Section contains common control modes. Each section includes wiring and programming steps.

### E-1 Keypad Speed Control – with Forward and Reverse

The keypad control and optional external control wiring - the “FWD” and “REV” terminals can be used to determine motor direction

**Keypad Control Wire Connection Diagram**



**Terminal and Function Setup Table**

Function	Value	Drive Terminal	Descriptions
F_001	2	FWD	<b>START</b> : Press “RUN” with the <b>Forward</b> contact Closed and the <b>Reverse</b> Open. <b>STOP</b> : “Forward” and “Reverse” contacts are Open, the motor Stops.
		REV	<b>START</b> : Press “RUN” with the <b>Reverse</b> contact Closed and the <b>Forward</b> Open <b>STOP</b> : “Reverse” and “Forward” are open motor Stops
F_002	1	Vin	Speed input by the keypad
F_054 (Optional)	-9	X3	E-Stop contact is “Opened”, the motor coasts to stop and the drive displays “Fr”
F_055 (Optional)	-7	X4	If the External Relay Opens, the drive trips to “thr” and motor stops. The contact must be reset and the drive must be reset.

**Note:**

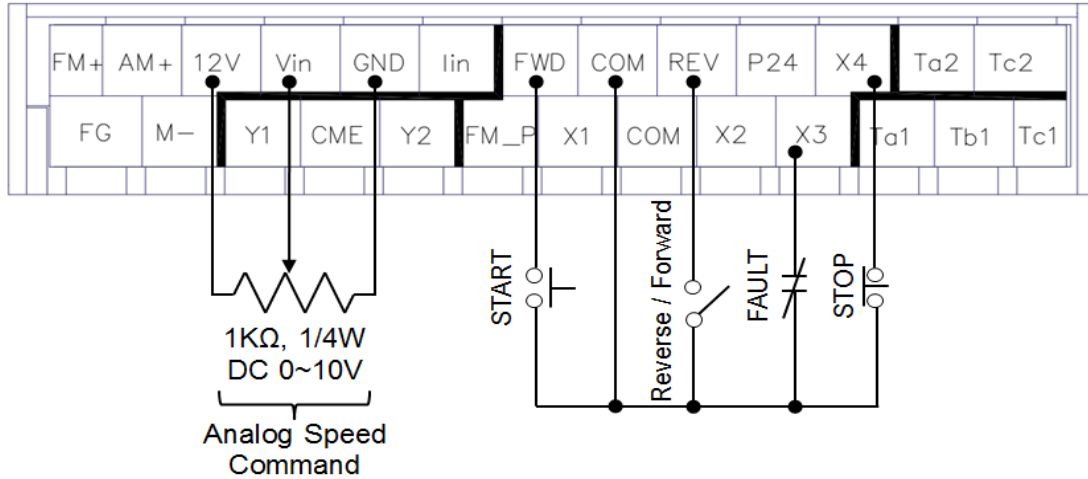
- If both FWD and REV terminals are set at the same time, the motor stops and the drive displays “dtF” (**direction command error**). If both FWD and REV terminals are open at the same time, the motor stops and the drive displays “-----” (**no direction command input**).
- To Stop the motor, use the keypad “STOP/RESET” button or by opening “Forward” or “Reverse” inputs. See Section B on basic programming information. See Section C – Parameter Table for Parameter Setup and Section D – Parameter Descriptions for more options.

## Section E Terminal Wiring Connection for Operation

### E-2 3-Wire Start/Stop Control Circuit (Standard Run)

The 3-wire Start/Stop control uses the “FWD” input (a momentary N.O. contact) as the “START” input. The “STOP” command is a N.C momentary contact. The speed is set by a pot in this example. Options: Jog input; E Stop (should be NC); and FWD/REV directional input.

#### 3-Wire Start/Stop Control Wire Connection Diagram



#### Terminal and Function Setup Table

Function	Value	Drive Terminal	Descriptions
F_001	1	FWD	<b>START</b> : Press “START” push-button with the “Forward” / “Reverse” contact “Open” <b>STOP</b> : Press “STOP” push-button
		REV	<b>START</b> : Press “START” push-button with the “Forward” / “Reverse” contact “Closed” <b>STOP</b> : Press “STOP” push-button to open the circuit and motor stops
F_002	0	Vin	Set speed input by a POT via Vin
F_017	6		<b>Default</b> – Jog speed = 6Hz. Jog speed can be changed if needed
F_031	60		<b>Default</b> – Max output frequency = 60Hz for a POT input
F_054 (Optional)	-7	X3	Set Fault Input(Overload Relay)
F_055	-17	X4	Set STOP command input from terminal X4
F_124	1	Vin	<b>Default</b> – Vin input as speed command

#### Note:

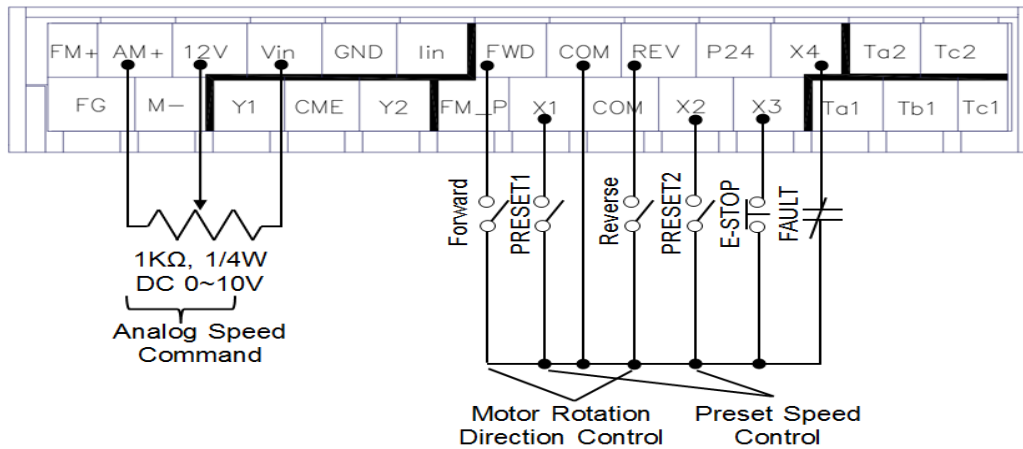
1. If the Jog is used, it will over ride the Pot input as long as the jog is “set”.
2. For speed input from the keypad – Set F\_002 to “1”.
3. See Section B on basic programming information. See Section C – Parameter Table for Parameter Setup and Section D – Parameter Descriptions for more options.

## Section E Terminal Wiring Connection for Operation

### E-3 2-Wire Circuit for 3-Preset and Analog Speed Control

This circuit setup allows a user to select 3 preset speeds with 2 wire inputs. Optional directional input and speed control from a speed Pot.

**2-Wire Circuit for 3-Preset and Analog Speed Wire Connection Diagram**



**2-Wire Circuit for 3-Preset and Analog Speed Function Setup Preset Speed Setting Table**

X2	X1	Speed Command	Speed	Acc	Dec
Open	Open	Primary Speed	F_009	F_019	F_020
Open	Closed	Preset Speed 1	F_010	F_021	F_022
Closed	Open	Preset Speed 2	F_011	F_023	F_024
Closed	Closed	Preset Speed 3	F_012	F_025	F_026

**Note:** For more preset speed parameter setup and explanation, please see Section C-2 (Preset Speeds) and C-3 (Acceleration/Deceleration)

**Preset Speed Input and Function Setup Table**

Function	Value	Drive Terminal	Descriptions
F_001	2	FWD	<b>START</b> : Press “RUN” with the <b>Forward</b> contact Closed and the <b>Reverse</b> Open <b>STOP</b> : “Forward” and “Reverse” contacts are Open, the motor Stops
		REV	<b>START</b> : Press “RUN” with the <b>Reverse</b> contact Closed and the <b>Forward</b> Open <b>STOP</b> : “Reverse” and “Forward” are open motor Stops
F_002	0		Set speed input by a POT to Vin
F_052	3	X1	<b>Default</b> – Define X1 terminal as Preset-speed level 1
F_053	4	X2	<b>Default</b> – Define X2 terminal as Preset-speed level 2
F_054 (Optional)	-9	X3	Set E-Stop as normal closed set
F_055 (Optional)	-7	X4	Set Fault (Overload Relay) as normal closed set

**Note:**

1. Primary speed is when both X1 and X2 are Open, the motor runs at primary speed as set in parameter F\_009.
2. When Forward and Reverse contacts are “Closed” at the same time, motor stops and drive displays “dtF” (**Direction command error**).
3. When Forward and Reverse contacts are “Open” at the same time, motor stops and drive displays “-----” (**No direction command input**). For all preset speed and accel/decel time settings (preset speed setting table), see Section E-1 and Section C-2 for all settings.
4. Analog speed input will **NOT** be active when the preset speed inputs – **PRESET1** and **PRESET2** are active.
5. See Section B on basic programming information. See Section C – Parameter Table for Parameter Setup and Section D – Parameter Descriptions for more options.



## Section E Terminal Wiring Connection for Operation

### E-4 Running the Drive Using a Remote PLC or HMI (Host)

This setup allows users to connect the external control device such as HMI to control the drive. The following wiring setup is using HMI connected to the drive via the communication port with RS-485 cable with ModBus protocol. Communication Parameters that must be set in Step 1 and 2

**Note:** It is very important to consider how the drive is operate if communication is lost.

There are three general steps for setting up the RS-485 communications via ModBus protocol.

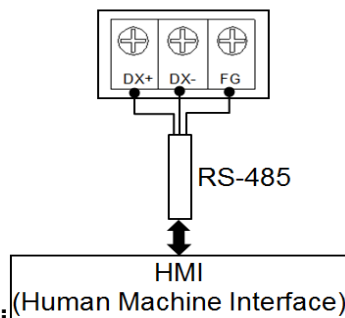
**Step 1** – consult the manual for your HMI or PLC to establish the communication settings so both devices are operating at the speed and with the same protocol. The example below for parameters F\_111 and F\_112 must EXACTLY match the communication protocol to the HMI or PLC.

**Step 2** – Select the way drive is to operate using RS-485. F\_113 and F\_114 establishes what happens if communications is interrupted.

**Warning:** The operation after loss of communications should be considered in regards to operator safety.

**Step 3** – F\_115 set to “1” for control of the drive from the HMI (PLC) communications.

This will program the drive to accept the communication from the Host. The instructions must be programmed in the Host for proper communications.



Drive Function Setting to Establish Communications

Function	Value	Descriptions
F_001	8	Sets the communication control to the drive for start and rotation commands
F_002	5	Sets the speed input from HMI via RS-485 communication
F_110	1	Sets the communication address (Setting value 0 is disable). This “names” the drive for the Host to address this specific drive (choices from 1-254). Each drive must have a unique name
F_111	1	Set the communication transmission speed(Baud rate must match the HMI or PLC)
F_112	1	Sets the communication protocol (set to match the HMI or PLC)
F_113	0.0	Set the communication time out detection Default : 0.0 – No time out detection
F_114	0	Sets the communication error processing <b>Note: this setting determines the operation the drive if communication is lost.</b> 0: Warning - continue operation 1: Warning - ramp to stop 2: Warning - coast to stop
F_115	1	Sets the multi-function input control selection 1: Drive operation will be done by the communication from the HMI (or PLC) -

**Note:**

1. The setting of F\_111 is based on the baud rate of the external control device. Maximum baud rate setting is 38400bps.
2. Recommend to set F113 = 0.0 when doing the initial setup using the communication control. After the communication between the external control device and drive is working properly, F\_113 is recommended to set in order to assure the communication is properly functional.
3. Set the function F\_115 to “1”, when the command is sent from the external device.

### HMI Programming

## Section E Terminal Wiring Connection for Operation

To establish the communication control using HMI as the host controller to drive, user must program HMI by the communication protocol (see the communication manual) to establish the communication control. The following example shows how to program HMI to control drive including start/stop, speed setting, drive function access, and drive data readouts.

**Note:** Each HMI and PLC program differently to communicate via Modbus. The purpose of this section is give an example of how to Start, set Speed, and how to get Data out of the Drive to be used or displayed by the Host via Modbus protocol.

### Example of programming HMI:

- Create “Start” and “Stop” icons to start and stop the drive
- Create “Speed setting” (unit: 0.01Hz) data input
- Create “Output current” data display for drive data readouts

All programming codes to HMI must use hexadecimal value and follow the below Modbus format to create a command from the Host to the drive.

Drive Address No.	Operation Code	Registers		CRC Checksum
Follower number (Set by F_110)	Write/read	Drive register number (See Appendix III)	Data input/output (See Appendix III)	CRC-16 XOR function

**Step 1:** Set the Drive Address number (drive address number) that HMI would like to control if multiple drives are connected. If only one drive, then set drive address number as “1”

**Step 2:** Set the operation code in hexadecimal value to access the drive for “write” or “read” operation

**Step 3:** Set the register number – this includes drive registers number, data inputs, and data outputs

**Step4:** Set HMI with “XOR” function for CRC-16 to automatically generate CRC checksum codes for each instruction.

**Note:** In general, HMI now has automatic CRC checksum generation. User only needs to define XOR function in setting HMI for CRC-checksum and user can just simply program drive address number, operation code, and registers.

### HMI Programming Code (Write Operation to Drive)

HMI Icon/Setting	Data Input Decimal Value	Data Input Format/Unit		Drive Address No. (Hex)	Operation Code (Hex)	Register number (Hex)	Data Input (Hex)
Start	-			01H	06H	2000H	0002H
Stop	-			01H	06H	2000H	0001H
F_009 (Speed Setting)	30.05	0.01	HZ	01H	06H	1009H	0BBDH

**Note:**

- All coding in HMI must convert to hexadecimal values
- Operation code: 06H (write to drive single register)
- For drive functions and parameters, the register number is “10nnH”. nn=F\_000~F\_133 hexadecimal value
- For drive data input, the decimal value must convert into hexadecimal value. Example: speed setting 30.05Hz (decimal value – unit = 0.01Hz) → 30.05 x 100 = 3005 (decimal value) = 0BBD (Hex value)

## Section E Terminal Wiring Connection for Operation

### HMI Programming Code (Read Operation to Drive)

HMI Icon/Setting	Data Readout	Data Input Format/Unit		Drive Address No. (Hex)	Operation Code (Hex)	Register number (Hex)	Data Readout (Hex)
Output Frequency	30.05	0.01	HZ	01H	03H	2103H	0BBDH
Output Current	5.2	0.1	A	01H	03H	2104H	0034H

**Note:**

All data readout from drive is represented as "hexadecimal value". When this hex value is converted to decimal value, the decimal value must be divided by the resolution of display:

**Frequency readout: 0BBDH = 3005 (decimal)**, Frequency display resolution = 0.01Hz. Output frequency display on HMI = 3005 / 100 = 30.05 Hz

**Current readout: 0034H = 52 (decimal)**, Current display resolution = 0.1A. Output current display on HMI = 52 / 10 = 5.2 A

### E-5 Selectable Control from a 3-Wire Start/Stop Circuit Or from a Host

This circuit diagram using 3-wire circuit for drive start/stop control with "selector" switch to interchange the control from the host device and the external control switch. In general, user can use HMI/PLC to control the drive operation, but the control priority can be swapped to the external control switch by "Selector" switch. When the selection is set, the drive is operated by 3-wire start/stop circuit instead of HMI/PLC.

**Step 1** – consult the manual for your HMI or PLC to establish the communication settings so both devices are operating at the speed and with the same protocol. The example below for parameters F\_111 and F\_112 must EXACTLY match the communication protocol to the HMI or PLC.

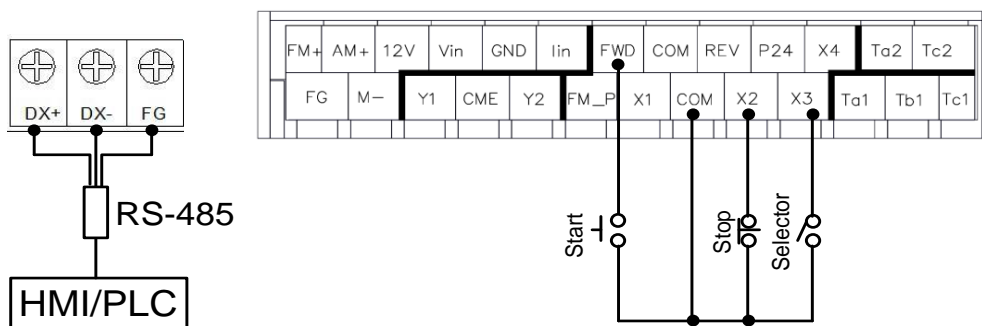
**Step 2** – Select the way drive is to operate using RS-485. F\_113 and F\_114 establishes what happens if communications is interrupted.

**Warning:** The operation of the loss of communications and operations after that loss should be considered in regards to operator safety.

**Step 3** – F\_115 set to "1" for control of the drive from the HMI (PLC) communications.

**Note: For Modbus communication example see E-4, also see Appendix III**

**Note:** It is very important to consider how the drive is operate if communication is lost.



## Section E Terminal Wiring Connection for Operation

### Drive Function setting:

Function	Value	Descriptions
F_001	8	Start up the drive and control the rotation direction of motor by HMI or PLC through RS-485 communication interface
F_002	5	Sets the speed input from HMI via RS-485 communication
F_053	-17	Input terminal X2 is set to “-17” – Stop command with 3-wire start/stop circuit.
F_054	18	Input terminal X3 is set to “18” – Select command input from Host or external control switches/devices which connected to the input terminals.
F_110	1	Set the communication address. Range : 1~254 <b>Note: The address of host and drive must be the same.</b>
F_111	1	Set the transmission speed (Baud rate) <b>Note: The transmission speed (Baud rate) must be same as the baud rate of HMI or PLC. Default</b>
F_112	1	<b>Default</b> – communication protocol = 8E1
F_113	0.5	Set the communication time out detection. If the communication between drive and host over 0.5 secs, drive displays “Cot” – <b>communication time out</b> <b>Default</b> : 0.0 (No communication time out detection) – Communication time out detection is not active.
F_114	1	Set the motor to run at ramp to stop when the communication has time out “Cot” happen
F_115	1	Set the value to “1”, when using communication control.
<b>Note:</b> For HMI programming example, please see section E-4 and Appendix IV for the communication control to drive.		

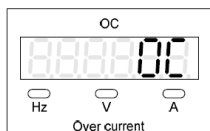
### F-1 The Difference Between Fault and Warning Messages

**Warnings** - Are messages that do not require "Reset" and do not interrupt the drive's operation

**Faults:** Messages indicating a problem with the drive or the attached load requiring the drive's output to be turned "OFF" and will not allow the drive to restart till "Reset" or the "Auto Restart" is programmed.

### F-2 Troubleshooting Fault and Warning Messages

#### 1. Over Current Fault



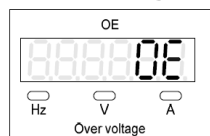
**Keypad Display: OC**

Drive's output current has exceeded 220% of the drive rated current detected by the current sensor. Once the current limit is reached, the drive will shut "off" the output and display the "OC" Fault code. This is a Hardware fault so there are no parameters to adjust.

#### Suggestions:

- Verify the drive is the correct size for the motor.
- Confirm wiring from the drive to the motor.
- Confirm motor leads are connected for the correct operating voltage as shown on the drive nameplate.
- Verify if the drive parameter settings F\_034 (Base Frequency) and F\_035 (Base Voltage) have accidentally been changed.
- If there is a contactor or switch on the output of the drive, confirm that it is not operating after the drive output is turned "ON".

#### 2. Over Voltage Fault



**Keypad Display: OE**

When the DC Bus exceeds the maximum voltage, the drive will fault and display "OE". The DC Bus max voltage:

230VAC drives - 410Vdc

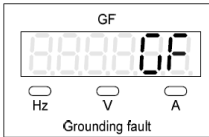
460VAC drives - 820Vdc

This is a hardware fault so there is no parameter to adjust. The DC Bus voltage is from high line voltage or from an overhauling motor creating high voltage on the Bus. To monitor the DC Bus voltage set F\_006 to "4".

#### Suggestions:

- Check the incoming line voltage is when in the drive specification
- If the drive trips on deceleration -Increase the decel time.
- If the fault is occurring during deceleration and the decel time cannot be extended, consider adding additional regen resistor. (see Appendix)

### 3. Ground Fault



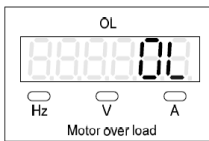
**Keypad Display: GF**

If the three phase output current monitor detects one phase to be unbalanced, the drive output will turn "Off" and the keypad will display "GF". This is a hardware fault so there is no parameter to adjust.

#### **Suggestions:**

- The most common reason for this fault is a motor winding failure due to corona. Generally the drive can be reset and run for a period before another trip again with the "GF" Fault. To determine if it is a winding failure, use a "High Impedance Meter" to measure the motor insulation impedance (good insulation impedance must be between 50MΩ to 100MΩ). If impedance is below 50MΩ, the motor needs to be replaced or rewound. If the motor is replaced, be sure to reduce the chance of the new motor failure by adding a reactor or take other actions to reduce "ring up" or "corona".
- Verify lead wires are not shorted from drive to motor.

### 4. Motor Overload Fault



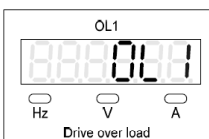
**Keypad Display: OL**

The drive has a built in Overload Relay which is calibrated by F\_048. This should be set for the motor Full Load Amps (FLA). If the drive current is above motor FLA, the drive will trip similar to a mechanical motor overload relay operating curve. The time before tripping is based on the level of current above the F\_048 setting.

#### **Suggestions:**

- Verify the motor FLA at F\_048 is correct for the attached motor.
- Reduce the motor load.
- Confirm the motor leads connected properly
- Confirm parameter settings F\_034 (Base Frequency) and F\_035 (Base Voltage) was not changed by mistake.
- Confirm the motor and drive nameplate Voltage is the same.

### 5. Drive Overload Fault



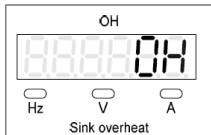
**Keypad Display: OL1**

If the drive current operates at 150% of the drive rating for 1 minute, the drive will fault and display "OL 1". This is a hardware setting so there is no parameter to adjust.

### Suggestions:

- Verify the drive and motor correctly sized.
- Confirm parameter setting F\_034 (Base Frequency) and F\_035 (Base Voltage) was not changed by mistake and as same as motor and drive nameplate voltage and Frequency.
- Confirm motor rotation; check for mechanical obstructions such as belts over tightened or gearboxes not properly aligned.

### 6. Over Heating Fault



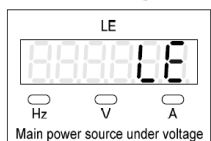
Keypad Display: OH

The drive thermal sensor has exceeded 85°C and has shut “off” the output and displayed “OH” on the keypad. This is a hardware fault so there is no parameter to adjust.

### Suggestions:

- Check the drive’s cooling fans mounted on the heat sink are operating. If not replace the fan(s).
- If the drive is mounted in an enclosure, confirm proper ventilation. Max ambient is 50°C or 122°F.
- Verify other equipment heat is not being exhausting in to the drive.

### 7. Low Voltage Warning



Keypad Display: LE

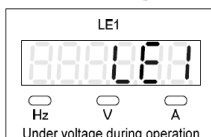
When the drive DC bus voltage drops to 33% and the drive **is not in operation**, the keypad will display the “LE” warning. This display will be seen each time the drive is powered down just before the keypad turns “off”.

**Note: This is not a Fault so reset is NOT required.**

### Suggestions:

- Confirm the input voltage on all three phases
- Confirm proper power input connections
- Confirm the drive voltage rating is correct

### 8. Low Voltage Fault



Keypad Display: LE1

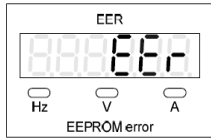
When the drive detects the line voltage **below 67%** during operation, the drive will shut “off” the output and the keypad will display the “LE1” Fault code. This is a hardware fault so there is no parameter to adjust.



### Suggestions:

- Confirm the input voltage on all three phases
- Confirm proper power input connections
- Confirm the drive voltage rating is correct

### 9. EEPROM Fault



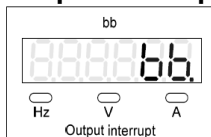
Keypad Display: EEr

The Drive microprocessor can no longer communicate properly with the EEPROM so the drive will shut “off” the output and display fault message of “EEr”.

### Suggestions:

- The normal cause for this fault is board damage. Recycle power to the drive and if the fault is still present - replace the control board or drive.

### 10. Output Interrupt Warning



Keypad Display: bb

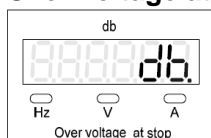
An Input terminal X1 – X6 (parameter F\_052 thru F\_057) has been programmed to “8” or “-8” for “Output Interrupt”. When that input is “set”, the drive will turn “off” with the keypad displaying the “bb” fault. The motor will coast to stop once the input is “set”.

**Note:** this is a “Warning” so drive reset is not required. Once the input has been “released”, the drive output will return to the commanded output. To clear the warning, release the input and the drive will be “re-enabled” to the commanded speed.

### Suggestions:

- This warning is only displayed if programmed. If this warning is not expected, then change parameters F\_052 – F\_057 from “8” or “-8”.
- To aid in troubleshooting, the inputs using F\_006 to “8” set the display to show “input” status. Confirm if the input is working correctly as seen by the drive display (please see F-4 to confirm each input terminal status)
- If the input is operating reverse of expectations, check the parameter F\_052 – F\_057 to see if it set to “8” or “-8”. The “8” setting means the drive will display the Warning on input “closing” and a “-8” means the input will set on input “opening”.

### 11. Over Voltage at Stop – Fault



Keypad Display: db

When the drive detects the DC bus voltage over the programmed voltage level while the drive is NOT in operation, the keypad will display “db”. This is a hardware fault and there is no parameter to adjust.

**Warning:** Disconnect the drive from the line to prevent damage to the drive or to the regen resistor. To monitor the bus voltage, set Parameter F\_006 to “4”.

**Note:** Drive programmed maximum voltage level

## Section F Troubleshooting

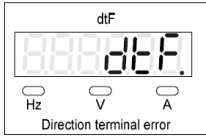
230V series – Max DC bus voltage 385V

460V series – Max DC bus voltage 785V

**Suggestions:** This is a high line voltage issue

- Check the line voltage and three phase line voltage balance.
- Confirm the drive is the correct voltage.

### 12. Direction Error Warning



**Keypad Display: dtF**

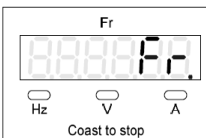
The drive has received a “Forward” and “Reverse” input at the same time. This is a “Warning” so the drive does not need to be “Reset”. The message will disappear once the drive has only one direction input.

**Note:** The drive will not start if it is at “stop” nor will it change directions till the conflict is resolved.

**Suggestions:**

- Verify inputs by changing the display to see input status by changing F\_006 to “8” (see F-4 to confirm input).
- Verify the input terminals are programmed correctly (terminals X1 – X6 and parameter F\_052 thru F\_057)

### 13. Free Run – Warning



**Keypad Display: Fr**

The “Free Run” input has been “set” and the motor will “coast” to stop. This is not a fault so the drive does not need to be reset. To clear the display the Input must be “released”.

**Suggestions:**

- If this operation was not expected, an input terminal X1-X6 was changed using F\_052-F\_057 to “9” or “-9”. To help in troubleshooting, use the keypad display input monitoring mode by setting F\_006 to “8” to check if an input terminal X1~X6 has an input.

### 14. External Fault



**Keypad Display: thr**

This fault is programmed to an input. For the fault to display the input has been “set” causing the drive output to turn “off” and display “thr”. An input X1-X6 has been programmed for “External Fault” by the parameter from F\_052 to F\_057 set to “7” or “-7”. The default Input X5 parameter F\_056 is set to “7”.

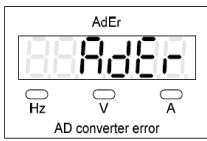
**Note:** Once the input is released then the drive still must be “reset” unless “auto-restart F\_080” has been programmed for all types of faults.

**Suggestions:**

- If this operation was not expected an input terminal X1-X6 was changed using F\_052-F\_057 to “7” or “-7”. To help in troubleshooting use the keypad display input monitoring mode by setting F\_006 to “8”. (see F-4 to confirm input status) If the program input has been “set”, release the input to clear this fault.
- If the input is operating reverse of expectations, check the input that has been programmed for

“External Fault”. If the setting is “7”, the drive will fault when the input is “set”. If the setting is “-7”, the drive will fault if the input is “opened”.

### 15. AD Converter Fault



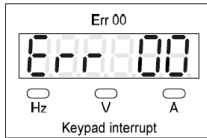
#### Keypad Display: AdEr

The Analog to Digital converter of the CPU has failed. This is a hardware fault. Recycle the power to the drive allowing the drive to completely power down. Upon powering up the AD fault reoccurrences, replace the control board or the drive.

#### Suggestions:

- If the fault reoccurred during drive operation, check for high voltage wiring near input/output terminal wiring. If this is found separate, and recycle power.

### 16. Keypad Interrupt – Warning



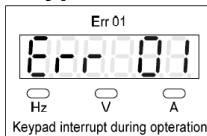
#### Keypad Display: Err 00

The drive has lost communications to the keypad but the drive is not enabled.

#### Suggestions:

- This is normally a wiring issue between the keypad and CPU board. Confirm the cabling and keypad is properly seated. If reinserting the cable does not clear the display replace the cable.

### 17. Keypad Interrupt during Operation Fault



#### Keypad Display: Err 01

The drive has lost communications to the keypad while operating.

**Note: The drive output will continue even under this fault**

#### Suggestions:

- This is normally a wiring issue between the keypad and CPU board. Confirm the cabling and keypad is properly seated. If reinserting the cable does not clear the display replace the cable.

### 18. Write to Drive Fault



#### Keypad Display: Wr\_F

The program download from the keypad to the drive was not successful.

#### Suggestions:

- Verify the software versions are the same for both drives
- If the software versions are the same, confirm the cable connections between the keypad and the drive and try the download again.
- If the cable connection is ok but the program still cannot be downloaded, check the parameter setting F\_134.

See B-5.4 for instructions

### F-3 Additional Issues and Suggestions

**No Display** - Power has been applied but the Display does not illuminate

**Suggestions:**

- Confirm Power to ALL three phases L1, L2 and L3.
- Confirm Power is not attached to the T1, T2, T3. **Warning:** this can cause the damage to the drive so **immediately** remove power and reconnect to L1,L2 and L3.
- Confirm Drive is correct rating for the line voltage.
- Check Keypad interface Cable.
- Check for the following voltages – if they are not present the drive is faulty.
  - Bus Voltage on the DC Power Terminals
  - Control Voltage present
  - Analog Voltage control terminals

**Motor does not Rotate** - There are three areas to check Motor, Control wiring, Programming

**Suggestions for the Motor – making noise but not rotating.**

If the motor is making noise then power is getting to the motor.

- Check the connections in the motor terminal box are correct and for the right voltage.
- Confirm the wiring from the drive to the motor is correct.
- The power leads are correct and there is power going to the load then disconnect the load from the motor and try running the motor. If the drive rotates motor unloaded then load needs to be confirmed.

**Suggestions for the motor – motor not making noise.**

If there is no noise in the motor confirm voltage at the T1, T2, and T3. If there is not power to the motor then the drive is not working or the drive has not been correctly programmed or wired.

**Suggestions for Confirming Wiring-** Use F\_006 “8” (See F-4)

Using the keypad confirm wiring to the inputs.

**Note:** Once the wiring has been confirmed then the programming needs confirmation that it was programmed correctly.

**Suggestions for confirming the Program**

- Reconfirm each Input program setting F\_052 thru F\_057. **Note:** the Parameter setting can be either a “+”, or a “-“
- If used confirm the Analog Input. **Note:** the Default on the drive is for a Current input so if a pot input is connected SW1 must be changed (See A-3).

**Final Suggestions** – if the motor wiring and software seem to be correct and still no motor rotation.

Disconnect all control wiring and reset the drive using F\_134.

- Confirm the drive will operate the motor. If not the motor load is too much, the motor is not connected correctly. Confirm by disconnecting the motor from the load
- If the motor did rotate - then program and input connections are the issue. Reconfirm program and wiring.

**Drive operation does not operate consistently having trips stops for no reason or speed oscillates.**

These are signs of high voltage AC noise on the Low Voltage input to the drive.

**Suggestions:**

- Snub all relay and contactor coils
- Confirm all control wiring cross high voltage at 90° from each other.
- Confirm the input wires are not in the same raceway or conduit as the input or output wires.
- Confirm control wires shield are connected at only one end and to the drive common or ground for that input.

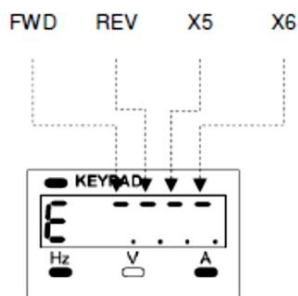
## Section F Troubleshooting

### F- 4 Digital Input and Output Diagnostic Display

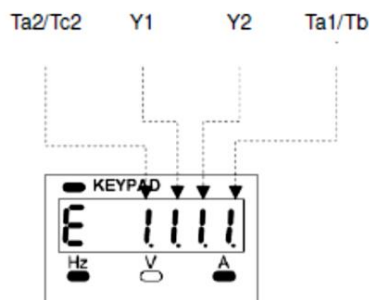
This display will confirm what the drive actually sees for each digital input and show if the digital output has been “set” or is “open”.

Set F\_006 to

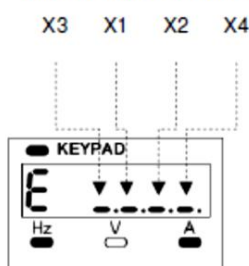
Digital Input and Direction Terminals



Digital Output Terminals



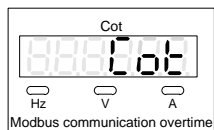
Digital Input Terminals



#### Note:

- Terminal Status Display displays the terminal signal status when a wire properly connects to the terminal.
- If a wire is properly connected to a terminal, the keypad display under Terminal Status Display shows “-” or “1” when the input or output terminal has a signal

### F- 5 Communication



#### Keypad Display: Cot

The communication between the HMI or PLC and the drive did not link or are communicating at different settings.

#### Suggestions for Initial set up issues

#### Link not established

- 1) Confirm wiring to Host (HMI or PLC is correct)
- 2) Confirm F\_115 is set to “1”
- 3) Confirm settings for communication protocol for the drive and Host (HMI or PLC) are identical. Parameters F\_111, and F\_112
- 4) Confirm the setting value of F\_110 is within the range of 1~254

- Increase the setting of F\_113 (communication overtime detection)
- Confirm the wiring of signal transmission line, when the host control multiple drives.

**Note:** the communication protocol is standard ModBus which is initiated by the Host. The programming of the Host (HMI or PLC) to communicate with the drive please consult the manual for the Host.

#### Control(Start/Rotation) command not functioning:

- Confirm the start command of F\_001 is set to “8” or “9”.  
 “8” – Start/Rotation by communication ports  
 “9” – Start by communication ports; rotation by FWD and REV terminal.

## Section F Troubleshooting

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- **Confirm the rotation command of F\_001 is set to “10” or “11”.**
  - “10” – Start by FWD and REV terminal; rotation by communication ports.
  - “11” – Start by Keypad RUN key; rotation by communication ports.

### **Speed input command not functioning:**

- Confirm the setting value of F\_002 is set to “5”.

### **Suggestions for Intermittent Loss of Communication**

RS485 is relatively noise immune with proper grounding of the shielded cable connecting the drive to the Host (HMI or PLC). **Note:** If unshielded wiring has been used between the Drive and Host, running the wiring in the same wire way with higher voltage wiring, or near relay coils or contactors can interrupt communications causing a fault.

It is highly recommended to use shielded cables with a grounding or drain wire between the Host and Drive.

- **Confirm the length of transmission line that cannot exceed 500 Meters or 1500 ft from the host to the last drive.**
- **The length of transmission line cannot exceed 500m for one set.**
- **Terminal resistor**
  - 1) Switch DSW 3 (See section A-4 board layout for DSW3) to “ON” position for the first and last drive, and switch to “1” (OFF) position for others drives, when multiple drives are controlled with RS-485.
  - 2) Default position of DSW3 is “ON” position.

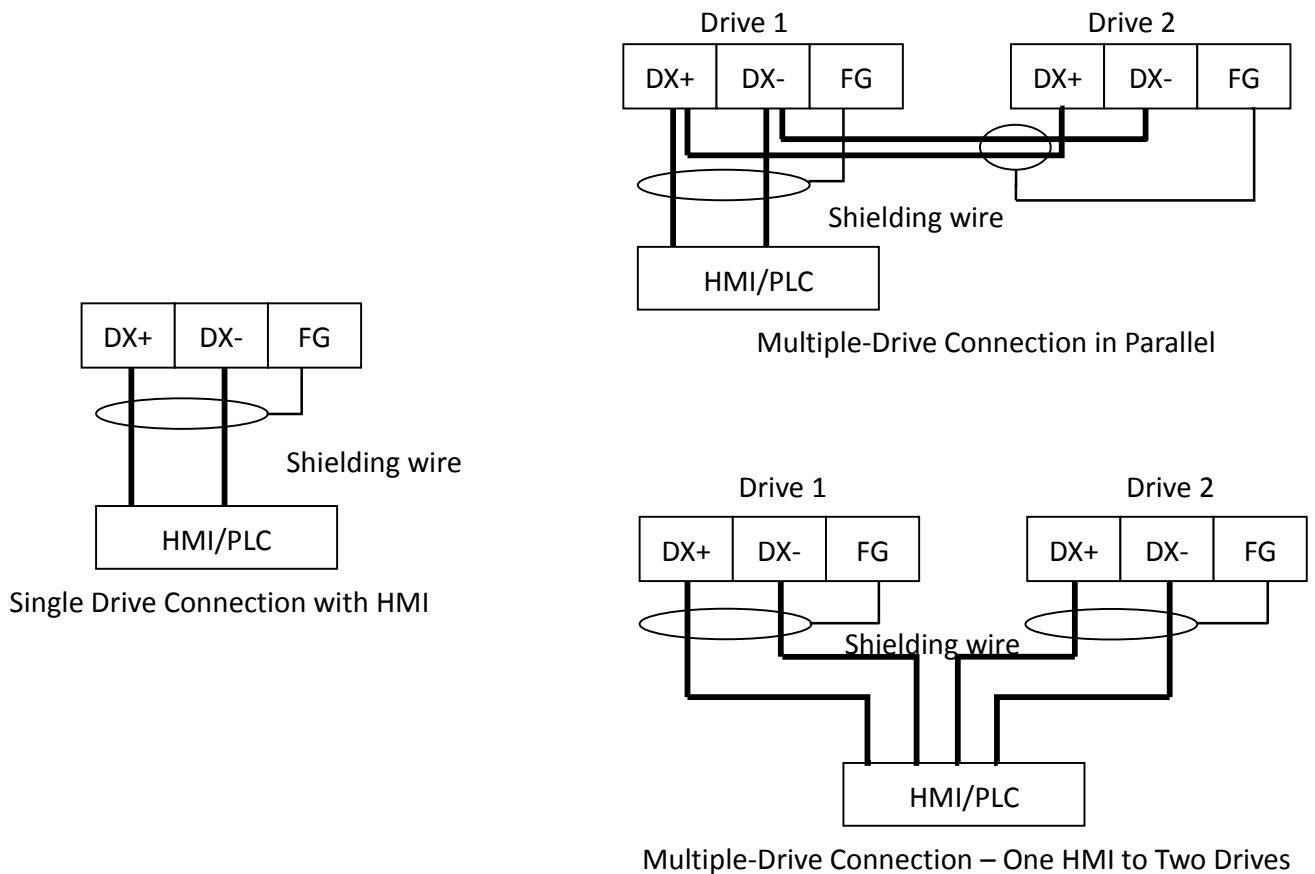
### **Shield Termination Recommendations**

**Note:** It is recommended the cable must use the shield cable with the shielding or ground wire connected to terminal FG of the drive (See section A-4 for board layout).

- a. Communication connection for a single drive:  
Connect the shield ground wire to the drive FG terminal ONLY. Leave the HMI/PLC unconnected.
- b. Communication connection for multiple drives:  
Connect each shielded ground wire to FG terminal. It is important to connect only one end of the shield cables ground wire.

## Section F Troubleshooting

See the below connection diagrams.



### F- 6 Communication Network Troubleshooting

Possible reasons for communication errors:

1. The host is not sending the command to the drive
2. The host is sending the command but not getting back any messages from the drive. That is the motor is operating as commanded but the host has not received the message from the drive.
3. The host is sending the command but not getting back any messages from the drive. Motor is not operating by as commanded and message received by the host.
4. The host receives the invalid returning messages from the drive
5. The host receives the error codes from the drive

If above communication errors occur during the communication control, please apply the following steps to troubleshoot the communication errors.

- (1) Check communication function settings to verify the validity of functions (see section C-10 Modbus Communication Setup and Appendix III-ModBus Communication).
- (2) Check RS-485 cables and shielding to see if cables are proper installed or wired (see F-5 Shield Communication Recommendations).
- (3) Verify the drive communication setting with the troubleshooting steps in F-5 Communication.
- (4) Detach RS485 communication cable from drive.
- (5) Set F\_054=0, short X3 and COM to start the drive communication test. If the communication between the host and drives is not functional or not sending the correct message either from the host to drives or from drives to host, the drive will display "C.E." and please check steps (2) and (3) to verify if the communication lines between devices are not properly installed or wired.



## Section F Troubleshooting

- (6) If above testing finds no error, but the host receives a returned error messages then the host is sending an invalid operation command to the drive. The following table is the error message format returned from the drive.

Address	OP Code	Error Code	CRC Checksum	
			LSB	MSB
01H	1xxxxxxxB	xxH	xxH	xxH

OP code sets MSB (bit7) as 1 for the original command message, but error code gives different values according to different types of errors. The below table is describing types of error code:

Error Code	Error Type	Descriptions
<b>0 0</b>	Serial communication format error	Parity error of serial communication
<b>0 1</b>		Data frame error of serial communication
<b>0 2</b>		Over-bit error of serial communication
<b>0 3</b>	Modbus OP code error	OP code is not in either 03H,06H,08H, or 10H
<b>0 4</b>	Modbus CRC error	CRC checksum error
<b>0 5</b>	Modbus data range error	1. Data length in transmission not matched with the protocol 2. Data range over the register length at "write"
<b>0 6</b>	Modbus register characteristics error	Registers writes into read-only registers
<b>0 7</b>	Modbus register error	No-defined registers

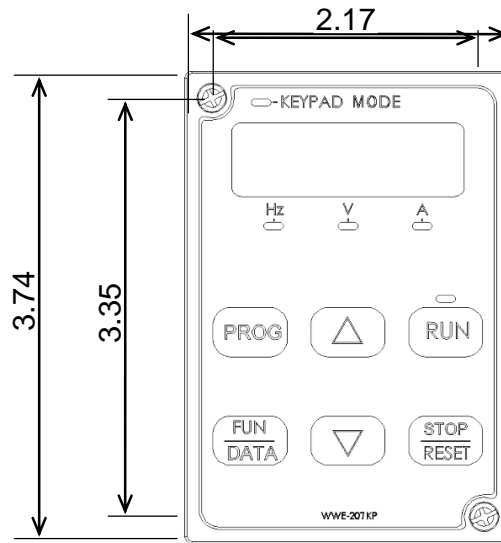
If the host receives above error codes from the drive during the communication control, please identify which error and do the following steps for troubleshooting:

- Error code 00~02:** verify the communication protocol and baud rate between the host and the drive. The drive protocol and baud rate settings must be same as the protocol and baud rate setting – See section F\_111 and F\_112 in C-10 ModBus Communication Setup.
- Error code 03:** verify the OP code in the host device to see if the host gives the correct OP code
- Error code 04:** check the host setting for CRC or check if the programming algorithm for CRC code generation is valid when user writes a program to generate CRC codes in the host.
- Error code 05:** Check if the data length of the host writing to the drive is not matched with ModBus communication protocol (see A3-1 Communication Protocol in Appendix III)
- Error code 06:** Check if the data writing to registers from the host writes to "read-only" registers (see A3-3 Drive Registers and Command Code)
- Error code 07:** Check if the host is not giving the register definition in the programming for write or read operations.

## Appendix I Outline Drawings

### A1-1 Keypad Drawings

#### WWE-207KP Keypad



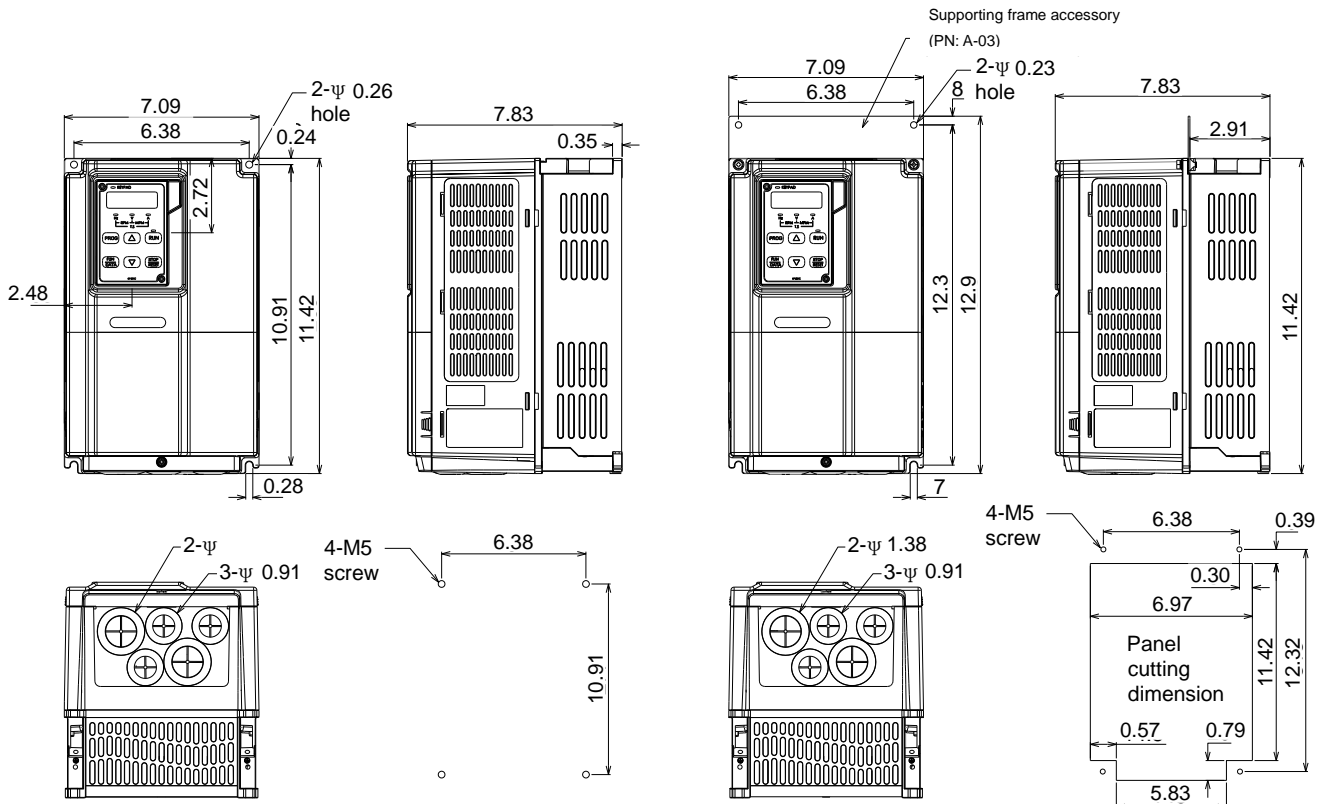
WWE-207KP

### A1-2 Drive Outline Drawing / Mounting Information

230V series: WWEVFD6-7.5-230 ~ WWEVFD6-15-230

460V series: WWEVFD6-7.5-460 ~ WWEVFD6-20-460

(Optional accessory: supporting frame accessory)



Drive Dimension  
(Panel Mounting)

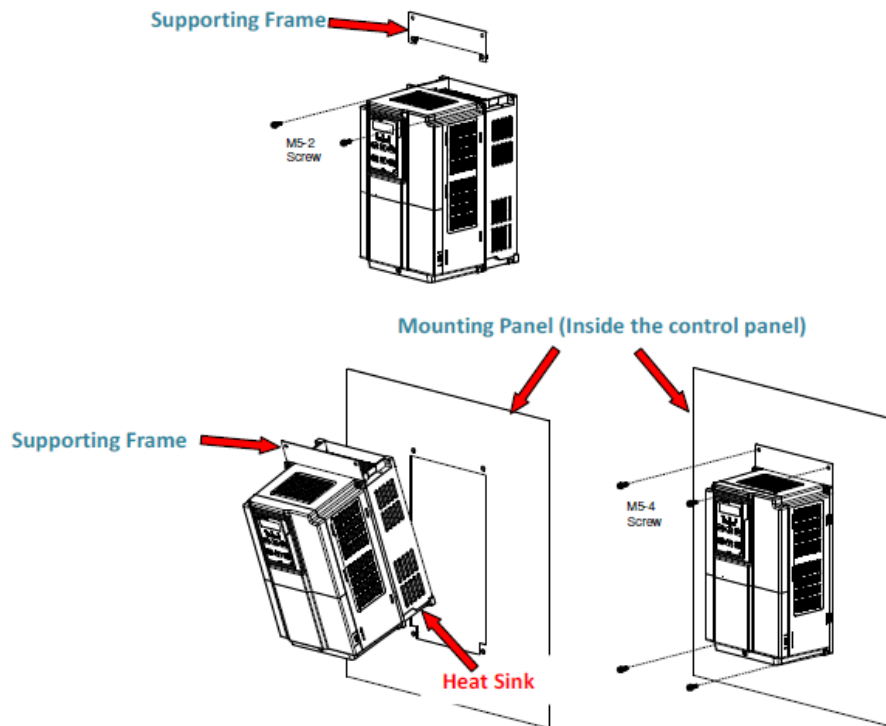
Drive with Supporting Frame Dimension  
(External Heat Sink Mounting)



## Appendix I Outline Drawings

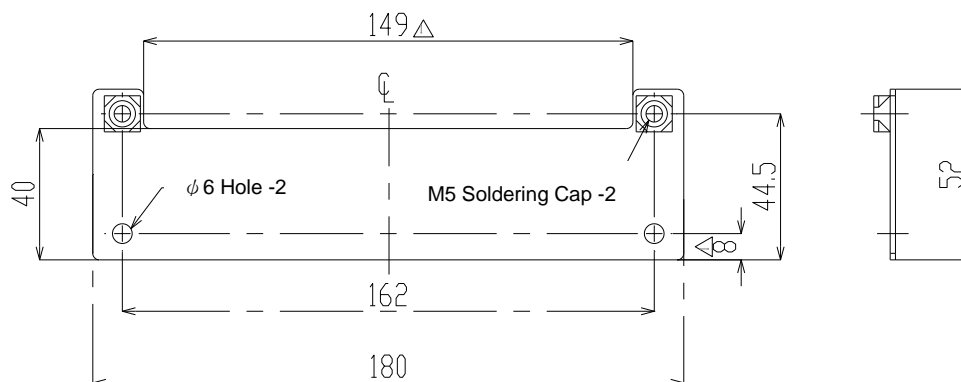
### A1-5 Supporting Frame and Enclosure Installation

Enclosure cut out for installation of the heat sinks externally (See A1-2 for the layout for cutting the panel to mount the heat sink externally). To mount the heat sink externally requires PN: A-03 to hold the drive in place. **Note:** It is important to first screw in the supporting frame (PN: A-03) before placing the drive in the cut in the panel.



#### (Accessory – Supporting Frame)

The dimensions of the supporting frame PN: A-03



## A2-1 Resistor Values for External Brake Resistors

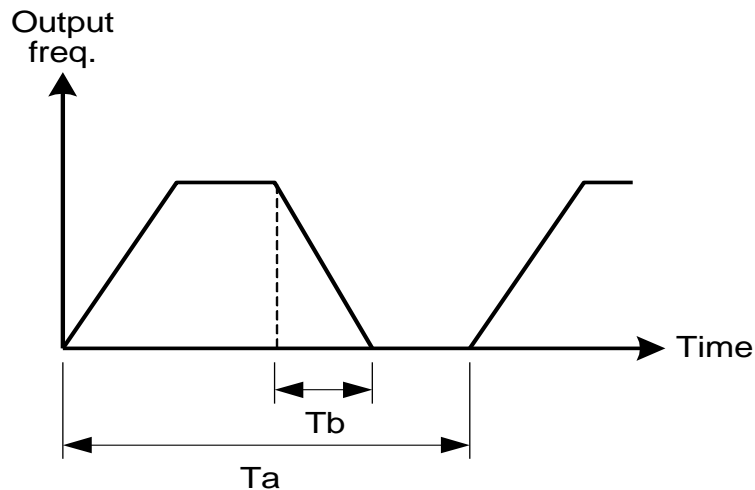
### AC 230V Input

Model Number	Minimum Specification	Standard Brake Resistor	Approx. Braking Torque (10%ED)
WWEVFD6-7.5-230	20Ω	MHL500- 40*2pcs in parallel, total 1000W	140
WWEVFD6-10-230			110
WWEVFD6-15-230	13.3Ω	MHL500- 40*3pcs in parallel, total 1500W	115

### AC 460V Input

Model Number	Minimum Specification	Standard Brake Resistor	Approx. Braking Torque (10%ED)
WWEVFD6-7.5-460	80Ω	MHL500- 40*2pcs in series, total 1000W	125
WWEVFD6-10-460			100
WWEVFD6-15-460	40Ω	MHL500- 40*2pcs in parallel, 2 sets in series, total 4pcs 2000W	150
WWEVFD6-20-460			120

### Calculating Braking Requirements



#### ※Note:

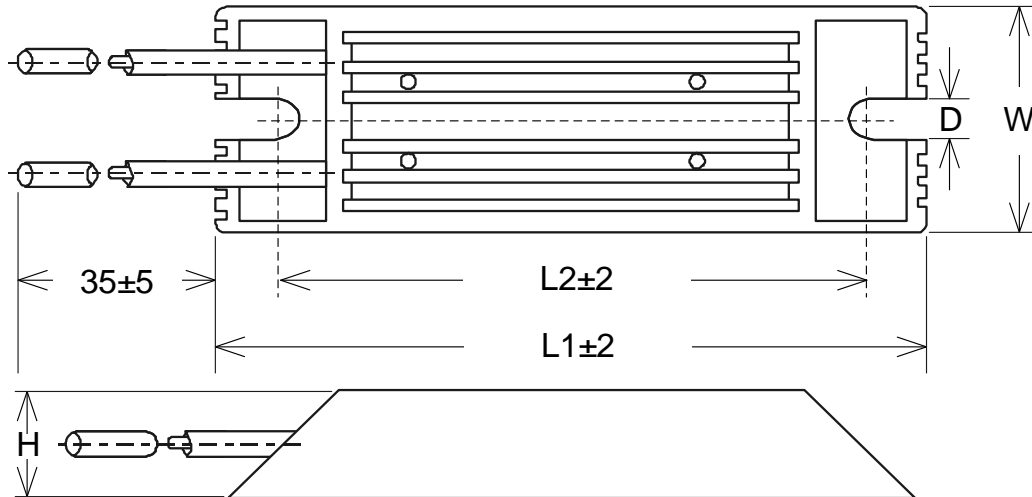
1. %ED (Effective Duty cycle) =  $T_b / T_a \times 100(\%)$  (continuous operation time  $T_b < 15$  sec). The definition is as shown in a figure right.
2. Above watts of table is defined at 10%ED.
3. 230V series drive or DBU braking activation voltage is DC 385V.  
460V series drive or DBU braking activation voltage is DC 785V.

### A2-2 Dynamic Brake and Resistor

- A. Brake transistor can be installed in the following models:  
 Standard build-in : WWEVFD6-7.5-230~WWEVFD6-15-230 and  
 WWEVFD6-7.5-460~WWEVFD6-20-460.

B. Brake resistor outline (Option)

Aluminum case resistor



Model	Specification	Dimensions (mm)					Max. Weight (g)
		L1	L2	W	H	D	
MHL500-40	500W/40Ω	335	320	60	20	5.3	1100

Notes:

1. When install the brake resistor or dynamic brake unit, please set F\_093 (AVR) to "0".
2. When the braking is frequently applied, please increase the resistor wattage and add the cooling fan to prevent the resistor overheating.
3. Please use the heat-resistant wire for the brake resistor wiring.

## Appendix III ModBus Communication

### A3-1 Communication Protocol

Serial data transmission is an asynchronous serial data transmission: 1 byte = 11 bits (3 types of format shown in below figures)

#### A3-1-1 Data Transmission Protocol of Modbus Communication

Data Transmission Protocol	Start Bit	Data Bits	Parity Bits	Stop Bits
8,N,2	1	8	--	2
8,E,1	1	8	1 (Even)	1
8,O,1	1	8	1 (Odd)	1

#### A3-1-2 Operation Code (OP Code) Definition:

OP Code	Definition
03H	Read multi-registers
06H	Write to single register
08H	Drive detection
10H	Write to multi-registers

#### ※03H (Read multi-registers):

Example: Read data from registers 2101H and 2102H of the drive 1

Message Code (Host to Drive)

Address	OP Code	Starting Register		Register Numbers to Readout		CRC Checksum	
		MSB	LSB	MSB	LSB	LSB	MSB
01H	03H	21H	01H	00H	02H	9FH	C4H

This example shows the host to read the drive data from 2 registers of the drive. The host identifies drive 1 by calling the drive address (01H) with the “read” operation command (03H) to read the drive data from the registers (2101H – starting register) to the register (2102H – Register Numbers to Readout defines the numbers of register for data readouts). Please see A3-3 for the drive register information.

Return Code (Drive to Host)

Address	OP Code	Data Byte	2101H(Register) Data		2102H(Register) Data		CRC Checksum	
			MSB	LSB	MSB	LSB	LSB	MSB
01H	03H	04H	55H	00H	17H	70H	D6H	EBH

The host reads registers 2101H and 2102H of drive (01H) (drive status and speed command). After the drive receives the host’s command, the drive returns 4 bytes data (2101H=5500H and 2102H=1770H) to the host. Please see A3-3 for the drive register information.

**Caution:** The host cannot simultaneously broadcast 03H OP code to drives when multiple drives connected or all drives reject host’s OP code.



## Appendix III ModBus Communication

### ※ 06H (Write to single register)

Example: Write a data (1770H) into the drive register (2001H)

Message Code (Host to Drive)

Address	OP Code	Drive Register		Register Data		CRC Checksum	
		MSB	LSB	MSB	LSB	LSB	MSB
01H	06H	20H	01H	17H	70H	DDH	EDH

This example shows the host to write the data (1770H) to the register (2001H) of the drive. The host identifies drive 1 by calling the drive address (01H) with the “write” operation command (06H) to write the data (1770H) into the register (2001H). Please see A3-3 for the drive register information.

Return Code (Drive to Host)

Address	OP Code	Drive Register		Register Data		CRC Checksum	
		MSB	LSB	MSB	LSB	LSB	MSB
01H	06H	20H	01H	17H	70H	DDH	EDH

The host writes data 1770H into the drive register 2001H. After receiving data from the host and writing data into drive’s registers, the drive returns the original receiving message to the host. OP code-06H of the host can synchronously broadcast to all drives but has no return code to the host. Please see A3-3 for the drive register information.

### ※08H (Drive detection): Only use when testing the communication

OP code – 08H is to detect if the drive is correctly receiving the data from the host. The main purpose of using this OP code is to ensure the host data to be correctly sent to the drive.

Example: Verify the data (0000H and AA55H) to be correctly received by the drive.

Message Code (Host to Drive)

Address	OP Code	Data 1		Data 2		CRC Checksum	
		MSB	LSB	MSB	LSB	LSB	MSB
01H	08H	00H	00H	AAH	55H	5EH	A7H

The host sends OP-code (08H) to verify the data 0000H and AA55H to be correctly received by the drive.

Return Code (Drive to Host)

Address	OP Code	Data 1		Data 2		CRC Checksum	
		MSB	LSB	MSB	LSB	LSB	MSB
01H	08H	00H	00H	AAH	55H	5EH	A7H

The drive returns the same message to the host to confirm the data well received from the host. Data 1 must be 0000H but Data 2 can be any values.

**Note:** The host cannot simultaneously broadcast 08H OP code to all drives when multiple drives connected or drives reject drive’s OP codes.

## Appendix III ModBus Communication

### ※ 10H (Write to multi-registers)

When multiple data need to write into the drive from the host, the host can define how many registers and data to be written into the drive.

This example is illustrating 2 data (1011H and 1770H) from the host to be written into 2 drive registers (2000H and 2001H).

#### Message Code (Host to Drive)

Address	OP Code	Starting Register		Register Number to Write		Data Length	Data 1		Data 2		CRC Checksum	
		MSB	LSB	MSB	LSB		MSB	LSB	MSB	LSB	LSB	MSB
01H	10H	20H	00H	00H	02H	04H	10H	11H	17H	70H	3FH	FBH

The host calls the drive 1 by defining the drive address (01H) with the write to multi-registers OP code (10H) to write 2 data (1011H and 1770H) into the drive registers (2000H and 2001H) which are defined by calling starting register (2000H) with “register number to write” (0002H). In this example, if user has 4 data to write to 4 drive registers, the message code can be as follows:

- Starting register: 2000H (still)
- Register number to write: 0004H

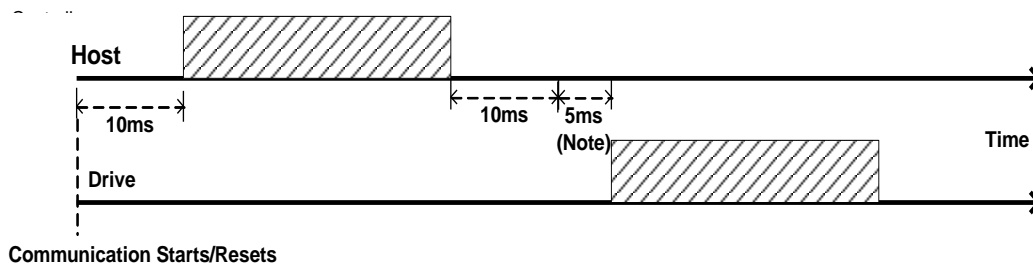
Then, 4 data will be sequentially written into 4 registers starting from 2000H, 2001H, 2002H, to 2003H. Please see A3-3 for the drive register information.

#### Return Code (Drive to Host)

Address	OP Code	Starting Register		Register Numbers to Write		CRC Checksum	
		MSB	LSB	MSB	LSB	LSB	MSB
01H	10H	20H	00H	00H	02H	4AH	3BH

The host writes 2 data (1011H and 1770H) with total data length 4 byte to 2000H and 2001H registers of drive. The drive receives and writes the data to the registers, and then returns the message to the host. The host can synchronously broadcast all drives to write multi-data to multi-registers in order to change the data synchronously. Please see A3-3 for the drive register information.

### A3-2 Processing Time of Communication Transmission



The communication waits for 10ms to start the communication transmission after the drive powers on or the communication function of the drive changes. The drive needs 5ms processing time to return the

## Appendix III ModBus Communication

message to the host after the message are received from the host. If the host only broadcasts to the drive, the host can start sending the message code after 5ms.

**Note:** if the message code is to “Read” or “Write” the parameter, the drive needs 100ms processing time to return the message to the host.

### A3-3 Drive Registers and Command Code

#### A3-3-1 Registers – Write Operation (Only Write, Read Prohibited)

Reg. No.	Name	Description	
2000H	Operation command 1	b0~b1	00: No use
			01: Stop
			02: Start
			03: JOG command
		b2~b3	Reserved
		b4~b5	00: No use
			01: Forward command
			02: Reverse command
			03: Rotation direction change command
		b6~b7	00: Primary acc/dec time
			01: First acc/dec time
			02: Second acc/dec time
			03: Third acc/dec time
		b8~bA	000: Primary speed (communication)
			001: Preset speed 1
			010: Preset speed 2
			011: Preset speed 3
			100: Preset speed 4
			101: Preset speed 5
			110: Preset speed 6
			111: Preset speed 7
		bB	Reserved
		BC~bD	00: No use
			01: bit6~A functions ( <b>see Note 1</b> )
			10: Multi-function inputs controlled by communication
			11: Disable 01 and 10
		bE~bF	Reserved
2001H	Speed/frequency command	Main frequency is set by communication (unit: 0.01Hz)	
2002H	Operation command 2	b0	1: External fault command
		b1	1: Reset command
		b2	1: Jog command
		b3	1: Output interruption command
		b4	1: Coast to stop command
		b5	1: Secondary acc/dec command
		b6	1: Acc/dec prohibition command
		b7	1: Select analog input source
		b8	1: DC braking enable
		b9	1: Secondary frequency selection
		bA~bF	Reserved

## Appendix III ModBus Communication

### A3-3-2 Function Setting Registers – Write/Read Operation (Write/Read Allowed)

Reg. No.	Function	Reg. No.	Function	Reg. No.	Function	Reg. No.	Function
1000H	F_000	1023H	F_036	1046H	F_072	106AH	F_108
1001H	F_001	1024H	F_037	1047H	F_073	106BH	F_109
1002H	F_002	1025H	F_038	1048H	F_074	106CH	F_110
1003H	F_003	1026H	F_039	1049H	F_075	106DH	F_111
1004H	F_004	1027H	F_040	104AH	F_076	106EH	F_112
1005H	F_005	1028H	F_041	104BH	F_077	106FH	F_113
1006H	F_006	1029H	F_042	104CH	F_078	1070H	F_114
1007H	F_007	102AH	F_043	104DH	F_079	1071H	F_115
1008H	F_008	102BH	F_044	104EH	F_080	1072H	F_116
1009H	F_009	102CH	F_045	104FH	F_081	1073H	F_117
100AH	F_010	102DH	F_046	1050H	F_082	1074H	F_118
100BH	F_011	102EH	F_047	1051H	F_083	1075H	F_119
100CH	F_012	102FH	F_048	1052H	F_084	1076H	F_120
100DH	F_013	1030H	F_049	1053H	F_085	1077H	F_121
100EH	F_014	1031H	F_050	1054H	F_086	1078H	F_122
100FH	F_015	1032H	F_051	1055H	F_087	1079H	F_123
1010H	F_016	1033H	F_052	1056H	F_088	107AH	F_124
1011H	F_017	1034H	F_053	1057H	F_089	107BH	F_125
1012H	F_018	1035H	F_054	1058H	F_090	107CH	F_126
1013H	F_019	1036H	F_055	1059H	F_091	107DH	F_127
1014H	F_020	1037H	F_056	105AH	F_092	107EH	F_128
1015H	F_021	1038H	F_057	105BH	F_093	107FH	F_129
1016H	F_022	1039H	F_058	105CH	F_094	1080H	F_130
1017H	F_023	103AH	F_059	105DH	F_095	1081H	F_131
1018H	F_024	103BH	F_060	105EH	F_096	1082H	F_132
1019H	F_025	103CH	F_061	105FH	F_097	1083H	F_133
101AH	F_026	103DH	F_062	1060H	F_098		
101BH	F_027	103DH	F_063	1061H	F_099		
101CH	F_028	103EH	F_064	1062H	F_100		
101DH	F_029	103FH	F_065	1063H	F_101		
101EH	F_030	1040H	F_066	1064H	F_102		
101FH	F_031	1041H	F_067	1065H	F_103		
1020H	F_032	1042H	F_068	1066H	F_104		
1021H	F_033	1043H	F_069	1067H	F_105		
1022H	F_034	1044H	F_070	1068H	F_106		
1023H	F_035	1045H	F_071	1069H	F_107		

## Appendix III ModBus Communication

### A3-3-3 Registers – Read Operation (Only Read, Write Prohibited)

Reg. No.	Name	Description	
2100H	Drive error code	00H	No error
		01H	Over current
		02H	Over voltage
		03H	Over heat
		04H	Drive overload
		05H	Motor overload
		06H	External fault
		07H	Short protection
		08H	AD converter failure
		09H	Reserved
		0AH	Reserved
		0BH	Reserved
		0CH	Reserved
		0DH	Grounding fault
		0EH	Low voltage
		0FH	Memory error
		10H	Reserved
		11H	Interruption protection
		12H	Overload
		13H	Reserved
		14H	Reserved
		15H	Coast to stop
2101H	Drive status 1	b0~b7	Reserved
		b8	1: Frequency control by communication
		b9	1: Frequency control by analog inputs
		bA	1: Operation command by communication
		bB	1: Function setting lock (function setting not changeable)
		bC	1: Status: drive running
		bD	1: Status: jog running
		bE	1: Forward indication
		bF	1: Reverse indication
2102H	Speed setting	Monitor drive's speed setting Format 0.01 Units HZ	
2103H	Output frequency	Monitor drive's current output frequency (unit: 0.01Hz)	
2104H	Output current	Monitor drive's output current (unit: 0.1A)	
2105H	PN voltage	Monitor drive's DC BUS (PN) voltage (unit: 0.1V)	
2106H	Output voltage	Monitor drive's AC output voltage (unit: 0.1V)	
2107H	Frequency of multi-speed	Monitor drive's frequency of multi-speed (see <b>Note 2</b> )	
2108H	Reserved		
2109H	Reserved		
210AH	Power factor angle	Monitor drive's power factor angle (unit: 0.1°)	
210BH	Reserved		
210CH	Reserved		
210DH	Reserved		
210EH	Reserved		
210FH	Output power factor	Monitor drive's output power factor (unit: 0.01KW)	

## Appendix III ModBus Communication

Reg. No.	Name	Description	
2300H	I/O terminal status	b0	1:FWD terminal operation
		b1	1:REV terminal operation
		b2	1:X1 terminal operation
		b3	1:X2 terminal operation
		b4	1:X3 terminal operation
		b5	1:X4 terminal operation
		b6	Reserved
		b7	Reserved
		b8	1:Y1 terminal detection
		b9	1:Y2 terminal detection
		bA	1:T1 terminal detection
		bB	1:T2 terminal detection
		bC	1: Primary speed by analog input
		bD	1: Primary speed by keypad
		bE	1: Primary speed by UP/DOWN command
		bF	1: Primary speed by communication
2301H	Drive status 2	b0	Reserved
		b1	1: Constant speed
		b2	1: Zero speed
		b3	1: Frequency detection
		b4	1: Overload
		b5	1: Stall prevention
		b6	Reserved
		b7	1: Braking action
		b8	Reserved
		b9	Reserved
		bA	1: Error signal
		bB~bF	Reserved
2302H	Reserved		
2303H	Fault record 1	Fault record 1 (see <b>Note 3</b> )	
2304H	Fault record 2	Fault record 2 (see <b>Note 3</b> )	
2305H	Fault record 3	Fault record 3 (see <b>Note 3</b> )	
2306H	Fault record 4	Fault record 4 (see <b>Note 3</b> )	
2307H	Fault record 5	Fault record 5 (see <b>Note 3</b> )	

### Note:

- When the function is enabled, multi-function command – multi-function command 1, 2, 3, will be inactive.
- Analog = 0  
 Digital primary speed =1  
 Multi-speed 1~7 = 2~8  
 Jog speed =9  
 Communication = 11

## Appendix III ModBus Communication

### 3. Fault record table

Error code	Drive display	Description
1	adEr	A-D converter malfunction
3	SC1	
8	OC	Over current
12	OE	Over voltage
13	LE1	Drive low voltage during operation
14	GF	Grounding fault
15	OH	Over heat
16	OL	Motor overload
17	OL1	Drive overload
18	OLO	Overload detection
19	thr	External thermal replay trip
20	PAdF	KP-202 error
21	SC	Drive internal fuse open

The fault record is different from the fault message read out from 2100H register. The fault message from register 2100H is the real time display. If user would like to check the historical records of faults, the host can access drive registers 2303H to 2307H to read out the fault historical data. The maximum 5 records can be displayed at the same time when the host can access drive registers to read out the fault records.

### A3-4 Programming Examples – Register and Command

#### A3-4-1 Access Drive Function Setting – Write Operation

Write a single register to access drive function setting:

- Set function F\_009 (primary speed) = 30 Hz
- Speed setting is directly input by function setting
- Drive register used: 10nnH → F\_009: 009 (decimal value) = 09H (Hex). F\_009 = 1009H register
- Speed = 30Hz → 30.00Hz (resolution: 0.01Hz) → 30.00 x 100 = 3000 (decimal) = 0BB8H (hex)
- The host controls only one drive (drive 1)

Code to write to drive register from the host (CRC exclusive)

Address	OP Code	Drive Register		Register Data	
		MSB	LSB	MSB	LSB
01H	06H	10H	09H	0BH	B8H



## Appendix III ModBus Communication

### A3-4-2 Host Control to Drive – Write Operation

When the host control by ModBus communication, user can simply create an icon or active key/button to activate the drive. The following examples shows how to program the communication control

#### 1. Start the drive:

- Create an icon or active button/key on the host for “Drive Start”
- Program the host with the following code for “Drive Start”
- The drive register to be written for start operation: 2000H
- The register data for start operation: 0002H

Address	OP Code	Drive Register		Register Data	
		MSB	LSB	MSB	LSB
01H	06H	20H	00H	00H	02H

#### 2. Forward rotation command:

- Create an icon or active button/key on the host for “Forward”
- Program the host with following code for “Forward” rotation control
- The drive register to be written for forward command: 2000H
- The register data for forward command: 0010H

Address	OP Code	Drive Register		Register Data	
		MSB	LSB	MSB	LSB
01H	06H	20H	00H	00H	10H

#### 3. Speed Setting (frequency command) – without using drive function setting:

Set the speed to be 30.05Hz (resolution: 0.01Hz)

- The drive register to be written for Speed setting (frequency command): 2001H
- Convert 30.05Hz to hexadecimal value:

$$30.05 \times 100 \text{ (by the resolution)} = 3005 \text{ (decimal)} = 0BBDH$$

Address	OP Code	Drive Register		Register Data	
		MSB	LSB	MSB	LSB
01H	06H	20H	01H	0BH	BDH

#### 4. Primary Acceleration/Deceleration Time Setting:

Set the acceleration/deceleration time = 1.5 seconds (resolution: 0.1 seconds)

- Set F\_019 (Primary accel time) = 1.5 seconds

Convert F\_019 to hexadecimal value for generating register number: 019 (decimal) = 13H

Convert 1.5 seconds to hex value:  $1.5 \times 10$  (by resolution) = 15 (decimal) = 000FH

- Set F\_020 (Primary decel time) = 1.5 seconds

Convert F\_020 to hex value: 020 = 14H

- Select acceleration/deceleration operation command: register: 2000H, register data = 00 (b6,b7)

Set the acceleration time F\_019 = 1.5 seconds

## Appendix III ModBus Communication

Address	OP Code	Drive Register		Register Data	
		MSB	LSB	MSB	LSB
01H	06H	10H	13H	00H	0FH

Set the deceleration time F\_020 = 1.5 seconds

Address	OP Code	Drive Register		Register Data	
		MSB	LSB	MSB	LSB
01H	06H	10H	14H	00H	0FH

Select primary acceleration/deceleration time

Address	OP Code	Drive Register		Register Data	
		MSB	LSB	MSB	LSB
01H	06H	20H	00H	00H	00H

### A3-4-3 Host Control to Drive – Read Operation

#### 1. Drive Error Trips (Fault Code):

Example: Drive error trips due to “GF” (grounding fault) and the fault message displayed at the host.

- a. The host sends the below codes to access the drive register to monitor drive faults (read only one register data)

-Drive register: 2100H

-Number of register to read: 1 → 0001H

Message Code (Host to Drive)

Address	OP Code	Starting Register		Register Numbers to Readout	
		MSB	LSB	MSB	LSB
01H	03H	21H	00H	00H	01H

- b. The drive returns the fault code to the host when “GF” occurs:

-GF code: 0DH

Return Code (Drive to Host)

Address	OP Code	Data Byte	2100H(Register) Data	
			MSB	LSB
01H	03H	04H	00H	0DH

- c. Program the host to convert register data 000DH to “GF” message

#### 2. Drive Frequency Output Readout:

Example: If the drive frequency outputs = 40.65Hz, read the data output from the drive and display 40.05Hz in the host.

- a. The host sends the below codes to access the drive register to read out the frequency output data (read only one register data)

-Drive register: 2103H

-Number of register to read: 1 → 0001H

## Appendix III ModBus Communication

### Message Code (Host to Drive)

Address	OP Code	Starting Register		Register Numbers to Readout	
		MSB	LSB	MSB	LSB
01H	03H	21H	03H	00H	01H

b. The drive returns the frequency output readouts to the host

-Output frequency readouts from the drive (2103H register data):

### Return Code (Drive to Host)

Address	OP Code	Data Byte	2103H(Register) Data	
			MSB	LSB
01H	03H	04H	0FH	E1H

c. Program the host to convert register data 0FE1H (Hex value) = 4065 (Decimal value)

d. Display the output frequency (resolution = 0.01):  $4065/100 = 40.65$  (unit in Hz)

Appendix IV Function List – Record the changes to the Drives’s Parameters.

Function	Section	Actual Value	Default Value
F_000	C-1		P6100
F_001	C-1		3
F_002	C-1		1
F_003	C-1		1
F_004	C-1		1
F_005	C-1		1
F_006	C-1		1
F_007	C-1		20
F_008	C-1		0
F_009	C-2		60
F_010	C-2		10
F_011	C-2		20
F_012	C-2		30
F_013	C-2		0
F_014	C-2		0
F_015	C-2		0
F_016	C-2		0
F_017	C-2		6
F_018	C-3		60
F_019	C-3		15
F_020	C-3		15
F_021	C-3		15
F_022	C-3		15
F_023	C-3		15
F_024	C-3		15
F_025	C-3		15

Function	Section	Actual Value	Default Value
F_026	C-3		15
F_027	C-3		15
F_028	C-3		15
F_029	C-3		0
F_030	C-12		0
F_031	C-4		60
F_032	C-4		0.5
F_033	C-4		230V:8.00 460V:12.0
F_034	C-4		60.00
F_035	C-4		230V:230 460V:460
F_036	C-12		0
F_037	C-12		0
F_038	C-12		0
F_039	C-12		0
F_040	C-5		1
F_041	C-5		0
F_042	C-4		1
F_043	C-4		0
F_044	C-6		0
F_045	C-6		1
F_046	C-7		1
F_047	C-5		20
F_048	C-7		230V
			7.5 10 15
			18.7 24.9 34.2
			460V
			7.5 10 15 20
			9.3 12.5 17.1 24.0

Appendix IV Function List – Record the changes to the Drives’s Parameters.

Function	Section	Actual Value	Default Value
F_049	C-7		230V
			7.5 10 15
			8.4 10.5 14.4
			460V
			7.5 10 15 20
F_050	C-7		4.2 5.3 7.2 8.6
F_051	C-7		0
F_052	C-8		4P
F_053	C-8		3
F_054	C-8		4
F_055	C-8		1
F_056	C-8		2
F_057		Reserved	
F_058		Reserved	
F_059	C-9		3
F_060	C-9		2
F_061	C-9		11
F_062	C-9		2
F_063	C-9		2
F_064	C-12		0
F_065	C-12		1
F_066	C-12		0
F_067	C-12		0
F_068	C-12		160
F_069	C-12		0.1
F_070	C-12		170

Function	Section	Actual Value	Default Value
F_071	C-12		160
F_072	C-12		15
F_073	C-12		15
F_074	C-12		1
F_075	C-4		50
F_076	C-4		0.5
F_077	C-4		0
F_078	C-12		0
F_079	C-12		230V:175.0 460V:320.0
F_080	C-12		0
F_081	C-4		1
F_082	C-4		0
F_083	C-4		0
F_084	C-4		0
F_085	C-4		0
F_086	C-4		0
F_087	C-4		0
F_088	C-12		150
F_089	C-12		0.5
F_090	C-12		100
F_091	C-11		no_Err
F_092	C-11		0
F_093	C-12		1
F_094	C-12		3
F_095	C-12		230/460

Appendix IV Function List – Record the changes to the Drives’s Parameters.

Function	Section	Actual Value	Default Value
F_121	C-12		0
F_122	C-12		0
F_123	C-5		0
F_124	C-5		1
F_125	C-5		1
F_126	C-5		0
F_127	C-5		1
F_128	C-5		0
F_129	C-6		2
F_130	C-6		1
F_131	C-9		1
F_132	C-4		0.5
F_133	C-11		Monitor value
F_134	C-11		0

Function	Section	Actual Value	Default Value
F_096	C-12		0.5
F_097	C-12		0
F_098	C-12		1
F_099	C-12		1
F_100	C-12		2
F_101	C-12		3
F_102	C-12		0
F_103	C-12		3
F_104	C-12		15
F_105	C-12		15
F_106	C-12		0
F_107	C-5		0
F_108	C-12		10
F_109	Reserved		
F_110	C-10		0
F_111	C-10		1
F_112	C-10		1
F_113	C-10		0.0
F_114	C-10		0
F_115	C-10		0
F_116	C-12		4.0
F_117	Reserved		
F_118	C-12		0
F_119	C-12		0
F_120	C-12		1



# *EFFICIENCY SERIES*

**WWEVFD-080111**  
**August 1, 2011**