

ELECTRIC REGULATOR

RM5G Supplemental User Manual

Danger

Hazardous High Voltage

Ground the control before servicing

Remove all power and wait until all the control has discharged.

Measuring the voltage of terminals P and N to verified it has discharged.

Failure to comply will result in death or serious injury.

Warning

Separate over current protection is required by the national electric code. The user is responsible for conforming with the national electric code and all applicable local codes which govern such practices as wiring protection, grounding, disconnects and other current protection.

Warning

Never exceed the maximum input voltage

Exceeding the maximum input voltage
causes catastrophic failure.

Repair is impractical the control should be replaced.

Warning

The RM5G is for 3 phase induction motors only.
The RM5G will damage capacitor start single phase motors.

CAUTION

Before MEGGER or DIELECTRIC testing the AC motor.
Disconnect the AC motor from the RM5G control.
Megger or dielectric testing will damage the control.

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Section 1) Receiving & Storage

Section 1.1) Physical Inspection

When you receive the RM5G AC drive, avoid shock or vibration when unloading and transporting the unit. This can damage the semiconductors or other components.

Immediately upon receipt inspect the unit for the following;

- Check to be certain the unit is clean of packing materials.
- Check for damage incurred during shipment, dents, scratches, etc.
- Inspect mechanical the parts, loose screws, terminals, etc.
- Inspect for, damaged, loose or shorted electronic components or connections.
- If you find damage, don't connect power to it. The unit must be replaced or repaired. Connecting power could result in fire or further damage and could void warranty.

Promptly report damage or problems you found during inspection to Electric Regulator Corp. Telephone (760) 438-7873 Fax (760) 438-0437 or Sales@ElectricRegulator.com

Store the AC drive in a clean dry place in the package it was in shipped. Avoid storing the unit in a location with high temperatures, humidity, dust or corrosive gases. Outdoor storage is not recommended.

Section 1.2) Input Power & Motor Rating

Check the identification label to confirm that the input power and the motor's ratings are compatible with the drive.

- Identification Label On the drive please find the label as shown below to verify the specifications are compatible with the motor. See example below:

ISO 9001 IP20	
TYPE	RM5G-2050
INPUT	3PH 200-240V 176A 50/60Hz
OUTPUT	3PH 200-240V 145A 0.1-400Hz
PGM NO.	103F4-1(AZXXXXXX)
SERIAL NO.	BXXXXXXXXX

- Model Number Scheme RM5G-2 050 B -1PH
 A B C D E

A: RM5G..... Model Series Number

B: 1..... Voltage 100V to 120V

2..... Voltage 200V to 240V

4..... Voltage 440V to 480V

C: 050..... Horsepower: Example 50 HP

D: B..... Indicates built in Dynamic Braking
Transistor, if blank not included

E: -1PH..... Indicates single phase input power,
blank indicates three phase input power

- Motor Specification Inverter duty motor compatible with IGBT variable frequency power.

Section 1.3) Common Specifications

Motoring Features	Output Signal	Alternating Current Pulse Width Modulation (PWM) Synthesizes sinusoidal wave	
	Frequency Range	0.01 to 400 Hz (see function code F092)	
	Frequency Resolution	0.1 Hz	
	Overload Current	Permits 150% of motor's rating for 1 minute (See section 4.28 on page 32)	
	Acceleration & Deceleration	0.1 to 3200 seconds. For coasting to stop set deceleration to 0 seconds.	
	Braking	DC braking current is programmable from 0 to 150% of the RM5G amperage rating, see page 21, section 4.07,. If dynamic braking transistor (DBT) and resistor are installed, see page 20, section 4.06,.	
	Voltage Frequency Pattern	Selection of: Three Segment user programmed V/F pattern, see page 30 section 4.25,. Economy, adjusts the voltage to the minimum required to maintain speed. Squared Curve 1.7 power curve Squared Curve 1.5 power curve	
	Stall Prevention	Stall prevention acceleration current and level speed current are independently programmable. (see F 070 and F071_	
Control Features	Speed Adjustment Signal (Speed Reference Scale)	Vin = 0 to 10 VDC Voltage Reference Iin = 4 to 20 mA Current Reference (see F002, F040, F 041 and F126 through F128)	
	Forward & Reverse Inputs	Activated by terminals FWD or REV (see F001)	
	Inputs (Programmable)	6 Programmable inputs with a selection of 16 parameters. (see F 052 to F057)	
	Outputs (Programmable)	2 Transistor Outputs with program menu of 11 parameters. 2 Relays with program menu of 11 parameters. (see F 058, F059, and F060)	
Meters	Keypad Display	The keypad display has 8 functions, see page 12.	
	Digital Meters, Auxiliary	The RM5G supports up to 3 digital meters with a selection of eight parameters. See page 29 or function codes F099, F100, F101.	
	Analog Meters, Auxiliary	The RM5G supports 2 analog meters with a menu of 6 parameters.	
Problem Diagnostics	Problem Diagnostics Messages	AdEr (A/D Converter Error) bb (Outputs Disabled) EEr (EEPROM error) Err_00 (Keypad Connection fault before operation) Err_01 (Keypad Connection Fault during operation) db (High dynamic braking voltage) Fr (Coasting to stop) GF (Ground Fault)	LE (Low Voltage) LE1 (Low Voltage while operating) OC (Over Current) OE (Over Voltage) OL (Motor Overload) OLI (Drive (RM5G) Overload) OLO (System Overload) OH (Drive Overheat) PAdF (Keypad Connection Failure) SC (Blown Fuse)
Ambient Conditions	Atmosphere	Non Explosive, Non Corrosive,	
	Temperature	-10C to 50C No Condensation (14F to 122F)	
	Humidity	90% Relative Humidity or less	
	Vibration	Less than 5.9m/sec ² (0.6G)	
	Altitude	Under 1000 meters or 3280 ft, for higher altitudes see graph on page 7, section 2.1	

Section 1.4) Electric Power Specifications

Single Phase Input Power converted to Three Phase Output Power

Model Number	RM5G-100 ½ -1PH	RM5G-1001-1PH	RM5G-1002-1PH	RM5G-200 ½ -1PH	RM5G-2001-1PH	RM5G-2002-1PH
Horsepower	½	1	2	½	1	2
Input Power (V, ϕ , Hz)	100 to 120V, 1 ϕ , 50 to 60 Hz			200 to 240V, 1 ϕ , 50 to 60 Hz		
Permissible Input Power Fluctuation	90 ~ 132V, 50 to 60 Hz, +/-5%			176 ~ 264V, 50 to 60 Hz, +/-5%		
Input Amps Required	8.8	18	24	7	13.5	19
Output Amp Rating	2.5	4.2	6	3	5	8
Max. Output Voltage	200 ~ 240V/ 3 ϕ			200 ~ 240V/ 3 ϕ		
Output Frequency Range	0.01 to 400 Hz			0.01 to 400 Hz		
Overload Rating	Permits 150% overload for 1 minute			Permits 150% overload for 1 minute		
Enclosure Rating	IP20			IP20		

200V to 240V, Three Phase Input Power

Model Number	RM5G-2001	RM5G-2002	RM5G-2003	RM5G-2005	RM5G-2007	RM5G-2010	RM5G-2015	RM5G-2020	RM5G-2025	RM5G-2030	RM5G-2040	RM5G-2050	RM5G-2060	RM5G-2075
Horsepower	1	2	3	5	7.5	10	15	20	25	30	40	50	60	75
Input Amperes Required (A)	6	10	14	18	30	40	60	69	85	103	132	176	200	240
Output Ampere Rating (A)	5	8	11	17	25	33	46	60	74	90	115	145	175	220
Input Power (V / ϕ / Hz)	200 to 240V / 3 ϕ / 50 to 60 Hz													
Permissible Input Power Fluctuation	176 ~ 264V / 50 to 60 Hz +/-5%													
Output Voltage Rating (V)	200 to 240V / 3 ϕ													
Output Frequency Range (Hz)	0.01 to 400 Hz													
Overload Rating	Permits 150% overload for one minute													
Enclosure Rating	IP20													

440V to 480V, Three Phase Input Power

Model Number	RM5G-4001	RM5G-4002	RM5G-4003	RM5G-4005	RM5G-4007	RM5G-4010	RM5G-4015	RM5G-4020	RM5G-4030	RM5G-4040	RM5G-4050	RM5G-4060	RM5G-4075	RM5G-4100	RM5G-4150	RM5G-4200	RM5G-4300	RM5G-4420	RM5G-4500	RM5G-4600
Horsepower	1	2	3	5	7.5	10	15	20	30	40	50	60	75	100	150	200	300	420	500	600
Input Amperes Required (A)	3.5	5	8	12	16	22	28	38	52	70	84	100	130	155	196	282	385	540	650	800
Output Ampere Rating (A)	2.5	4	6	9	14	18	24	30	45	61	73	87	110	137	210	304	415	585	700	860
Input Power (V / ϕ / Hz)	380 to 480V / 3 ϕ / 50 to 60 Hz																			
Permissible Input Power Fluctuation	323V ~ 506 V / 50 to 60 Hz +/-5%																			
Output Voltage Rating (V)	380V to 480V / 3 ϕ																			
Output Frequency Range (Hz)	0.01 to 400 Hz																			
Overload Rating	Permits 150% overload for one minute																			
Enclosure Rating	IP20																			

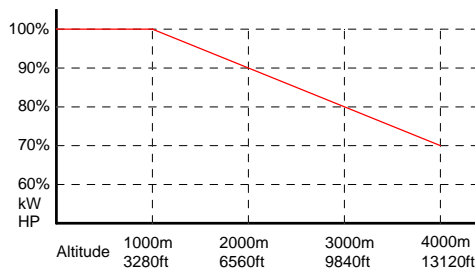
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Section 2) Installation

Section 2.1) Operating Environment

The RM5G AC drive should be located in an operating environment that meets the following conditions.

- Ambient Temperature between 14° to 122° Fahrenheit (-10° to 50° Celsius).
- Relative Humidity Avoid locations exceeding RH 90%.
- Condensation Do not locate the unit where condensation occurs.
- Altitude If located above 1000m/3280 ft above sea level, see table for power derating.



- Corrosion Avoid locations with corrosive gases or liquids; example: ocean air.
- Contamination Avoid locations subject to dust or iron particles.
- Hazardous Gases & Liquids The RM5G is not designed for explosive environments. Do not locate the unit where it is subject to combustible or flammable gases or liquids.
- Ventilation Mount the unit in a lengthwise vertical position to ensure proper cooling ventilation. Provide not less than 5 inches (125 mm) top and bottom and 2 inches (50 mm) each side of clear space around the unit. If the unit is in a sealed enclosure, provide adequate ventilation for air flow from top to bottom.
- Shock & Vibration Avoid mounting the unit in a location subject to shock or vibration.

Section 2.2) Motor Selection

- The motor should be a standard three phase induction motor. The minimum insulation requirement is 100 M at 500V. Most modern motors meet or exceed this requirement. Submersible motors may fail due to sand and other contaminants abrading the insulation.
- Inverter duty motor compatible with IGBT variable frequency power.
- If the normal speed is above 15 Hz a self ventilated motor normally adequate.
- If the motor speed is under 15 Hz for more than several minutes, separately powered ventilation for the motor is required.
- The resonance frequency of a typical motor is somewhere between 6 Hz to 9 Hz. If you plan to run close to the resonance frequency, read page 16 section 4.16, Frequency Bypass.
- If you run the motor above 60 Hz, see page 37, section 4.36

Section 2.3) AC Line Reactors (ACL)

AC line reactors should be used in the following circumstances.

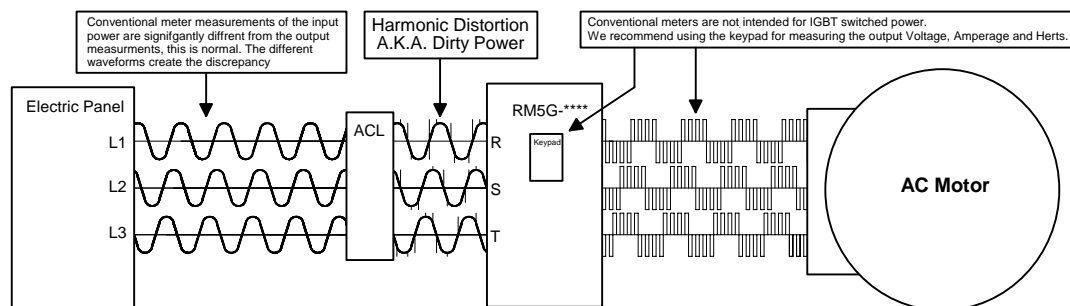
- If four or more AC drives are connected to the same input power.
- If the AC drive input power is shared with equipment that have IGBT's or SCR's.
Typical examples are induction heaters, DC drives or welders.
- If the input power lines are very long or share power with equipment that are a long distance from the AC drive. (Long distances often amplify bad power harmonics)
- If the output power lines are very long, typically more than 40 feet.

200~240V Table

HP	Inputs R, S, T		Outputs U, V, W	
	Inductance	Amperes	Inductance	Amperes
1	0.45 mH	15A	0.45 mH	15A
2	0.45 mH	15A	0.45 mH	15A
3	0.45 mH	15A	0.45 mH	15A
5	0.2 mH	30A	0.2 mH	30A
7.5	0.2 mH	30A	0.2 mH	50A
10	0.13 mH	50A	0.2 mH	50A
15	0.13 mH	50A	0.07 mH	75A
20	0.07 mH	75A	0.05 mH	100A
25	0.05 mH	100A	0.05 mH	100A
30	0.05 mH	150A	0.035 mH	150A
40	0.035 mH	150A	0.025 mH	200A
50	0.025 mH	200A	0.025 mH	200A
60	0.025 mH	200A	0.015 mH	300A

440~480V Table

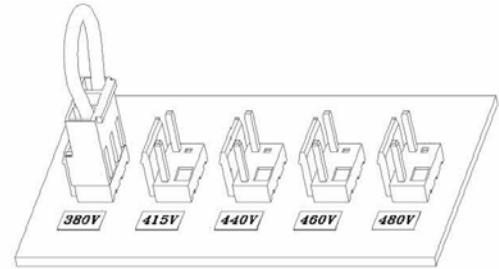
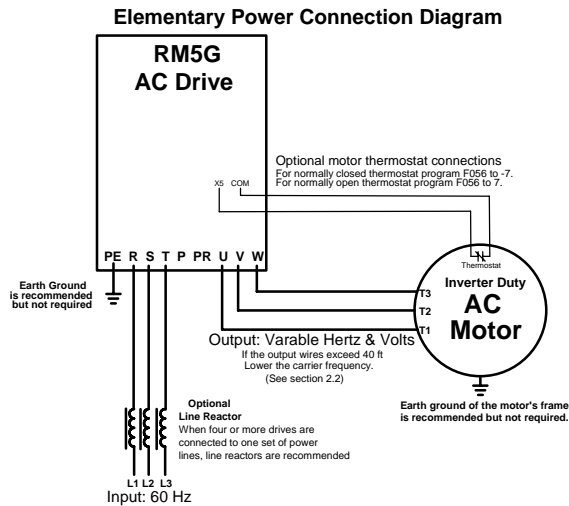
HP	Inputs R, S, T		Outputs U, V, W	
	Inductance	Amperes	Inductance	Amperes
1	0.45 mH	15A	0.45 mH	15A
2	0.45 mH	15A	0.45 mH	15A
3	0.4 mH	15A	0.45 mH	15A
5	0.45 mH	15A	0.45 mH	15A
7.5	0.2 mH	30A	0.2 mH	30A
10	0.2 mH	30A	0.2 mH	30A
15	0.2 mH	50A	0.13 mH	50A
20	0.13 mH	50A	0.13 mH	50A
25	0.13 mH	50A	0.13 mH	50A
30	0.13 mH	75A	0.07 mH	75A
40	0.07 mH	75A	0.05 mH	100A
50	0.05 mH	100A	0.05 mH	100A
60	0.05 mH	150A	0.035 mH	150A
75	0.035 mH	150A	0.025 mH	200A
100	0.025 mH	200A	0.025 mH	200A
150	0.015 mH	300A	0.015 mH	300A
200	0.013 mH	400A	0.013 mH	400A
250	0.013 mH	600A	0.01 mH	600A
300	0.01 mH	600A	0.01 mH	600A
350	0.01 mH	600A	0.006 mH	800A
420	0.006 mH	800A	0.006 mH	800A
500	0.006 mH	800A	0.005 mH	1000A
600	0.005 mH	1000A	0.005 mH	1000A



Section 2.4) Wire Size Table and AC Power and Motor Connections

Input: 220 V _{AC} / 3 Phase / 60 Hz				Input: 460 V _{AC} / 3 Phase / 60 Hz			
HP	200% Load AC Amps	Recommended Wire Size	Circuit Breaker AC Amps at 250V _{AC}	HP	200% Load AC Amps	Recommended Wire Size	Circuit Breaker AC Amps at 600V _{AC}
1	3.9	14 AWG	5	1	1.9	14 AWG	5
2	7.9	14 AWG	10	2	3.8	14 AWG	5
3	11.8	14 AWG	15	3	5.7	14 AWG	10
5	19.68	12 AWG	25	5	9.41	14 AWG	10
7.5	29.52	10 AWG	30	7.5	14.12	14 AWG	15
10	39.36	8 AWG	40	10	18.83	12 AWG	20
15	59.05	6 AWG	70	15	28.24	10 AWG	30
20	78.73	4 AWG	90	20	37.65	8 AWG	40
25	98.41	3 AWG	100	25	47.07	8 AWG	50
30	118.09	1 AWG	125	30	56.48	6 AWG	60
40	157.46	00 AWG	175	40	75.31	4 AWG	75
50	196.82	000 AWG	200	50	94.13	4 AWG	100
60	224.38	0000 AWG	225	60	112.96	3 AWG	125
75	295.24	300 MCM	300	75	141.2	1 AWG	150
100	393.65	500 MCM	400	100	188.27	00 AWG	200
125	492.06	(2) 250 MCM	500	125	235.33	0000 AWG	250
150	590.47	(2) 350 MCM	600	150	282.4	250 MCM	300

Output: Variable 0 ~ 60 Hz / 0 ~ 220 Volts			Output: Variable 0 ~ 60 Hz / 0 ~ 460 Volts		
HP	200% Load DC Amps	Recommended Wire Size for 40 ft length	HP	200% Load DC Amps	Recommended Wire Size for 40 ft length
1	3.9	14 AWG	1	1.9	14 AWG
2	7.9	12 AWG	2	3.8	14 AWG
3	11.8	12 AWG	3	5.7	14 AWG
5	19.68	10 AWG	5	9.41	12 AWG
7.5	29.52	8 AWG	7.5	14.12	12 AWG
10	39.36	6 AWG	10	18.83	10 AWG
15	59.05	4 AWG	15	28.24	8 AWG
20	78.73	2 AWG	20	37.65	8 AWG
25	98.41	1 AWG	25	47.07	6 AWG
30	118.09	0 AWG	30	56.48	4 AWG
40	157.46	0000 AWG	40	75.31	3 AWG
50	196.82	250 MCM	50	94.13	2 AWG
60	224.38	300 MCM	60	112.96	1 AWG
75	295.24	500 MCM	75	141.2	00 AWG
100	393.65	(2) 250 MCM	100	188.27	0000 AWG
125	492.06	(2) 350 MCM	125	235.33	300 MCM
150	590.47	(2) 500 MCM	150	282.4	(2) 000 AWG



440V~480V motors, 75 HP and higher, set the jumper in the diagram above to your input voltage

Section 2.5) Switching Frequency (i.e. Carrier Frequency)

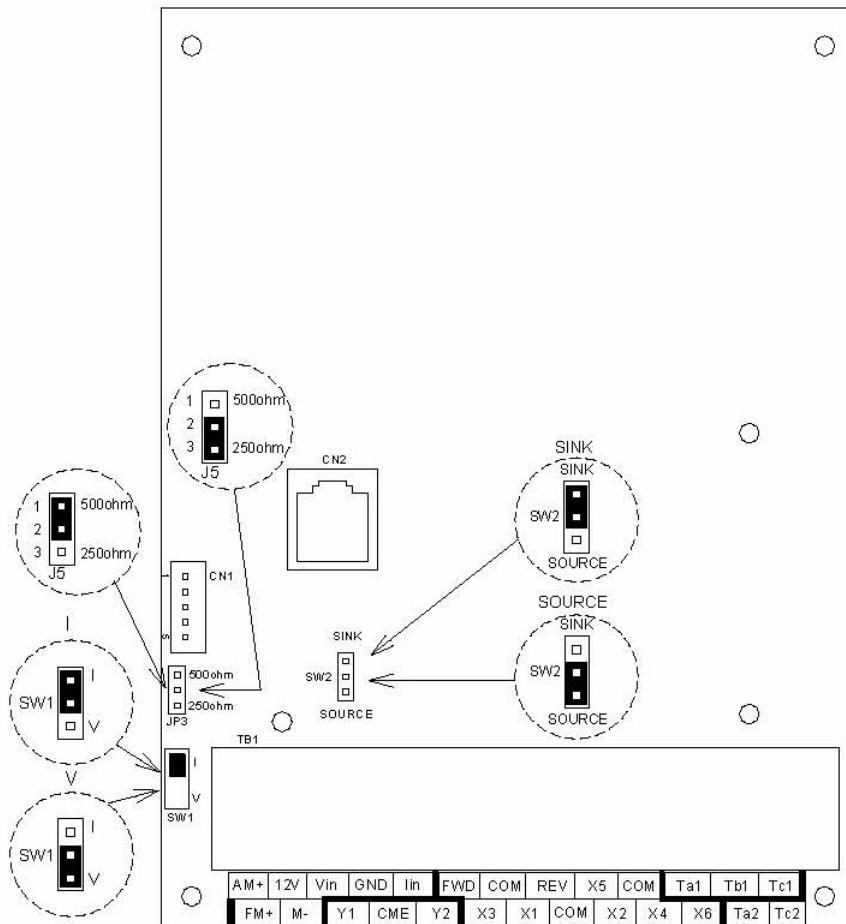
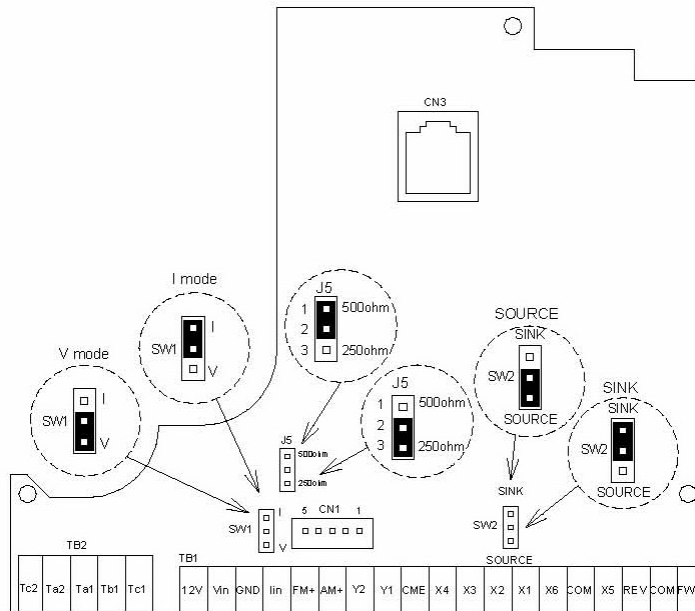
Longer wires require lower carrier frequency. Function code F 081 programs the carrier frequency.

Wire Length	Under 12m / 40 ft	12m / 40 ft	25m / 80 ft	50m / 160 ft	100m / 320 ft	Over 100m
½ to 5 HP	10 kHz	7.5 kHz	5 kHz	2.5 kHz	800 Hz	800 Hz
7 ½ to 10 HP	10 kHz	7.5 kHz	5 kHz	2.5 kHz	800 Hz	800 Hz
15 to 30 HP	7.5 kHz	5 kHz	2.5 kHz	2.5 kHz	800 Hz	800 Hz
40 to 75 HP	5 kHz	5 kHz	2.5 kHz	2.5 kHz	800 Hz	800 Hz
100 to 700 HP	2.5 kHz	2.5 kHz	2.5 kHz	800 Hz	800 Hz	800 Hz

F 081	Switching Frequency (i.e. Carrier Frequency)	Factory Defaults Varies with HP	0) 800 Hz	3) 7.5 kHz	6) 15.0 kHz
			1) 2.5 kHz	4) 10.0 kHz	
			2) 5.0 kHz	5) 12.5 kHz	

Section 2.6) Main Control Card Diagrams

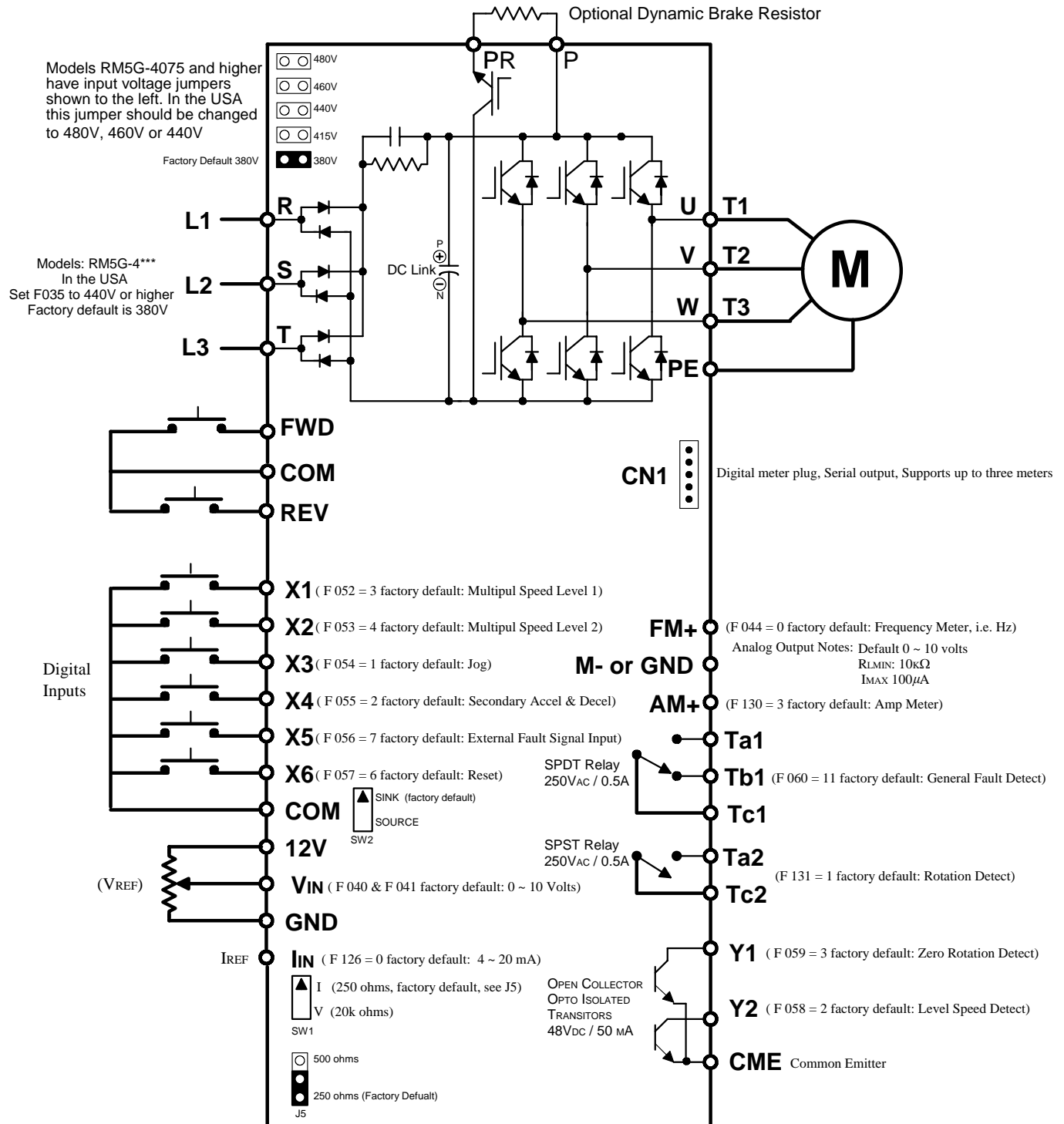
Main Control Card from ½ HP to 5 HP



Main Control Card for 7 ½ HP and above

Section 2.7) Elementary Diagram of RM5G

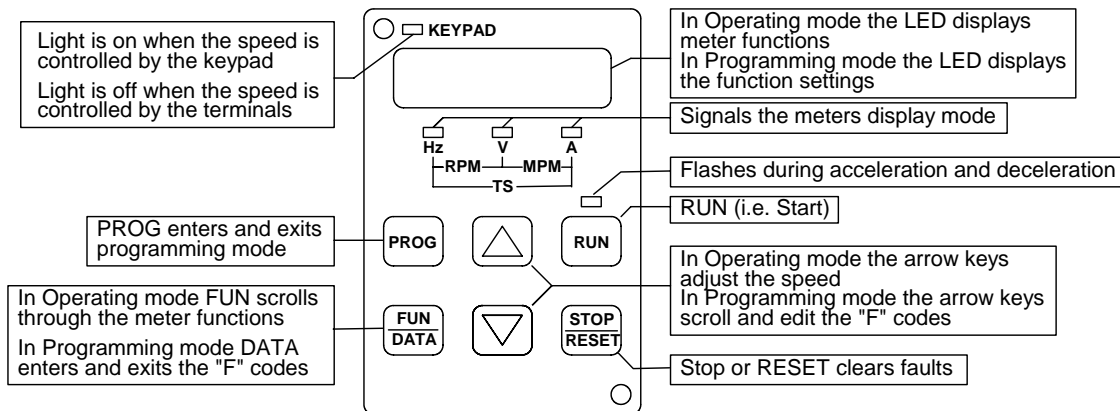
RM5G Elementary Diagram



Section 3.1) KP-201B Keypad Operation

The keypad has four operating modes.

- Monitoring Mode (default)
- Data Mode (Meter)
- Function Code Menu (Scrolls up and down from F 000 to F 134)
- Programming Mode (Edits the function codes)



When the power is switched on, the keypad LED display is in monitoring mode. In monitoring mode the default display is the frequency (Hz) output to the motor. The default display can be changed to the user's preference, see following example.

Example of how to program.

In this example you will change the default display to RPM. Press the PROG key to enter the function code menu. The function codes are numbered from F 000 through F 134. Then use the arrow keys to scroll up and down through the function codes, scroll to F 006. To change the program of F 006, press the FUN/DATA key to enter F006. Then use the arrow keys to scroll to the number 6 (RPM, see table below) then press the FUN/DATA key to exit F 006 and then press the PROG key to exit out of the function code menu. The default display should now be RPM.

Function code table for F 006

F 006	Keypad Default Display (Factory Default: 1)	1) Hz Output	4) DC Voltage (PN)	7) User Defined Meter
		2) Speed Adjustment Hz	5) Amperage Output	8) Terminal Status
		3) Voltage Output	6) RPM	

Section 3.2) Programming with positive and negative numbers.

The input and output terminals programs have positive and negative numbers. Positive numbers are for positive logic, closing the circuit engages the program and negative numbers are for negative logic, opening the circuit engages the program. For more information see section 4.15 on page 26.

Section 3.3) Operating the RM5G with out the keypad.

The RM5G will operate without the keypad, when the RM5G is operated by terminals Vin, GND, FWD and REV or digital operation. If more programming is required, reconnect the keypad.

Section 3.4) How to Restore the Factory Default Program.

Press the PROG key to enter function code menu, then use the arrow key to scroll to F 134, then press the FUN/DATA key. Then scroll until dEF60 is displayed, press and hold down the FUN/DATA key until the word "end" is displayed. All the function codes have been set to the factory defaults for 60 Hz operation.

Section 3.5) Programming Quick Guide (to the most commonly used function codes)

This page covers the most commonly used function codes for quick reference.

The RM5G default settings are for keypad operation. The motor will start when the run key is pressed and the arrow keys adjust the speed. When the RM5G is started for the first time it will accelerate to 60 Hertz. If you do not want run at 60 Hertz, before starting, press the down arrow key to adjust the speed, then start.

Before first time programing, we strongly recommend resetting function code F 134 to dEF60, see instructions at the bottom of the table.

- **Important: If you have 440V ~ 480V motor, set F 035 to your motor's Voltage.**
- **Warning: If you have RM5G-4075 or higher, be sure to set the fan voltage jumper, see page 9 or 11.**
- **Motor Full Load Amps (FLA) set F 048 to your motors FLA listed on the motor data plate.**

Most users will want to program the following parameters

- **Speed Adjustment** users that have speed potentiometers will need to program F 002
- **Start and Stop** users that have auxiliary start and stop buttons will need to program F 001.
- **Stop** the user should select controlled deceleration or coast (freewheeling), see F 082.
- **Acceleration and Deceleration** times are programmed by F 019 and F 020.

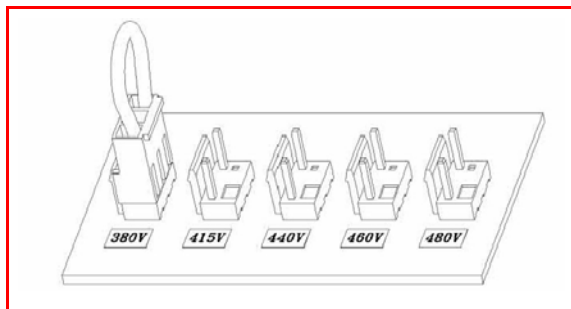
F 001	Start, Forward & Reverse	0) Enable FWD and REV terminals to start, keypad start is disabled.	
		1) Enable FWD and REV terminals to start, forward rotation only.	
		2) Keypad Start, Terminals select forward or reverse.	
		3) Keypad Start, forward only. (Factory Default: 3)	
		4) Keypad Start, reverse only	
Notes: Settings: 0, 1, 2. If FWD & COM or REV & COM are not connected the keypad flashes, “- - - -” . If both FWD, REV are connected simultaneous to COM the keypad flashes, “def”.			
F 002	Speed Adjustment	0) Analog signal to Vin & GND (0~10V) or Iin & GND (4~20mA)	
		1) Keypad Arrow Keys with Hz display. (Factory Default: 1)	
		2) Keypad Arrow Keys with RPM display when arrow keys are pressed.	
		3) Keypad Arrow Keys with user defined meter displayed when arrow keys are pressed. (See F007)	
		4) Digital Speed Input, terminals X1 trough X6, See F 052 through F 057	
F 019	Acceleration Time	0 to 3200 sec. (Factory: 1/2 to 5 Hp 5 sec, 7.5 to 30 Hp 15 sec, 40Hp & up, 30 sec.)	
F 020	Deceleration Time	0 to 3200 sec. (Factory: 1/2 to 5 Hp 5 sec, 7.5 to 30 Hp 15 sec, 40Hp & up, 30 sec.)	
F 035	Maximum Output Voltage	RM5G-2***, 0.1V ~ 255V, (Factory Default: 220V)	
		RM5G-4***, 0.1V ~ 510V, (Factory Default: 380V)	
		In North America, this should be set from 440V to 480V	
F 048	Motors Full Load Amps Rating	See motor's data plate for the Full Load Amps (FLA).	
F 082	Stop Parameters	0) Controlled Deceleration Stop (Factory Default:	
		1) Coast to Stop (i.e. Freewheeling)	
		2) Coast to Stop + DC Braking, See F 076 and F 075	
F 095	Input Voltage (for RM5G program reference)	RM5G-2***, 190V ~ 240V, Factory Default: 220V	
		RM5G-4***, 340V ~ 480V, Factory Default: 380V	
		In North America, this setting should be set from 440V to 480V	
F 134	Commands Default Display: 0	Table for F 134	
		0) Not Active	SAu) Save Program
		CLF) Clear Faults listed in F 091	rES) Restore Previous Settings
		dEF60) Factory 60 Hz settings	rd_EE) Copy Settings to Keypad
		dEF50) Factory 60 Hz settings	Uur_EE) Copy keypad settings to RM5G
		Instructions for F 134. Scroll to the function required then press and hold the FUN/DATA key and wait for the word “end” to appear.	

Section 3.6) Fundamental Motor and Electrical Parameters

Important, the Maximum Output Voltage (F 035) is a high priority setting.

F 035	Maximum Output Voltage	RM5G-2***	(Factory Default: 220V) Range 0.1V to 255V
		RM5G-4***	(Factory Default: 380V) Range 0.1V to 510V In North America, this should be set from 440V to 480V
F 048	Motor Full Load Amps (FLA)	See the motor data plate for the Full Load Amps (FLA)	
F 049	Motor No Load Amps	See the motor data plate for the No Load Amps If not available run the motor with no load a view the Amperage on the keypad. To view amperage press the FUN/DATA until the number 5 appears, this displays the Amperage.	
F 051	Number of Motor Poles	2, 4, 6, 8, 10 (Factory Default: 4)	
F 079	Low Input Voltage Switch Off Level	RM5G-2***	(Factory Default: 175V) Range 130V to 192V
		RM5G-4***	(Factory Default: 320V) Range 230V to 384V With 440V to 480V input power, Electric Regulator recommends programming F 079 to 384V
F 095	Input Voltage (Reference for RM5G program)	RM5G-2***	(Factory Default: 220V) Range 190V to 140V
		RM5G-4***	(Factory Default: 380V) Range 340V to 480V

440V to 480V motors 75 HP and higher
Set the jumper in the diagram below
to the input voltage



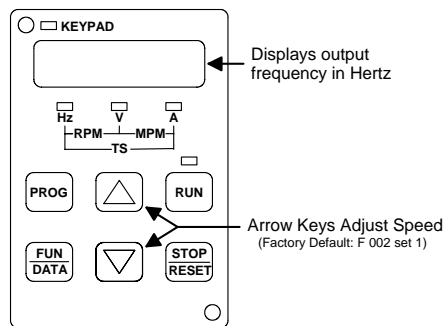
Section 4.01 **Speed Adjustment (i.e. Speed Reference)**

The RM5G has three methods of speed adjustment.

- Keypad speed adjustment, this is the factory default.
- Analog signal to terminals Vin or Iin.
- Digital speed adjustment through the X terminals.

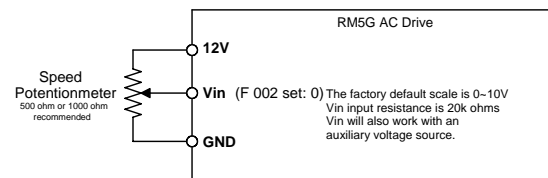
F 002	Selecting Speed Adjustment Input	0) Analog signal connected to Vin and GND (0 ~ 10V) or Iin and GND (4 ~ 20 mA)
		1) Keypad arrow keys with Hz display (Factory Default: 1)
		2) Keypad arrow keys with RPM display when keys are pressed
		3) Keypad arrow keys with user defined units (MPM) display when keys are pressed
F 004	Keypad Speed Adjustment	0) Disable keypad arrow keys during motor operation.
		1) Enable keypad arrow keys during motor operation (Factory Default: 1)
F 005	Speed Memory (Keypad Only)	0) Disable speed memory, manual adjustment only.
		1) Enable speed memory, stored after 3 minutes of operation. (Factory Default: 1)

Keypad Speed Adjustment

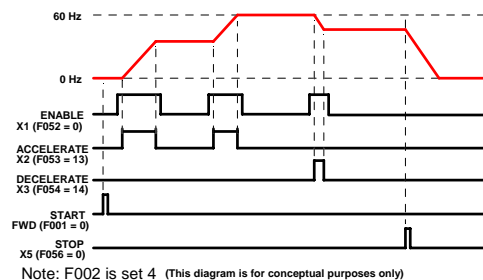


Vin Speed Adjustment

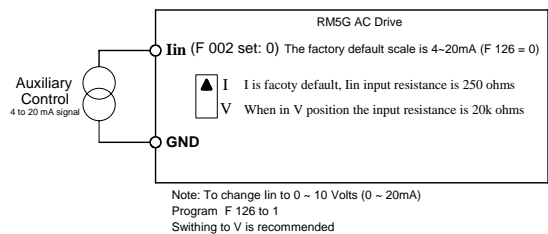
(i.e. Analog Speed Reference)



Digital Speed Adjustment

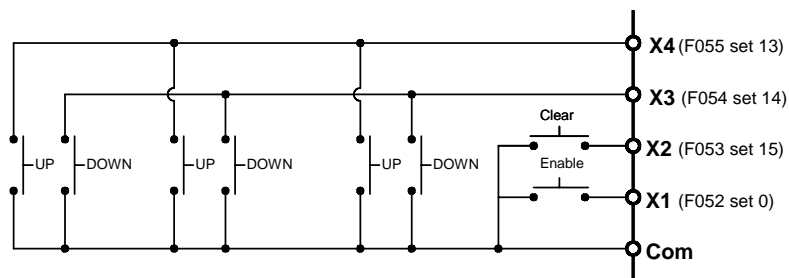


Iin Speed Adjustment



Manual Digital Speed Adjustment

(Example of Multiple Speed Adjustment Stations)



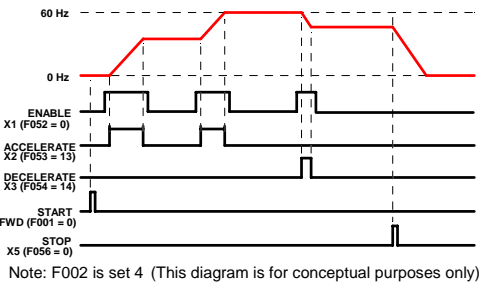
Section 4.02) Digital Speed Adjustment (Input)

The speed can be adjusted digitally to interface with a Programmable Logic Control (PLC). Digital speed adjustment can also be operated manually, serving multiple manual control stations (simulates a motorized pot with memory or without memory).

Refer to the program settings in yellow highlight

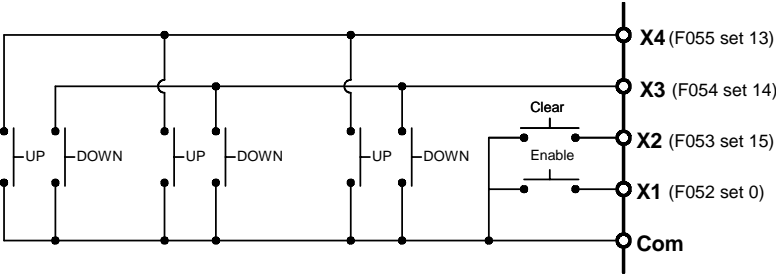
F 002	Speed Adjustment Input	0) Terminals activate start forward or reverse 1) Keypad arrow keys (Factory Default) 2) Keypad start, terminal select forward or reverse 3) Keypad with MPM displayed when arrow keys are pressed 4) Digital speed adjustment			
F 052	X1 input terminal	F 052 programs terminal X1 to enable digital speed adjustment 0) Enable digital speed adjustment			
F 053 (X2) F 054 (X3) F 055 (X4) F 056 (X5) F 057 (X6)	X2 through X6 input terminals	Terminals X2 through X6 can be programed to be digital speed inputs. Accelerate (ramp up) ± 13 Decelerate (ramp down) ± 14 Clear speed setting ± 15			
F 108	Digital Input Response Time	5 to 16 ms (Default 10ms)	Signal to the digital input must exceed the time of F 108.		
F 118	Digital Speed Memory	0) Clear the speed from memory when power is off (Factory Default: 0) 1) Save the speed in memory when power is off.			
F 119	Digital Speed Adjustment Frequency Increments	0) 0.01Hz 1) 0.05Hz 2) 0.10Hz 3) 0.15Hz 4) 0.20Hz	5) 0.25Hz 6) 0.30Hz 7) 0.35Hz 8) 0.40Hz 9) 0.50Hz	10) 1.00Hz 11) 1.10Hz 12) 1.20Hz 13) 1.30Hz 14) 1.40Hz	From 10 to 250 the speed is increased by 0.10Hz
F 120	Digital Speed Adjustment Operating Mode	1) 1 second 2) 2 seconds 3) 3 seconds 4) 4 seconds 5) 5 seconds 6) 1 increment	First Example: If F 119 is 10 and F 120 is 6, when the signal is received the speed will increase only 1 Hz. Second Example: if F 119 is 10 and F 120 is 2, when the signal is held on, the speed will immediately increase 1Hz then level for 2 seconds and then accelerate continuously		
F 121	Keypad Adjustment of Digital Speed Adjustment	When digital speed adjustment is used, the user can adjust the speed with the keypad by entering F 121. Important Note: Don't operate F 121 and the X terminals at the same time.			

Digital Speed Adjustment Sequence Diagram



Note: F002 is set 4 (This diagram is for conceptual purposes only)

Example of digital speed inputs being used to simulate a motorized potentiometer



Section 4.03) Analog Input Signal Scale

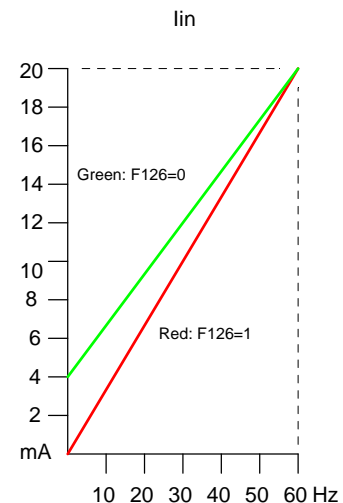
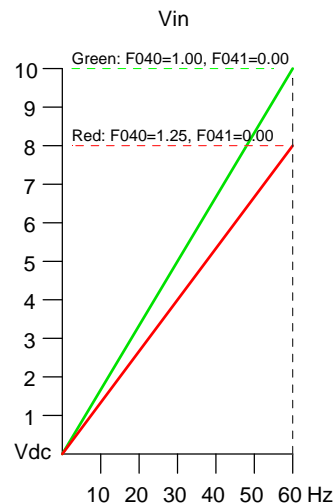
The RM5G has two analog inputs Vin and Iin, the signal scales can be changed by the user.

- Vin default scale is 0 ~ 10V, the input resistance is 20k Ohms.
- Iin default scale is 4 ~ 20mA and input resistance is 250 Ohms (SW1 set to I and J5 set 250) Jumper J5 can be set to 250 Ohms or 500 Ohms, see page 12 for details.

Iin can be changed to Voltage scale by changing SW1 to V, this changes the input resistance to 20k Ohms and programming F 126 to 1.

Note: See page 12 for the location of the SW1 jumper or switch and Jumper J5.

F 040	Vin Maximum Scale (Vin Gain)	0.00 to 2.00 (Factory Default: 1.00)	Terminal Vin default voltage scale is 0 to 10V. The maximum value can be set between 5 to 10V. Example: If F 040 is set 1.25 the result is 0 to 8V scale. Formula (10/1.25=8)
F 041	Vin Minimum Scale (Vin Bias)	-1 to 1 (Factory Default: 0.00)	The minimum value (bias) of the scale can be increase. The RM5G has two methods of adjusting F 041. <u>First method:</u> Adjusting F 041 while the motor is running, this often achieves best results. <u>Note:</u> If F 040 is other than 1.00, adjusting F 041 will change the maximum scale (gain). <u>Second method:</u> Mathematical formula, the results are approximate. When F 040 = 1.00 the Formula is: $\sin(F041*90)*-5.5$ Example: $\sin(-0.20*90)*-5.5 = 1.699$ Volts, approximately.
F 126	Iin Predefined Scales	0) 4 ~ 20mA (Factory Default: 0) 1) 0 ~ 20mA or 0 ~ 10V, Note: F 127 and F 128 requires F 126 =1	
F 127	Iin Maximum Scale (Iin Gain)	0.00 to 2.00 (Factory Default: 1.00)	F 127 requires F 0126 =1 (0 to 20mA) The maximum value can be set between 10mA to 20mA. Example: F 127 = 2.00 the result is 0 to 10mA. Formula (20/2=10) Notes: These instructions apply when DWS1 is set to I. If DSW1 is set V, the instructions for F 040 would apply.
F 128	Iin Minimum Scale (Iin Bias)	-1.00 to 1.00 (Factory Default: 0.00)	F 0128 requires F 0126 =1 (0 to 20mA) The RM5G has two methods of adjusting F 128. <u>First method:</u> Adjusting F 128 while the motor is running, this often achieves best results. <u>Note:</u> If F 127 is other than 1.00, adjusting F 128 will change the maximum scale (gain). <u>Second method:</u> Calculating by formula, the results are approximate. When DWS1 = I, F126 = 1 and F127 = 1.00 (20mA) The formula is: $\sin(F128*90)*-11$ Example: $\sin(-0.20*90)*-11 = 3.399$ mA approximately. If DSW1 = V, see F 041 formula



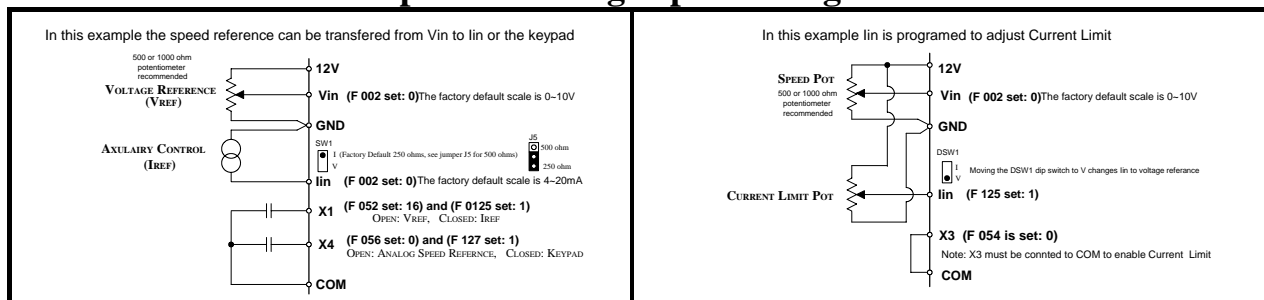
Section 4.04) Analog Inputs Vin and Iin Features

Analog inputs are also known as Speed Reference inputs.

- The RM5G has two analog inputs, Vin and Iin.
- Vin (Voltage input) default scale is 0 ~ 10 V.
- Iin, default scale is 4 ~ 20 mA, $R_L=250\Omega$.
The Iin terminal can be changed to a voltage input by jumper or switch SW1. The I position is for mA signal ($R_L = 250\Omega$ or 500Ω , see jumper J5 on page 12), the V position is for voltage signal ($R_L= 20k\Omega$).
- The scale of Vin and Iin can be defined by the user, see F 040, F 041, F 126, F 127 and F 128.
- The Vin and Iin inputs can be programmed to perform other functions such as current limit, voltage limit, bias and gain. see F 124 and F 125.
- Command can be transferred between Vin and Iin while the motor is running. See F 122, F 123 and the sections for F 052 through F 057..

F 002	Speed Adjustment Input	0) Terminals Vin or Iin 1) Keypad Arrow Keys with Hertz display (Factory Default: 1) 2) Keypad Arrow Keys with RPM displayed when keys are pressed. 3) Keypad Arrow Keys with User Defined Units displayed when keys are pressed. 4) Digital Speed Command (Terminals X1 ~ X6, See F052 ~ F057)
F 052 F 053 F 054 F 055 F 056 F 057	Transferring Command between Vin and Iin	When one of the digital inputs is set to +16 or -16 (terminals X1 to X6). It will transfer command to the secondary speed input selected by F 122. <u>Example:</u> When F 122 is set to 0, F 123 is set to 3 and F055 is set to 0. A signal to a digital input X4 transfers command to the secondary analog speed adjustment. Note: Vin is primary, Iin is secondary.
F 055	Transferring Command to the Secondary Analog Speed Input	When F055 is set to 0, F 122 is set to 0 and F 123 is set to 3. A signal to a digital input X4 transfers command to the secondary analog speed reference. Note: Vin is primary, Iin is secondary.
F 122	Selecting the Secondary Speed Input	0) Analog Speed Reference Vin or Iin, See F 123, number 3 (Factory Default: 0) 1) Keypad Arrow Keys 2) Digital Speed Adjustment Note: A digital input must be set +16 or -16, See function codes F 052 ~ F057
F 123	Secondary Analog Speed Ref., Function	0) Vin + Iin, The sum of Vin and Iin signals. (Factory Default: 0) 1) Vin-Iin (Vin sets maximum, Iin adjusts with in the range.) 2) Iin-Vin (Iin sets maximum, Vin adjusts with in the range.) 3) Vin or Iin is selected by digital input, See F055 set: +16 or -16
F 124	Vin Functions	0) Iin maximum scale (Iin Gain) 1) Voltage Speed Reference (V_{REF}) (Factory Default: 1) 2) Current Limit (When terminal X3 is programmed to 0, F 054=0) 3) Voltage Limit (V/F pattern maximum voltage)
F 125	Iin Functions	0) Vin maximum scale (Vin Gain) 1) Current Speed Reference (I_{REF}) (Factory Default: 1) 2) Current Limit (When terminal X3 is programmed to 0) (Current Limit Range 0 ~ 150%) 3) Voltage Limit (V/F pattern maximum voltage)

Examples of Analog Input Configurations



Section 4.05) Start, Stop, Forward and Reverse

The RM5G's default program is to start and stop from the keypad. Many alternate methods beyond the diagrams shown here are possible. For information about Dynamic Braking (DB) and DC braking see pages 22 and 23.

F 001	Start, Stop, Forward and Reverse	0) Terminals FWD or REV activate Start forward or Reverse (Keypad is disabled)
		1) Terminal FWD activates start forward only (Keypad is disabled)
		2) Keypad Start (i.e. Run), Terminals FWD and REV select direction
		3) Keypad Start (i.e. Run), Forward only (Factory Default: 3)
F 003	Keypad Stop	0) Disable Keypad Stop
		1) Enable Keypad Stop (Factory Default: 1)
F 056	Stop, Positive Logic (Digital Input X5)	When terminal X5 (F 056) is set: 0. Stop is achieved by momentarily closing X5 and COM for not less than 30 ms. This facilitates interfacing with PLC or momentary stop button. Note: When F 056 is set: 0. Terminals FWD and REV only require 30 ms signal to start. Sustaining the signal to FWD or REV is no longer required.
F 057	Stop, Negative Logic (Digital Input X6)	When terminal X6 (F 057) is set: 0. Stop is achieved by momentarily opening X6 and COM for not less than 30 milli seconds. This facilitates interfacing with PLC or simulation of a three line sustaining circuit. Note: When F 057 is set: 0. Terminals FWD and REV only require 30 ms signal to start. Sustaining the signal to FWD or REV is no longer required.
See table to left	Secondary Coast to Stop (i.e External Fault)	When the application requires both controlled deceleration stop button and uncontrolled deceleration stop button. Some electrical codes require Emergency Stop to coast to stop. Program one of the X terminals to ± 7 . Afterwards this requires reset either by an X terminal set to ± 6 (X6 is 6 by default) or resetting by pressing the keypad stop button. X1 (F 052) X3 (F 054) X5 (F 056) X2 (F 053) X4 (F 055) X6 (F 057)
F 082	Stop	0) Controlled Deceleration Stop (Factory Default: 1)
		1) Coast to Stop
		2) Coast and DC Braking, See page 21
F 083	Reverse	0) Enable Reverse (Factory Default: 0)
		1) Disable Reverse

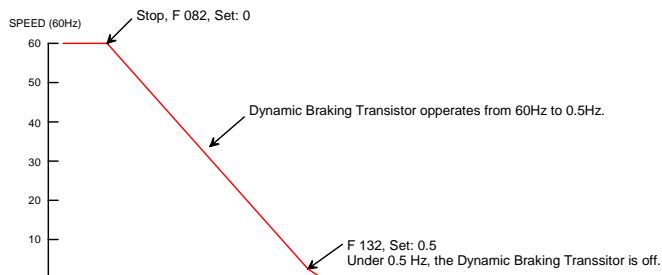
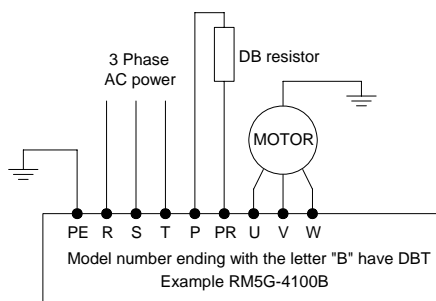
Examples of Start, Stop circuits

<p>Classic Three Line Sustaining Circuit</p> <p>Note: When F001 is set 0 or 1, the input signal must be sustained.</p>	<p>Simulated Three Line Sustaining Circuit</p> <p>Note: When F001 is set 0 or 1 and F057 is set 0. Then FWD and REV only require a momentary input signal.</p>
<p>Forward and Reverse using pulse signals</p> <p>Note: F001 is set 0 and F056 is set 0. When changing direction, first a stop signal next a REV or FWD signal.</p>	<p>Start & Stop circuit with momentary buttons</p>

Section 4.06) Dynamic Braking (i.e. DB)

The RM5G will handle up to 50% of the motor's regenerative amperage without a dynamic braking resistor. If the motor's regenerative amperage exceeds 50%, then dynamic braking is required. The drives rated from ½ to 15 HP have an internal Dynamic Braking Transistor (DBT) included as a standard feature. Drives above 15 HP the internal DBT is optional feature. To determine if your drive has a DBT, the model number will end with the letter "B", Example RM5G-4100B.

F 132	Dynamic Braking End Frequency	0.1 to 60.0 Hz (Factory Default: 0.5)	The Dynamic Braking Transistor (DBT) will stop operating at the frequency setting of F 132. Setting below 0.5 is not recommended.
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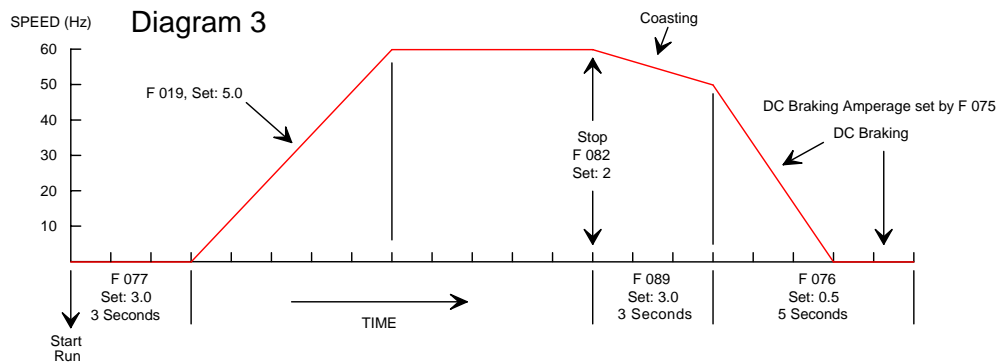
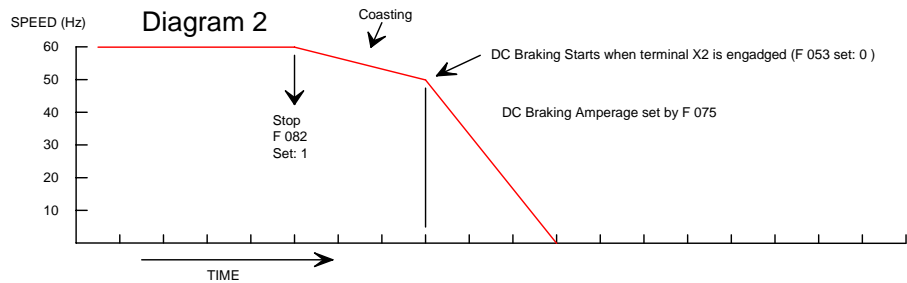
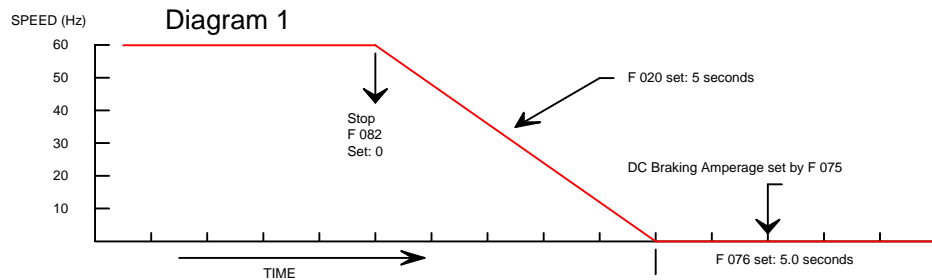


Section 4.06A) Dynamic Brake Resistor Table (DB resistor) Note: Resistor dimensions are on page 52.

Model #	Typical Resistance	Recommended Resistor/s	Model #	Typical Resistance	Recommended Resistor/s
RM5G-200 ½	100Ω	MHL 100W-100Ω	RM5G-4001	400Ω	MHL 100W-400Ω
RM5G-2001	100Ω	MHL 100W-100Ω	RM5G-4002	200Ω	MHL 100W-400Ω Two in parallel
RM5G-2002	100Ω	MHL 100W-100Ω	RM5G-4003	133Ω	MHL 100W-400Ω Three in parallel
RM5G-2003	40Ω	MHL 500W-40Ω	RM5G-4005	100Ω	MHL 100W-400Ω Four in parallel
RM5G-2005	20Ω	MHL 500W-40Ω Two in parallel	RM5G-4007	80Ω	MHL 500W-40Ω Two in series
RM5G-2010			RM5G-4010		
RM5G-2015	13.3Ω	MHL 500W-40Ω Three in parallel	RM5G-4015	40Ω	MHL 500W-40Ω Set of two in series Two sets in parallel Total of four pieces
RM5G-2020B	10Ω	MHL 500W-40Ω Four in parallel	RM5G-4030B	20Ω	MHL 500W-40Ω Set of two in series Four sets in parallel Total of eight pieces
RM5G-2030B	6.6Ω	MHL 500W-40Ω Six in parallel	RM5G-4050B	13.3Ω	MHL 500W-40Ω Two in series Six sets in parallel Total of twelve pieces
RM5G-2040B	3.3Ω	MHL 500W-40Ω Twelve in parallel	RM5G-4060B	10Ω	MHL 500W-40Ω Set of two in series Eight sets in parallel Total of sixteen pieces
RM5G-2050B	2.5Ω	MHL 500W-40Ω Sixteen in parallel	RM5G-4075B	8Ω	MHL 500W-40Ω Set of two in series Eight sets in parallel Total of twenty pieces
			RM5G-4100B		

Section 4.07) DC Braking

F 053	Terminal X2 DC Braking	When F 053 is set to 0, DC braking is applied by engaging X2 to Com.			Factory Default: 4
F 075	DC Braking Amperage	0 to 150% of the RM5G output rating on data label			Factory Default: 50%
F 076	DC Braking Time	F 082 is 0 0.1 to 20 sec Factory Default 0.5	F 082 is 1 F 076 is Disabled	F 082 is 2 1 to 200 sec See text at bottom the of this page	
F 077	Pre Start Motor Magnetizing Time	0 to 20 Sec. Factory Default 0.0	F 077 helps when motors have difficulty starting. When the start signal is received, DC is applied to the motor for the time setting of F 077, the DC amperage is set by F 075. See Diagram 3 for details		
F 082	Stop Parameters	0) Controlled Deceleration to Stop 1) Coast to Stop (Freewheeling) 2) Coast then DC braking			Factory Default: 0
F 089	DC Braking Delay Time	0.5 to 5 sec. Factory Default: 0.5	When F 082 is 2, F 089 sets the delay time before DC braking is applied.		



When F 082 is set 2, F 076 time length varies with the frequency attained.

Example 1) If the frequency is set to 60 Hz and the motor reaches 60 Hz, the DC braking time will be 10 times F 076 (F 076 is 0.5 x 10 = 5 seconds.)

Example 2) If the frequency is set to 60 Hz and the motor is stopped at 54 Hz (90%), the DC braking time will be 9 times F 076 (F 076 is 0.5 x 9 = 4.5 seconds.)

Section 4.08) Power Interruption Response

Power interruption is when the power is interrupted for sort time or the voltage is too low, see F079. The drive's DC link (capacitor bank) is large enough to supply power through very short power interruptions. This allows the motor to continue running (pass-through) short power interruptions. The user can selected the drives response to a power interruption by programming F 078. If you select 3, see the next section about stopping when the power is interrupted.

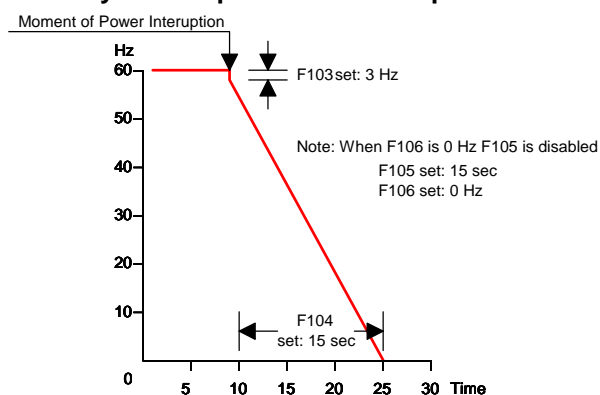
F 078	Power Interruption Response	0) Disable Pass-through Factory Default: 0	
		1) Enable Pass-through (see F 089)	
		2) Shut Off	
		3) Enable Controlled Deceleration Stop when power is interrupted.	
F 079	Power Interruption Switch Point Voltage	RM5G-2*** 130V to 192V,	Factory Default: 175V
		RM5G-4*** 230V to 384V,	Factory Default: 330V
F 089	Power Interruption Ride-through Restart Time Limit	0.5 to 5 sec. Factory Default: 0.5	F 089 sets the time limit of a power interruption and pass-through will restart. If the time is exceeded the RM5G will remain off. (Note: F 078 must be set to 1)
F 095	Input Voltage Calibration	RM5G-2*** 190V to 240V	Factory Default: 220V
		RM5G-4*** 340V to 480V	Factory Default: 380V

Section 4.09) Power Interruption Controlled Stop Program

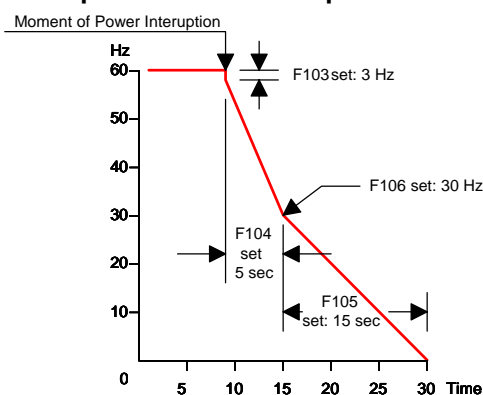
If power is interrupted the factory default is to let the motor coast to a stop, F 078 set to 0.

If controlled stop is required, program F078 to 3. The deceleration curve is defined by function codes F103, F104, F105 and F106.

Factory default power failure stop



Example of user defined power failure stop



F 103	Power Interruption Frequency Reduction	0 to 20 Hz Factory Default: 3	When the power is interrupted the frequency will immediately be reduced by F 103 setting. Note: F 103 setting is too large, this could cause hard braking and possibly trip off the RM5G, resulting in the motor coasting.
F 104	1st Decel Time from F 103 to F 106	0 to 3200 sec Factory Default: 15	If F 106 is set 0 Hz and F 104 is set 15 sec., the motor will decel to a stop in 15 sec. If F 106 is set 30 Hz the motor will decel to 30 Hz in 15 sec.
F 105	2nd Decel Time from F 106 to stop	0 to 3200 sec Factory Default: 15	If F 106 is set 0 Hz F 105 is inactive. If F 106 is set 30 Hz and F 105 is set 15 sec., the motor will decel from 30 Hz to stop in 15 sec.
F 106	Switch Point Frequency from first to second deceleration time	0 to 400 Hz Factory Default: 0	F 106 frequency setting is the point when the 1st decel time switches to the 2nd decel time. If F 106 is set 0 Hz, the 2nd decel time is disabled.

Section 4.10) Frequency Scale of Acceleration & Deceleration (F 018)

The frequency scale of the acceleration and deceleration times are determined by F 018.

Example: If F 018 frequency is set to 60 Hz., and F 019 is set to 15 seconds. The motor will reach 60 Hz in 15 sec. If F 018 is changed to 30 Hz. The motor will reach 30 Hz in 15 seconds and 60 Hz in 30 seconds.

Section 4.11) Acceleration & Deceleration Times (F 019 and F 020)

The acceleration and deceleration time of the primary speed, speed levels 4, 5, 6, 7 and Jog are programmed by F 019 and F 020. Speed Levels 1, 2 and 3 acceleration and deceleration times are programmed independently by F 021 through F 026, see page 29.

Section 4.12) Secondary Acceleration & Deceleration Times (F 027 & F028)

The secondary acceleration and deceleration times will override all other settings when input X4 is activated. Secondary acceleration & deceleration time are programmed by F 0 27 and F 028.

Note: F 055 must be set to 2 for X4 to activate secondary acceleration & deceleration.

Acceleration & Deceleration Function Codes

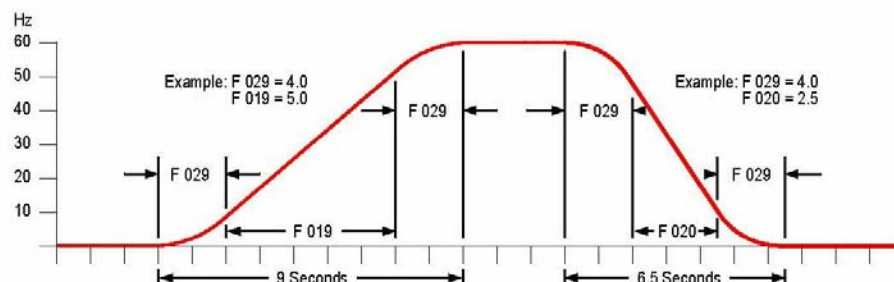
F 018	Frequency Scale of Acceleration & Deceleration	0.1 to 400 Hz Factory Default: 60	Example: If acceleration is set 15 seconds and the frequency scale (F 018) is set 60. The motor will accelerate to 60 Hz in 15 seconds. If F 018 is 30, the motor will accelerate to 30 Hz in 15 seconds and 60 Hz in 30 seconds.
F 019	Primary Acceleration Time Also Speed Levels 4, 5, 6, 7 & Jog	0.1 to 3200 Sec.	Factory Defaults: (1/2 to 5 HP: 5 sec.) (7.5 to 30 HP: 15 sec.) (40 Hp & up: 30 sec.)
F 020	Primary Deceleration Time Also Speed Levels 4, 5, 6, 7 & Jog	0.1 to 3200 Sec.	Factory Defaults: (1/2 to 5 HP: 5 sec.) (7.5 to 30 HP: 15 sec.) (40 Hp & up: 30 sec.)
F 027	Secondary Acceleration Time	0.1 to 3200 Sec. Factory Default: 15 sec	Secondary acceleration time is activated by input X4, Function code F 054 must be set to 2
F 028	Secondary Deceleration Time	0.1 to 3200 Sec. Factory Default: 15 sec	Secondary deceleration time is activated by input X4, Function code F 054 must be set to 2
F 054	X4 Input Terminal	0 to ± 16 Factory Default: 2	The factory default setting of 2 enables secondary acceleration and deceleration

Section 4.13) S-curve Starting, Leveling and Stopping

The S-curve time is in addition to the acceleration and deceleration times.

Example: If the S-curve time is programmed to 4 seconds and the acceleration time is 5 seconds, the total acceleration time is 9 seconds. If the deceleration time is 2.5 seconds, the total deceleration time is 6.5 seconds, see diagram below.

F 029	S-Curve Acceleration & Deceleration	0.0 to 5.0 seconds	Factory Default: 0.0
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Section 4.14 **Digital Inputs X1 through X6 programing**

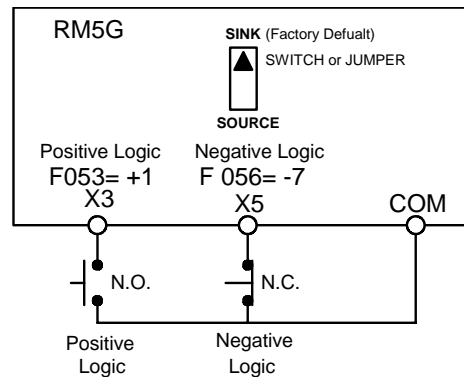
Digital inputs receive signals to engage the RM5G program features. The RM5G's digital inputs by factory default are positive logic and sink (NPN).

Digital Input Terminals X1 through X6			Table for terminals X1 through X6 See section 4.11 about positive and negative logic	
			0) X1: Enable Digital Speed Adjustment	±6) Reset
			0) X2: DC braking	±7) Coast to Stop (thr is displayed)
			0) X3: Current Limit	±8) Disable Outputs (bb is displayed)
			0) X4: Select Analog Speed Input Vin or Iin	±9) Freewheel (Fr is displayed) See Warning !!!
			0) X5: Stop, Positive Logic	±10) Speed search from Max., Hz.
			0) X6: Stop, Negative Logic	±11) Speed search from set Hz.
Function Codes	Input Terminals	Factory Defaults	±1) Jog	±12) Hold Speed
F 052	X1	3	±2) Secondary Accel & Decel	±13) Digital Speed Adjustment, Accel.
F 053	X2	4	±3) Preset Speed Level Input 1, Typically X1	±14) Digital Speed Adjustment, Decel.
F 054	X3	1	±4) Preset Speed Level Input 2, Typically X2	±15) Clear Digital Speed Adjustment
F 055	X4	2	±5) Preset Speed Level Input 3, Typically X3	±16) Select Vin or Iin.
F 056	X5	7		
F 057	X6	6		

Section 4.15 **Positive Logic and Negative Logic**

Positive logic the circuit is Normally Open (N.O.) When the circuit is closed the program is engaged.

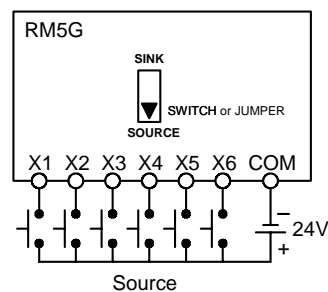
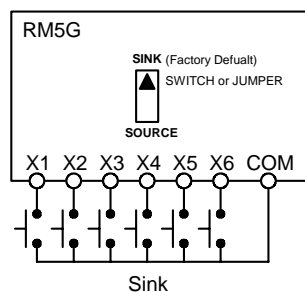
Negative logic the circuit is Normally Closed (N.C.) When the circuit is opened the program is engaged.



Section 4.16 **Sink or Source**

The X terminals have a Sink (NPN) or Source (PNP) switch or jumper, the factory default is Sink.

When set to Source, the auxiliary power must be 24V_{DC}, see diagrams below.



Section 4.17 Digital Inputs X1 through X6 reference

0) X1: Enable Digital Speed Adjustment

This function is exclusive to terminal X1 and is positive logic only, see section 4.02 on page 18.

0) X2: DC braking

This function is exclusive to terminal X2 and is positive logic only, see section 4.07 on page 23.

0) X3: Current Limit

This function is exclusive to terminal X3 and is positive logic only, see page 20, diagram on the bottom left of the page.

0) X4: Select Vin or Iin

This function is exclusive to terminal X4 and is positive logic only, see section 4.04 on page 20.

0) X5: Stop, Positive Logic

This function is exclusive to terminal X5, see page 21, diagram Start & Stop with momentary buttons and the diagram Forward and Reverse using pulse signals.

0) X6: Stop, Negative Logic

This function is exclusive to terminal X6, see page 21, diagram of Simulated Three Line Sustaining Circuit.

±1) Jog

X3 is factory default is Jog (+1), when engaged the motor will go the frequency setting of F 017 with the acceleration of F 019 and deceleration of F 020. Jog is a momentary function.

±2) Secondary Acceleration & Deceleration

X4 is factory default set to +2, for details see section 4.12, page 25.

±3) Preset Speed Level Input 1

X1 is factory default set to +3, for details see section 4.18, page 29.

±4) Preset Speed Level Input 2

X2 is factory default set to +4, for details see section section 4.18, page 29.

±5) Preset Speed Input 3

This setting is typically applied to X3 (F 054), This enables pre-set speed levels 4 through 7. See section_section 4.18, page 29.

±6) Reset

±7) Coast to stop and keypad displays “thr”.

Notes: Keypad operation (F001=3, F002=1) the stop button must be pressed before restarting.

Notes: Vin or Iin operation, FWD or REV must be cleared and system reset, when factory default X6 is reset.

±8) Disable Outputs Y1, Y2 and Relays T1 and T2, keypad displays “bb”

See page 30, section 4.19

Section 4.17 continued **Digital Inputs X1 through X6 reference**

±9) Motor Freewheels and keypad displays “Fr”

Warning !!! When ±9 is disengaged the motor will immediately restart from zero Hertz. Great care and consideration should be given when applying this program.

±10) Speed search from maximum frequency

±11) Speed search from set frequency

±12) Hold Speed

When engaged the speed will immediately put on hold at the frequency (Hz) of the moment.

±13) Digital Speed Adjustment Accelerate

Increases the frequency, see section 4.02 on page 18.

±14) Digital Speed Adjustment Decelerate

Decreases the frequency, see section 4.02 on page 18.

±15) Clear Digital Speed Adjustment

Clears the speed from memory, resetting it to zero, see section 4.02 on page 18.

±16) Select Vin or Iin

Transfers command between Vin and Iin, see section 4.04 on page 20.

Section 4.18 Pre-set Speed Levels

In addition to the adjustable primary speed, the RM5G has seven pre-set speed levels.

The factory default program has speed levels 1, 2, 3 and Jog enabled. To enable speed levels 4 through 7, program terminal X3 (F 054 set to 5). The speed levels are activated in binary order.

Note: Speed Levels 4 through 7, On* and Off* indicated F 054 is set 5

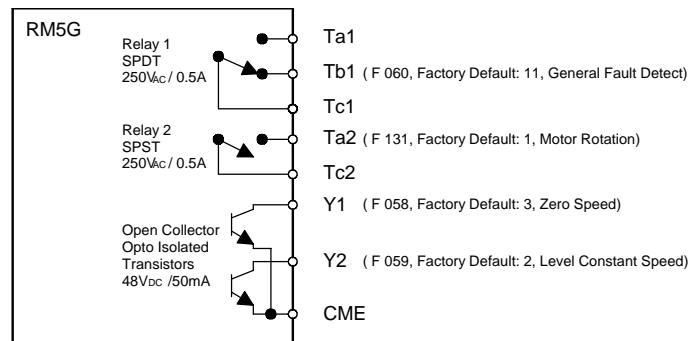
Note: Secondary Acceleration & Deceleration will override when engaged

				Terminals		
				X3*	X2	X1
F 009	Primary Speed Level (Adjustable Speed)	0 to 400 Hz	Factory Default: 60 Hz	Off	Off	Off
F 010	Pre-set Speed Level 1	0 to 400 Hz	Factory Default: 10 Hz	Off	Off	On
F 011	Pre-set Speed Level 2	0 to 400 Hz	Factory Default: 20 Hz	Off	On	Off
F 012	Pre-set Speed Level 3	0 to 400 Hz	Factory Default: 30 Hz	Off	On	On
F 013	Pre-set Speed Level 4	0 to 400 Hz	Factory Default: 0 Hz	On*	Off*	Off*
F 014	Pre-set Speed Level 5	0 to 400 Hz	Factory Default: 0 Hz	On*	Off*	On*
F 015	Pre-set Speed Level 6	0 to 400 Hz	Factory Default: 0 Hz	On*	On*	Off*
F 016	Pre-set Speed Level 7	0 to 400 Hz	Factory Default: 0 Hz	On*	On*	On*
F 017	Jog	0 to 400 Hz	Factory Default: 6 Hz	For Jog X3, On and F 053 set to 1		
F 021	Pre-set Speed Level 1 Acceleration Time	0 to 3200 sec	Factory Default Varies with HP	Speed levels 4 through 7 have the acceleration and deceleration times of F 019 and F 020.		
F 022	Pre-set Speed Level 1 Deceleration Time	0 to 3200 sec	Factory Default Varies with HP			
F 023	Pre-set Speed Level 2 Acceleration Time	0 to 3200 sec	Factory Default Varies with HP			
F 024	Pre-set Speed Level 2 Deceleration Time	0 to 3200 sec	Factory Default Varies with HP			
F 025	Pre-set Speed Level 3 Acceleration Time	0 to 3200 sec	Factory Default Varies with HP			
F 026	Pre-set Speed Level 3 Deceleration Time	0 to 3200 sec	Factory Default Varies with HP			
F 054	X3 Input Terminal	0 to ± 16	Factory Default: 1	Set F 054 to 5, to enable speed levels 4 through 7,		

Section 4.19) Digital Outputs

The RM5G has two relays and two transistor outputs. Relay 1 is a Single Pole Double Throw (SPDT) relay. Relay 2 is a Single Pole Single Throw (SPST) relay. They are both rated up to 250V_{AC} / 0.5A. Terminals Y1 and Y2 are open collector, opto-isolated transistor outputs and are rated 48V_{DC} / 50mA. Note: If an X terminal is programmed ± 8 , when engaged all the digital output are disabled and the keypad displays “bb”.

F 058	Y1 Terminal	Factory Default: 3	Table for Y1, Y2, Relay 1 and Relay 2 ±1) Motor Rotation ±8) Dynamic Braking ±2) Level Speed (See F061 and F062) ±9) Low Voltage Pass-through ±3) Zero Speed ±10) General Fault Pass-through Detected ±4) Freq., Output Detected (see F 063) ±11) General Fault Detected ±5) Overload (OLO) (see F 065 = 1) ±6) Stall Prevention Detected ±7) Low Input Voltage (LE)	
	Y2 Terminal	Factory Default: 2		
	Relay 1	Factory Default: 11		
	Relay 2	Factory Default: 1		
	Open Collector Transistor			
	Open Collector Transistor			
	Terminals: Ta1, Tb1, Tc1			
	Terminals: Ta2, Tc2			



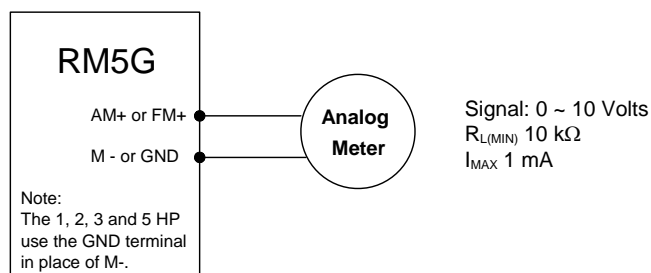
Section 4.20) Analog Outputs (i.e. Analog Meters)

The RM5G has two analog outputs, their maximum output power is 10V, 1mA.

The meter's recommend input resistance is 10,000 ohms ($R_L = 10k\Omega$).

F 044	FM+	Factory Default: 1	Table for AM+ and FM+ 0) Frequency (Hertz) 3) Vin input signal 6) Voltage Output 1) Keypad speed setting 4) Iin input signal 2) Amperage output 5) DC Voltage (PN)		
	Analog Output				
F 129	AM+	Factory Default: 2			
	Analog Output				

F 045	FM+ Scale	00.0 to 2.00	The factory default scale is 0 ~ 10V, The function code entry is a multiplier of 10 Volts Example, to change the scale to 0 ~ 8V, enter 0.80 (0.80 x 10 = 8.0V)
	(Gain)	Factory Default: 1.00	
F 130	AM+ Scale	00.0 to 2.00	
	(Gain)	Factory Default: 1.00	



Section 4.21) Keypad Default Display

The keypad LED display can be programmed to display one of the eight parameters listed below.

F 006	Keypad Default Display	1) Hertz Output	4) DC Voltage (PN)	7) User Defined Meter
		2) Speed Adjust, Hz	5) Amperage	8) Terminal Status
		3) Voltage	6) RPM	Factory Default: 1

Section 4.22) User Defined Meter (i.e. MPM)

The user defined meter is often referred to as MPM (Meters Per Minute). The keypad default display or the optional DM-501 meters can be programed to display MPM.

Example: You have a conveyer that runs at 250 feet per minute when the motor is at full speed, 60 Hz. You want the meter to display feet per minute (FPM). Divide 250 FPM by 60 Hz (250/60=4.1666), enter 04.17 in to F007. If you are using Vin the keypad will display MPM (FPM) while you are adjusting speed. If you are using the keypad, when you press the arrow keys the keypad display will change to Hz., several seconds after you stop pressing the arrow keys the keypad display will change back to MPM.

F 007	User Defined Meter Calibration	0.00 to 500.00 Units per Hz. Factory Default: 20	Example: 20 units per Hz is 1200 at 60 Hz.	
F 008	Keypad's Custom Speed Decimal Point	0 to 4 Factory Default: 0	0) No Decimal Points	2) Two Decimal Points
			1) One Decimal Point	3) Three Decimal Points
F 051	Number of Motor Poles	2 to 10 Poles Factory Default: 4P	Required for calibrating RPM and User Defined Meter	

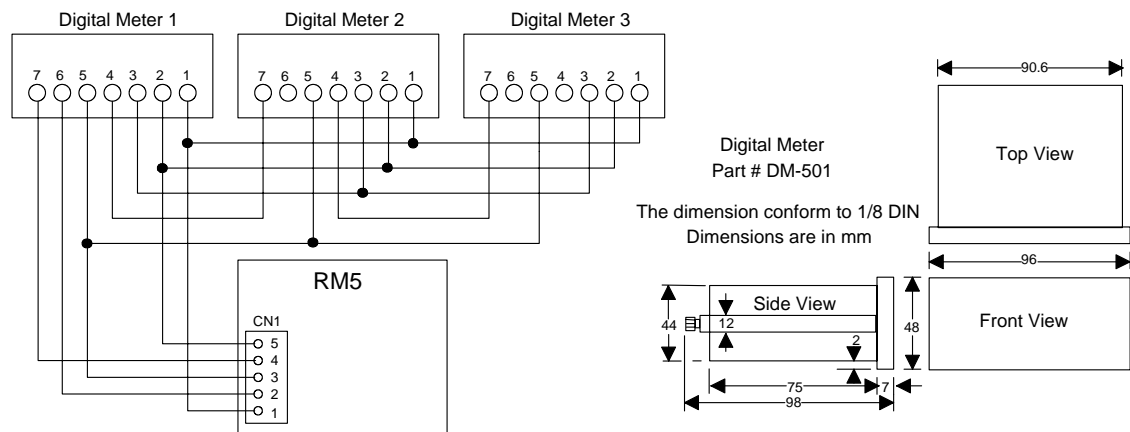
Section 4.23) DM-501 Digital Meters (Optional Item)

Digital meters and CN1 plug are available from Electric Regulator.

F 099	Digital Meter 1	Factory Default: 1	0) None, No Display	3) Voltage Output	6) RPM
F 100	Digital Meter 2	Factory Default: 2	1) Hertz Output	4) DC Voltage (PN)	7) User Defined Meter
F 101	Digital Meter 3	Factory Default: 3	2) Speed Adjust, Hz	5) Amperage Output	8) Terminal Status

Section 4.24) DM-501 Digital Meter Connection Diagram

The CN1 plug is the output for all three DM-501 digital meters.

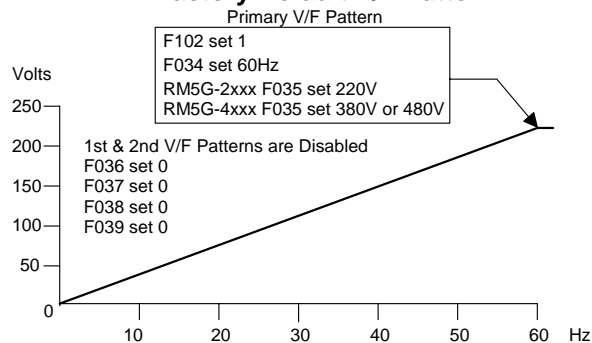


Section 4.25) Voltage Frequency Patterns (V/F Patterns)

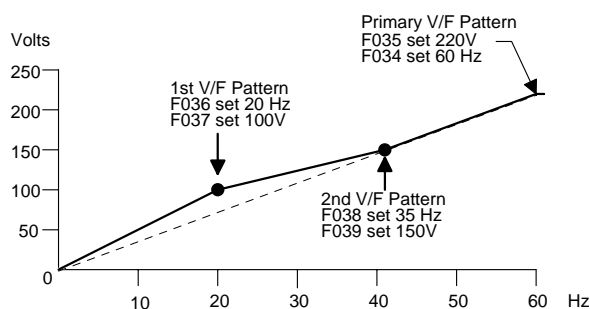
The RM5G has a selection of five V/F patterns or the user can create a three segment V/F pattern.

F 102	V/F Pattern Selection	0) Linear (Factory Default: 0) Note: Segmented V/F Patterns require F 102 set: 0 1) Economy, adjusts the voltage to the minimum required to maintain speed 2) Squared Curve 3) 1.7th Power Curve 4) 1.5th Power Curve	
F 031	Maximum Frequency	0.01 to 400 Hz Factory Default: 60Hz	To program F 031 above 120 Hz., see F 092
F 034	Maximum Frequency of Primary V/F Pattern	0.01 to 400 Hz Factory Default: 60Hz	F 034 sets the maximum frequency were the maximum voltage is reached (i.e. The Primary V/F Pattern) See the diagram of the Factory Default V/F Pattern below
F 035	Maximum Voltage of Primary V/F Pattern	RM5G-2XXX series	0.1 to 255 Volts, Factory Default: 220 Volts
		RM5G-4XXX series	0.1 to 510 Volts, Factory Default: 380 Volts Note: In North America this is normally set 440V~480V
F 036	1st Segment Frequency of V/F Pattern	0.01 to 400 Hz Factory Default: 0 Hz	The V/F pattern can be customized into two or three segments, 1st, 2nd and Primary V/F pattern. See diagrams above F036 and F037 set the frequency and voltage of the 1st segment. Note: To disable the 1st Segment set F036 and F037 to zero. Note: F 102 must be set 1
F 037	1st Segment Voltage V/F Pattern	RM5G-2XXX series	0.1 to 255 Volts, Factory Default: 0 Volts
		RM5G-4XXX series	0.1 to 510 Volts, Factory Default: 0 Volts
F 038	2nd V/F Pattern Frequency Scale	0.01 to 400 Hz Factory Default: 0 Hz	F038 and F039 set the frequency and voltage of the 2nd segment Note: To disable the 2nd Segment set F038 and F039 to zero. Note: F 102 must be set 1
F 039	2nd V/F Pattern Maximum Voltage	RM5G-2XXX series	0.1 to 255 Volts, Factory Default: 0 Volts
		RM5G-4XXX series	0.1 to 510 Volts, Factory Default: 0 Volts

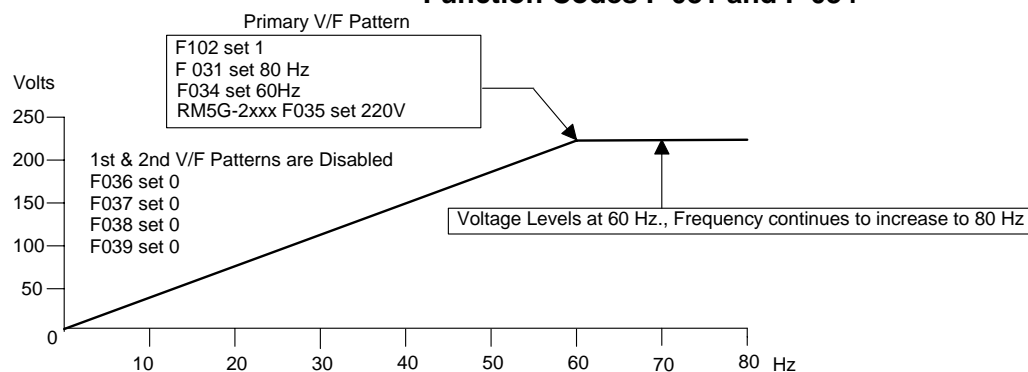
Factory Default V/F Pattern



Example of three segment V/F Pattern



Function Codes F 031 and F 034

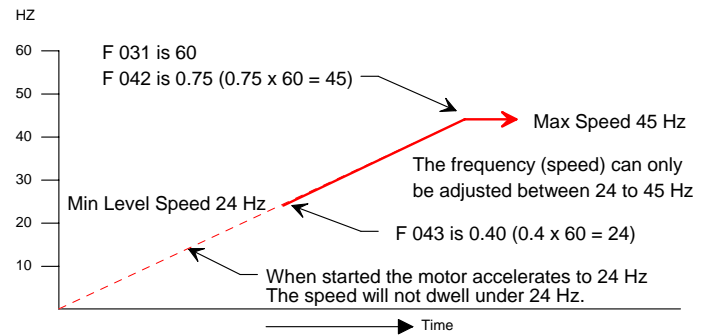


Section 4.26) Frequency Adjustment Range

The factory default frequency adjustment range is 0 to 60 Hz., the maximum speed can be programmed up to 400 Hz. To program F 031 above 120 Hz, see function code F 092 or see section 4.36 on page 37.

F 031	Maximum Output Frequency	0.1 to 400 Hz Factory Default: 60	To program F 031 above 120 Hz, see F 092
F 042	Maximum Frequency Adjustment Range	0.00 to 1.00 Factory Default: 1.00	F 042 is a multiplier of F 031. Example: If F 042 is 0.90 then maximum is 54 Hz, $(0.90 \times 60 = 54)$
F 043	Minimum Frequency Adjustment Range	0.00 to 1.00 Factory Default: 1.00	F 043 is a multiplier of F 031. Example: If F 043 is 0.25 then maximum is 15 Hz, $(0.25 \times 60 = 15)$

The diagram shows how to program a frequency adjustment range from 24 to 45 Hz.

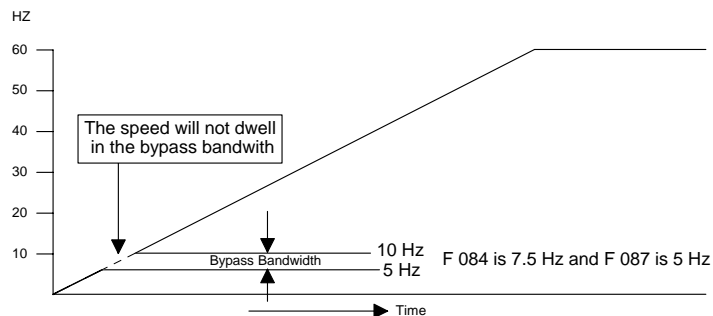


Section 4.27) Frequency Bypass

Frequency bypass prevents the motor's speed from dwelling with in the bypass bandwidth. Frequency bypass is often used to avoid machinery resonance frequency. The RM5G has up to three frequency bypasses.

Note: Many motors resonance frequency is between 6 Hz to 9 Hz.

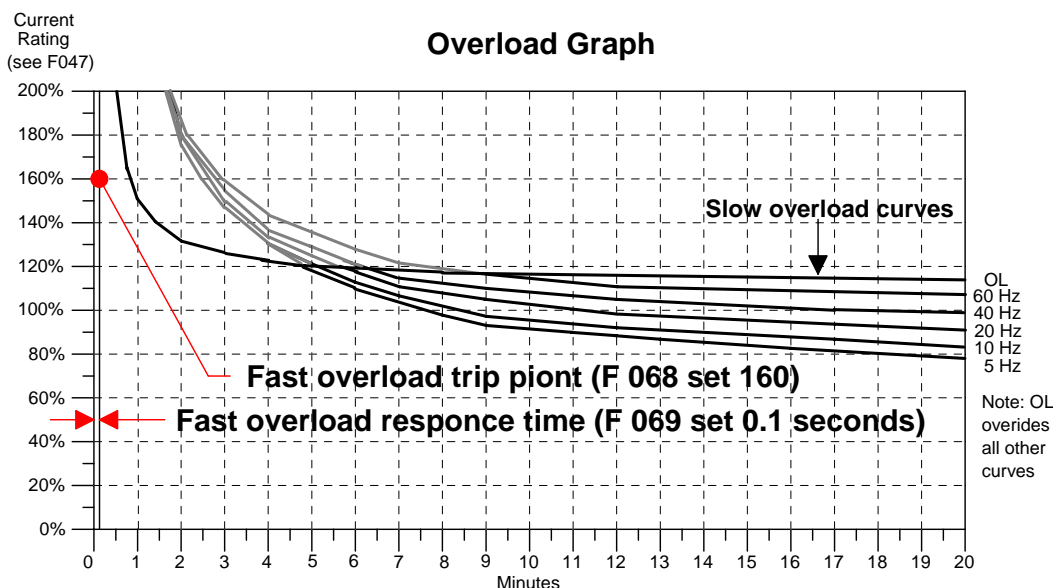
F 084	Frequency Bypass 1	0 to 400 Hz	Factory Default: 0
F 085	Frequency Bypass 2	0 to 400 Hz	Factory Default: 0
F 086	Frequency Bypass 3	0 to 400 Hz	Factory Default: 0
F 087	Frequency Bypass Bandwidth	0 to 25.5 Hz Factory Default: 0	F 087 bandwidth applies to all three, F 084, F 085 and F 086



Section 4.28) Motor Ratings and Overload Parameters

Read the motor's data plate and the RM5G data label before programming this section.

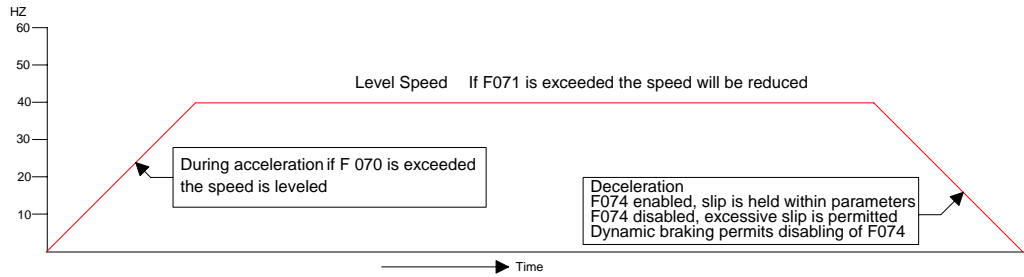
F 046	Slow Overload (OL)	0) Disable slow overload protection 1) Enable slow overload protection 2) Enable slow overload protection for separately ventilated motors	Factory Default: 1
F 048	Motor Full Load Amperage (FLA)	See the motor's data plate for the Full Load Amps (FLA) rating. If F 048 is too high or too low the motor speed may oscillate while accelerating or decelerating	
F 049	Motor No Load Amperage	See motor's name plate for the no load amperage rating. If not listed, measure the no load amperage by pressing the FUN/DATA keypad to display number 5 (amperage), see page 12.	
F 065	(OLO) Overload Signal to terminals Y1, Y2, Relays T1, T2	0) Disable OLO signal 1) Enable OLO Signal	Factory Default: 0 If terminals Y1, Y2 or relays T1, T2 are programmed to signal when an overload is detected, F 065 enables the signal (See F 058, F059, F 060 or F 131 setting 5)
F 066	Overload Signal Conditions	0) Signal OLO only when the motor is running at level speed. 1) Signal OLO overload when the motor is running at any speed.	Factory Default: 0
F 067	Fast Overload	0) Disable shut off when overload is detected. 1) Enable shut off when overload is detected.	Factory Default: 0
F 068	Fast Overload Level	30% to 200% Factory Default: 160	This is a percentage of the Amperage output listed on the RM5G data label
F 069	Fast Overload Response Time	0.1 to 10 seconds Factory Default: 0.1	When F 068 Amperage is exceeded by the time of F 069, the motor is stopped. Note: F 069 does not sum the time of separate overload events
F 094	Overload Protection	0) Disable overload protection 1) Thermal protection 2) Amperage protection 3) Both Thermal and Amperage protection	(Factory Default: 3)



Slow overload can not be changed by the user. Slow overload (OL curve) overrides all other curves. Example: If at any speed the motor current exceeds 150% for more than one minute the motor is switched off. Second example: If the motor is running at 20 Hz and the motor current exceeds 95% for more than 15 minutes, the motor is switched off.

Fast overload is normally disabled, function code F 067 must be set to 1 to enable fast overload. Fast overload will switch off the motor when the current exceeds the setting of F 068 by more than the time setting of F 069. The factory default settings are, if at any speed, if the motor current exceeds 160% for more than 0.1 second, the motor is switched off. Important note: F 068 is the RM5G's output Amperage, not the motors Amperage. Fast overload is intended to protect the RM5G drive, not the motor.

Section 4.29) Motor Slip and Stall Parameters

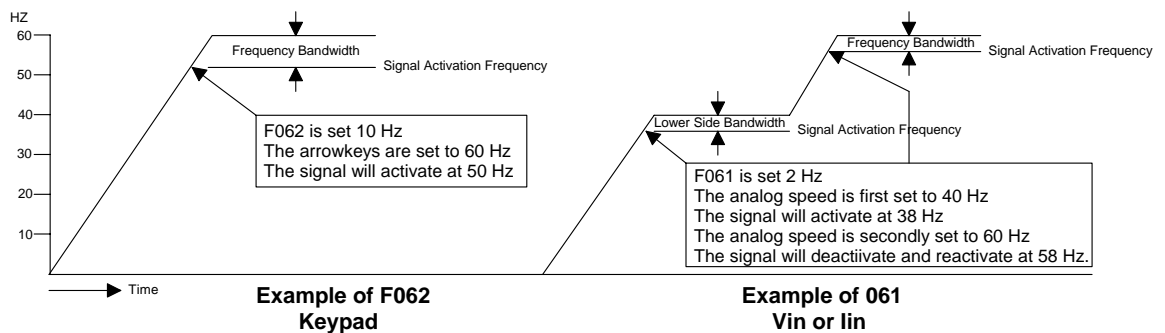


F 050	Motor Slip Compensation	-9.9 to 5 Hz Factory Default: 0.0	F 050= Motor Slip Compensation F 049= Motor No load Current F 048= Motor Max. Rated Current LC = Load Current during normal operation $F050 = \frac{LC - F049}{F048 - F049}$
F 064	Automatic Torque Boost	0.0 to 25.5 Factory Default: 1.0	Automatic Voltage boost during heavy loads
F 070	Stall Prevention During Acceleration	30% to 200% Factory Default: 170%	F 070 is a percentage of the motors Full Load Amps (FLA). If F 070 is exceeded the speed is reduced or leveled.
F 071	Stall Prevention During Level Speed	30% to 200% Factory Default: 160%	F 071 is a percentage of the motors Full Load Amps (FLA). If F 071 is exceeded the speed is reduced.
F 072	Stall Recovery Acceleration Time	0.1 to 3200 sec Factory Default: 15 sec	Acceleration time after recovering from stall at level speed.
F 073	Stall Prevention Deceleration Time	0.1 to 3200 sec Factory Default: 15 sec	Deceleration time when preventing stall while at level speed
F 074	Deceleration Stall Prevention	0) Disable stall prevention during decel. If dynamic braking is used F 074 can be disabled. 1) Enable stall prevention during deceleration. Factory Default: 1	

Section 4.30) Level Speed Detection Signal Bandwidth (for outputs Y1, Y2, T1 and T2)

If terminals Y1, Y2 or relays T1, T2 are programed to signal when the speed is level. The corresponding function codes are F058, F059, F060 or F 131 would be programmed to ± 2 , see section 4.19 on page 30. Function codes F061 or F062 determine the level speed bandwidth.

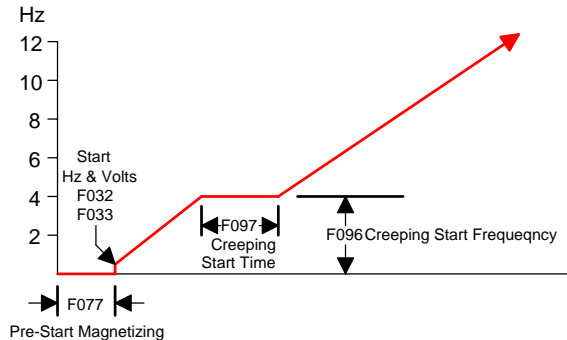
F 061	Vin or Iin Level Speed Signal Bandwidth	0.0 to 10 Hz. Factory Default: 2 Hz.	When Vin or Iin controls motor speed. F 061 is the Hz bandwidth of the level speed signal.
F 062	Keypad Arrow Keys Level Speed Signal Bandwidth	0.0 to 10 Hz. Factory Default: 2 Hz.	When the Keypad controls motor speed. F 062 is the Hz bandwidth of the level speed signal.



Section 4.31) Motor Starting Parameters

If the motor has difficulty starting, the following recommendations often solve the problem.

- First, pre-start motor magnetizing time, F077, 1.0 second is often sufficient.
- Second, decrease the switching frequency, F 081.
- Third decrease the acceleration time, F 019 for details see page 20.
- Fourth creeping start function codes F096 and F097.
- Last increase the starting frequency F032, finally increase the starting voltage F033.



F 032	Starting Frequency	0.1 to 10 Hz Factory Default: 0.5 Hz	
F 033	Starting Boost Voltage	220V Motor 0 to 50 Volts	Factory set: 6 volts
		480V Motor 0 to 100 Volts	Factory set: 12 volts
F 077	Pre-Start Motor Magnetizing Time	0 to 20 seconds Factory Default: 0	Before starting, DC voltage is applied to the stator to magnetize the rotor. This will delay start by the amount This function is similar to the starting capacitor on a
F 096	Creeping Start Frequency	0.0 to 400 Hz Factory Default: 0.5	Creeping before accelerating helps avoid excessive slip during acceleration. Typically the Creeping frequency is set 1 Hz above F 032 the start frequency.
F 097	Creeping Start Time	0.0 to 25.5 Sec. Factory Default: 0.0	

Section 4.32 Switching Frequency (i.e. Carrier Frequency) also see section 2.5 on page 11.

The switching frequency synthesizes a sinusoidal wave by using Pulse Width Modulation (PWM) and the motor's inductance. The motor will be quieter and smoother with higher switching frequencies. If the motor has difficulty starting, lowering the switching frequency sometimes solves this problem. If the length of the wires from the drive to the motor are long, the switching frequency should be lowered, also a line reactor may be recommend. Refer to the wires size table on page 11.

F 081	Switching Frequency	Factory Default: 1	0) 800 Hz	3) 7.5 kHz	6) 15.0 kHz
			1) 2.5 kHz	4) 10.0 kHz	
			2) 5.0 kHz	5) 12.5 kHz	

Section 4.33) Holding the Motor Stationary

When the motor is stopped, applying DC to the motor it will hold the motor stationary and will resist a small amount torque, F052 is not enabled when start engaged.

Warning: If DC is applied too long the motor will overheat and could cause damage.

F 052	Input X2 programmed to hold the motor when stopped	When F 052 is programmed to zero and terminal X2 engage (circuit closed) DC is applied to the motor, the DC Amperage is set by F 075.			
F 075	DC Amperage Applied to Motor	0 to 150% Factory Default: 50%	F 075 is a percentage of the output amperage listed on the RM5G data label. Also see page 23, Sec 4.17B		

Section 4.34) Store and Copy Programs

The keypad can store and copy a program to another RM5G drive.

Below are instructions of how transfer a program from one RM5G to another RM5G.

- First, enter F134 and scroll to “rd_EE” and press and hold the enter key until the word “end” appears.
- Second, disconnect the keypad and connected it to the next RM5G, go to F134 and scroll to “UUr_EE”, then press and hold the enter key until the word “end” appears.

F134	Copy Commands	0) Not Active	SAu) Store User Settings
		CLF) Clears fault history stored in F 091	rES) Restore Previous settings
		dEF60) Restore factory 60 Hz settings	rd_EE) Copy RM5G settings to Keypad
		dEF50) Restore factory 50 Hz settings	UUr_EE) Copy Keypad settings to RM5G

Section 4.35) Restoring the factory settings

Go to F134, scroll to "dEF60" then press and hold the FUN/DATA key until the word "end" appears. All the factory default 60 Hz settings have been restored. If you have a 440V ~ 480V power, go to F 034 and F 095 set the voltage according to your motor and input voltage.

F134	Copy Commands	0) Not Active	SAu) Store User Settings
		CLF) Clears fault history stored in F 091	rES) Restore Previous settings
		dEF60) Restore factory 60 Hz settings	rd_EE) Copy RM5G settings to Keypad
		dEF50) Restore factory 50 Hz settings	UUr_EE) Copy Keypad settings to RM5G

Section 4.36) Locking Programs & 400 Hz Motors

Function code F 092 performs two functions.

- Locking the function codes to prevent unauthorized programing.
- Enabling operation up to 400 Hz, the factory default program limits operation to 120 Hz.

F 092	Lock Function Codes & 120 Hz or 400 Hz Operation	0) Unlock Program, Maximum frequency is limited to 120 Hz. Factory Default: 0
		1) Lock Program, Maximum frequency is limited to 120 Hz.
		2) Unlock Program, Maximum frequency is 400 Hz.
		3) Lock Program, Maximum frequency is 400 Hz.

Section 4.37) Fault History

Function code F 091 stores in memory the last five faults that occurred. Enter F 091 and then scroll to see the faults. If you what to clear the fault history, go to F 134 and scroll to CLF then press and hold the enter key until the word “end” appears.

F 091	Fault History	Displays the last five faults
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Section 4.38) Limit of General Fault Pass-throughs

F 080	Limit of General Fault Pass-throughs	0 to 16 (Factory Default: 0)	If a fault is detected and then quickly corrects without intervention. The RM5G will continue to run (pass-through). F 080 limits the number of permissible pass-throughs
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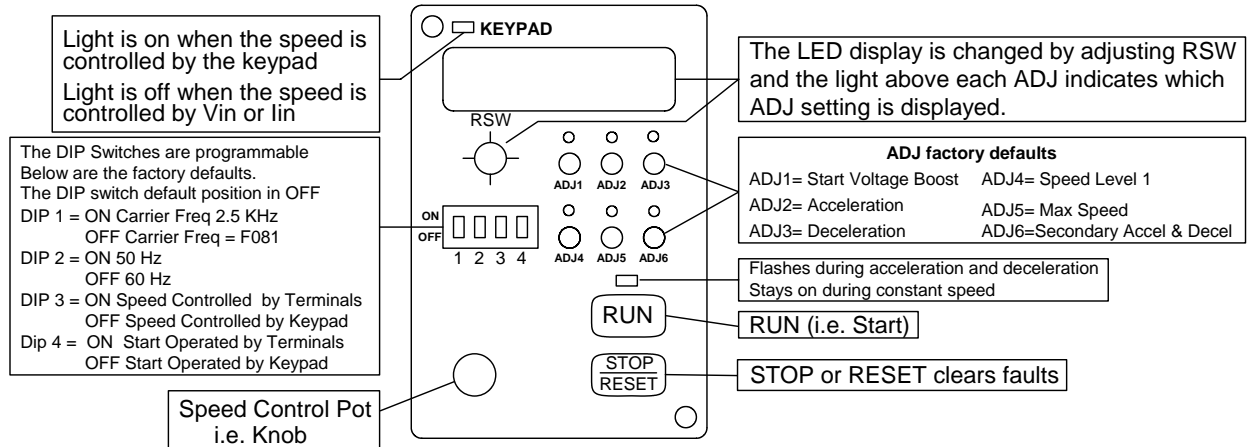
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Section 5.1) KP-202C Factory Settings

Adjusting the potentiometers (pots) on the KP-202C analog keypad are best made with a #00 Philips head screwdriver. The diagram below shows the KP-202C layout and factory default settings. The KP-202C adjustment pots one through 6 (i.e. ADJ1 to ADJ6) and dip switch functions are shown in the diagram below. The RSW rotary switch selects the LED display mode. The functions of the pots and dip switches can be programmed, please see sections 5.3 and 5.4



Section 5.2) RSW selects the LED display

The RSW rotary switch selects the LED display.

See the table below for descriptions of each position of the RSW.

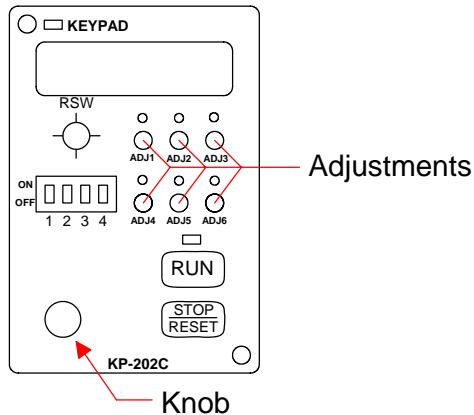
Note: ADJ4, ADJ5, ADJ6 can be programmed, all the others are dedicated.

RSW Position	Function Displayed	Factory Default Setting	Function Code
0	Frequency Output (Hz)	Dedicated Display	---
1	ADJ 1	Start Boost Voltage, 0 to 127 Volts	Dedicated
2	ADJ 2	Acceleration Time , 0.0 to 165 seconds	Dedicated
3	ADJ 3	Deceleration Time, 0.0 to 165 seconds	Dedicated
4	ADJ 4	Speed Level 1 Freq., 0.0 to 120 Hz (Factory Default: F 110 = 1)	F 110
5	ADJ 5	Max., Output Freq., 0.0 to 120 Hz (Factory Default: F 111 = 20)	F 111
6	ADJ 6	Secondary Acc & Dec, 0.0 to 165 sec. (Factory Default: F 112 = 17)	F 112
7	Knob	Speed Adjustment (Factory Default: F 117 = 0)	F 117
8	Carrier Frequency	1=2.5kHz, 2=5kHz, 3=7.5kHz, 4=10kHz, 5=12.5kHz, 6=15kHz	F081
9	Voltage Output	Dedicated Display	Dedicated
A	DC Voltage (PN)	Dedicated Display	Dedicated
B	Amperage Output	Dedicated Display	Dedicated
C	Motor RPM	Dedicated Display	Dedicated
D	MPM	Dedicated Display	Dedicated
E	Terminal Status	Dedicated Display	Dedicated
F	DIP Status	Dedicated Display	Dedicated

Section 5.3) Programming the Adjustment Pots (ADJ and Knob)

Programming the parameters of ADJ4, ADJ5, ADJ6 and the knob requires disconnecting the KP-202C and connecting KP-201.

Note: ADJ1, ADJ2 and ADJ3 are dedicated (not programmable).



Adjustment	Function Code	Setting
ADJ 4	F 110	1 to 49, (Factory Default: 1)
ADJ 5	F 111	1 to 49, (Factory Default: 20)
ADJ 6	F 112	1 to 49, (Factory Default: 17)
Knob	F 117	1 to 49, (Factory Default: 0)
See table below for program setting number information		

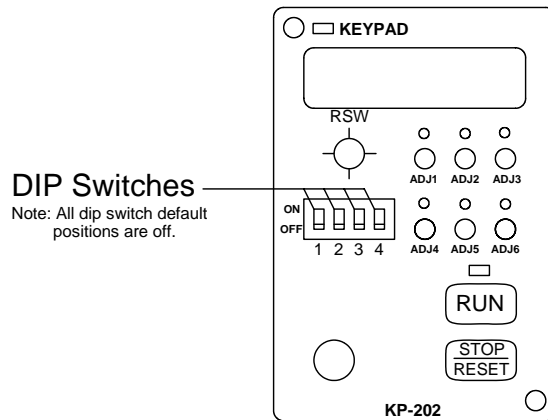
Example, to change ADJ 4 to Jog, go to F110 and program it to 8.

Setting	Function Description	Range of Adjustment	Details see page	Setting	Function Description	Range of Adjustment	Details see page
0	Primary Adjustable Speed	0 ~ 120 Hz	Pg 27	26	Vin Gain	0.00 ~ 2.00	Pg 17
1	Preset Speed Level 1	0 ~ 120 Hz	Pg 27	27	Vin Bias	-1.00 ~ 1.00	Pg 17
2	Preset Speed Level 2	0 ~ 120 Hz	Pg 27	28	Max., Output Frequency	0.00 ~ 1.00	Pg 31
3	Preset Speed Level 3	0 ~ 120 Hz	Pg 27	29	Min., Output Frequency	0.00 ~ 1.00	Pg 31
4	Preset Speed Level 4	0 ~ 120 Hz	Pg 27	30	FM+ Gain	0.00 ~ 2.00	Pg 28
5	Preset Speed Level 5	0 ~ 120 Hz	Pg 27	31	Motor Slip Compensation	-9.99 ~ 10.00	Pg 33
6	Preset Speed Level 6	0 ~ 120 Hz	Pg 27	32	Frequency Detection Level	0.0 ~ F063	Pg 28
7	Preset Speed Level 7	0 ~ 120 Hz	Pg 27	33	Automatic Torque Boost	0.0 ~ 25.5	Pg 33
8	Jog	0 ~ 120 Hz	Pg 27	34	System Overload Detection	30 ~ 200%	Pg 32
9	Primary Acceleration Time	0.0 ~ 165sec	Pg 23	35	Stall Prevention, Accel	30 ~ 200%	Pg 33
10	Primary Deceleration Time	0.0 ~ 165sec	Pg 23	36	Stall Prevention, Level Spd	1 ~ 150	Pg 33
11	Preset Spd Level 1 Acc Time	0.0 ~ 165sec	Pg 27	37	After Stall Prevent Accel Time	0.0 ~ 165sec	Pg 33
12	Preset Spd Level 1 Dec Time	0.0 ~ 165sec	Pg 27	38	Stall Prevent Decel Time	0.0 ~ 165sec	Pg 33
13	Preset Spd Level 2 Acc Time	0.0 ~ 165sec	Pg 27	39	DC Braking Level	1 ~ 150	Pg 21
14	Preset Spd Level 2 Dec Time	0.0 ~ 165sec	Pg 27	40	Frequency Bypass 1	0.0 ~ F084	Pg 31
15	Preset Spd Level 3 Acc Time	0.0 ~ 165sec	Pg 27	41	Frequency Bypass 2	0.0 ~ F085	Pg 31
16	Preset Spd Level 3 Dec Time	0.0 ~ 165sec	Pg 27	42	Frequency Bypass 3	0.0 ~ F086	Pg 31
17	Secondary Acc & Dec Time	0.0 ~ 165sec	Pg 23	43	Bypass Frequency Bandwidth	0.0 ~ 25.5Hz	Pg 31
18	Starting Frequency	0.1 ~ 10.0Hz	Pg 34	44	Creeping Start Frequency	0.0 ~ F096	Pg 34
19	Starting Voltage	0 ~ 127V	Pg 34	45	Creeping Start Time	0.0 ~ 25.5sec	Pg 34
20	Max., Output Frequency	0 ~ 120 Hz	Pg 30	46	MPM (User Defined Meter)	0.01 ~ 100.00	Pg 29
21	Maximum Output Voltage	255V or 510V	Pg 30	47	Iin Gain	0.00 ~ 2.00	Pg 17
22	V/F Segment 1, Frequency	0.0 ~ F034	Pg 30	48	Iin Bias	-1.00 ~ 1.00	Pg 17
23	V/F Segment 1, Voltage	0.0 ~ F035	Pg 30	49	AM+ Gain	0.00 ~ 2.00	Pg 28
24	V/F Segment 2, Frequency	0.0 ~ F034	Pg 30				
25	V/F Segment 2, Voltage	0.0 ~ F035	Pg 30				

Section 5.4 DIP Switch Programing

The DIP switches enable or disable functions, all the DIP switches are programmable.

Programming the dip switches requires disconnecting the KP-202C keypad and connecting KP-201 keypad.



DIP Number	Function code reserved to program DIP	Settings
DIP 1	F 113	0 to 15, Factory Default: 8
DIP 2	F114	0 to 15, Factory Default: 5
DIP 3	F115	0 to 15, Factory Default: 3
DIP 4	F116	0 to 15, Factory Default: 1
See the table below for program setting number information		

Example, to program DIP 1 to Energy Economy go to F 113 and program it to 15. To read more information about Energy Economy read F102 in the function code table.

Setting	Function Description	Details See Page
0	Disable DIP Switch	NA
1	ON: FWD Terminal activates start OFF: Keypad activates start	---
2	ON: FWD & REV Terminals activates start OFF: Keypad activates start	---
3	ON: Terminals Vin or Iin adjust speed OFF: Keypad adjusts speed.	---
4	ON: Enable Keypad stop key OFF: Disable Keypad stop key	---
5	ON: Maximum frequency 50 Hz OFF: Maximum frequency 60 Hz	---
6	ON: Disable Stall prevention during Accel. OFF: Enable Stall prevention during Acc.	F074
7	ON: Disable DC braking* OFF: Enable DC braking*	Pg 23 F075

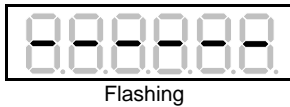

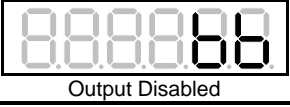



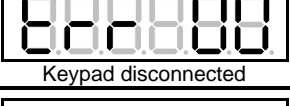
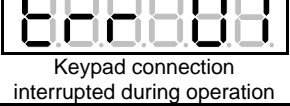


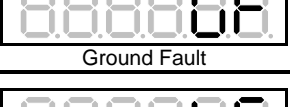
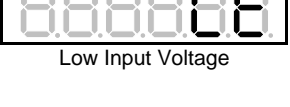
Setting	Function Description	Details See Page
8	ON: Carrier Frequency 2.5 kHz OFF: Carrier Frequency of F081	F081
9	ON: Pass-through short power interruptions OFF: Stop when power is interrupted	Pg 24 F078
10	ON: Coast to stop OFF: Controlled deceleration stop.	Pg 21 F082
11	ON: Disable Reverse OFF: Enable Reverse	Pg 21 F083
12	ON: Disable AVR OFF: Enable AVR	F093
13	ON: Disable motor overload protection OFF: Enable F046 overload program	F046
14	ON: Disable inverter overload protection OFF: Enable inverter overload protection	F094
15	ON: Enable Energy Economy OFF: Disable Energy Economy	Pg 32 F102

* Note: If F075 is set 50 or less DC braking is disabled, regardless of DIP switch setting.

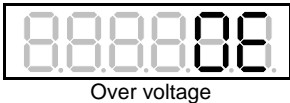








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Fault Code Table

Keypad Display	Fault Description	Possible Problems	Recommendations
 Flashing	The FWD or REV input terminals are not receiving a signal.	This is normal when stopped	
 Add converter error	The main processor has failed.		The main processing board must be replaced.
 Output Disabled	Output terminals Y1, Y2, T1 and T2 are disabled	One of the X input terminals is programed to ± 8 and is engaged.	See section 4.19 on page 30.
 Dynamic Braking	Dynamic Braking voltage is too high.	Dynamic Braking is generating more power than the resistor bank can handle.	Add more resistors or increase the deceleration time. See section 4.06 on page 22.
 FWD and REV error	Terminals FWD and REV are both engaged.		Disengage both terminals and troubleshoot the problem.
 EEPROM error	The EEPROM has failed.		The main processing board must be replaced.
 Keypad disconnected	The digital keypad (KP-201) was disconnected or failed.	Poor keypad wire connection.	If troubleshooting the keypad connection doesn't yield results. Then contact Electric Regulator.
 Keypad connection interrupted during operation	Keypad connection interrupted during operation	The keypad was disconnected and reconnected during motor operation.	Check keypad wire connections.
 Freewheeling	The motor is freewheeling (coasting). Warning be very cautious. we recommend pressing STOP before trouble shooting the problem.	One of the X input terminals is programed to ± 9 and is engaged. Warning: Press Stop first, then disengaged the X terminal. If Start of Run is engaged when the X terminal is disengaged, the motor will start running immediately	See section 4.14 on page 26.
 Ground Fault	The output amperage is unbalance	1) Faulty motor wiring. 2) Motor is leaking voltage.	1) Check the motor wiring. 2) Test the motor for power leakage. (i.e. Megger the motor).
 Low Input Voltage	Low input voltage. Signals if the input voltage drops below 80% of normal.	1) When the power is switched on or off. The LE signal may flash while charging or discharging. 2) If input power is too low, the motor speed is reduced. If power recovers it will return to normal speed.	1) The LE signal is normal while charging and discharging. 2) The power is inadequate.
 Low Input Voltage during operation	The input voltage dropped too low after initial charging up.	1) Phase Loss 2) Poor input power quality	1) Check if all three phases have voltage. 2) Investigate the input power source.

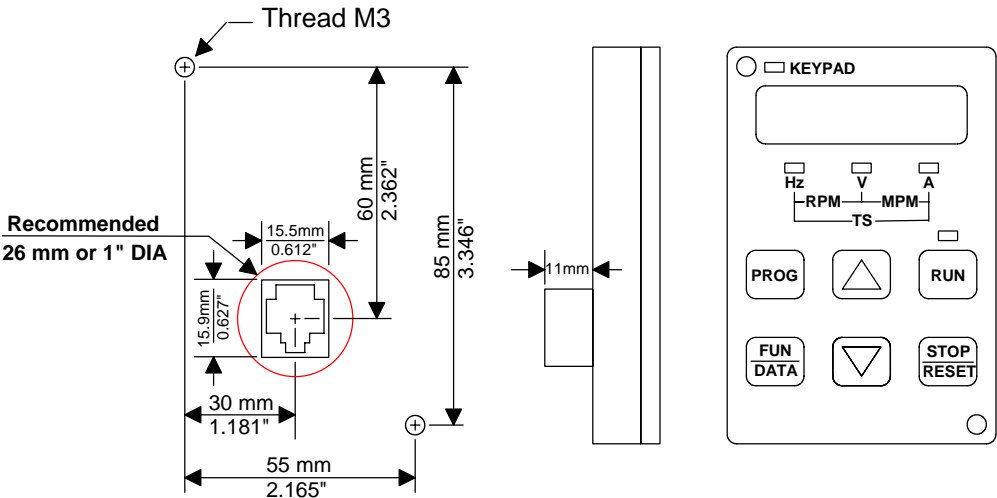
Fault Code Table continued

Keypad Display	Fault Description	Possible Problems	Recommendations
	The DC link voltage (PN) is too high. The DC link voltage has exceeded 125% of normal.	When the motor is decelerating it is regenerating too much power into the DC link.	Increase the deceleration time or for units 1 to 15 HP install dynamic braking resistor.
	The motor or drive (RM5G) has been overloaded.	Troubleshoot the motor load	Troubleshoot the motor load
	The heat sink temperature is too high.	1) Inadequate ventilation. 2) High ambient temperature. 3) Excessive motor load.	1) Improve ventilation. 2) Hot weather or direct sunlight can cause over heating. 3) If a motor is under heavy load and is accelerated too fast. The acceleration demand current can reach 300% to 600%. Recommendations, decrease acceleration time or increase the horsepower of the AC drive.
	The motor load exceeded the permitted time duration. See graph in Section 4.28 on page 34.	1) The motor load is too high. 2) The motor parameters are incorrectly programmed.	1) Reduce the motor load. 2) Correct the motor program 3) Replace with larger motor and drive.
	The drive's (RM5G) power rating was exceeded.	1) The motor load is too high. 2) The unit HP is too low.	1) Reduce the motor load. 2) Replace with larger AC drive.
			
	The analog keypad (KP-202) was disconnected or failed.	Poor keypad wire connection.	If troubleshooting the keypad connection doesn't yield results, then replace the keypad.
	The internal fuse is blown		Replace the fuse
	One of the X input terminals is programed ± 7 and is engaged. See section 4.14 on page 24.	1) Typically ± 7 is used for the motor thermostat. This is why thr is displayed. 2) The system engineer may use ± 7 for other purposed. Examine the system diagram.	A momentary signal will engage this fault signal. If the fault continues to be present, troubleshoot the fault and then press reset.

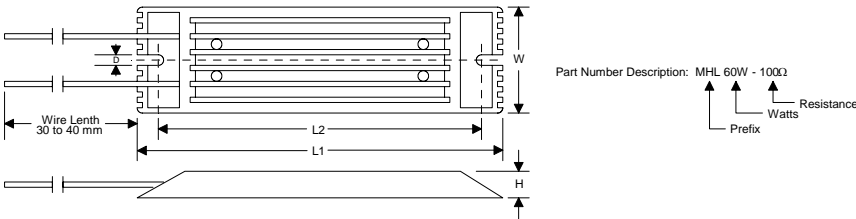
Clearing Faults or Warnings (Reset)

When a fault or warning is displayed, correct the problem (i.e. troubleshoot) and then press the STOP / RESET key or engage the auxiliary reset terminal.

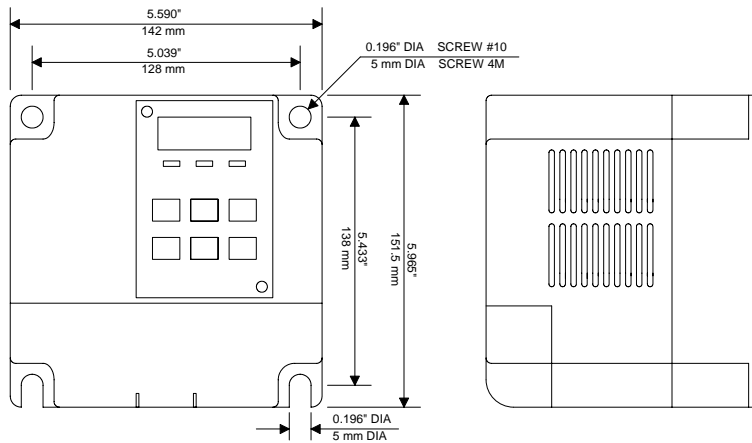
KP-201 and KP-202 have the same mounting dimensions



Dynamic Braking Resistor Dimensions



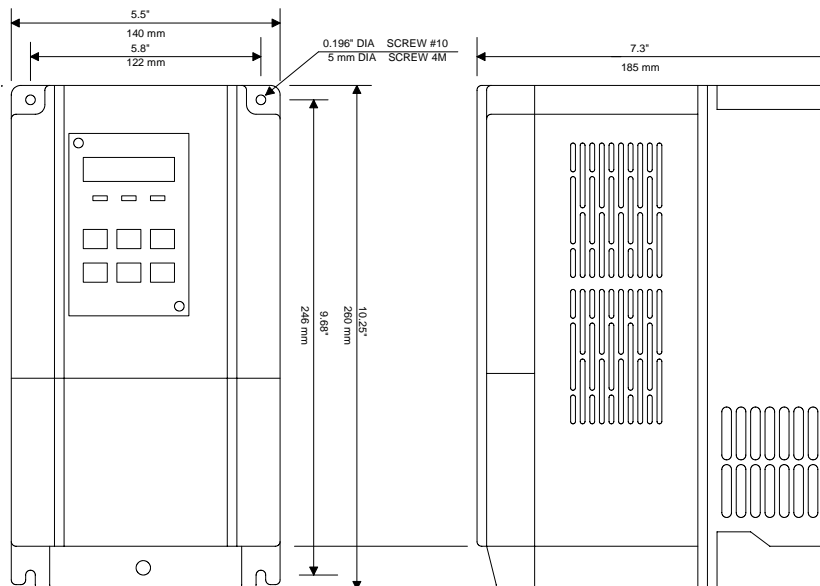
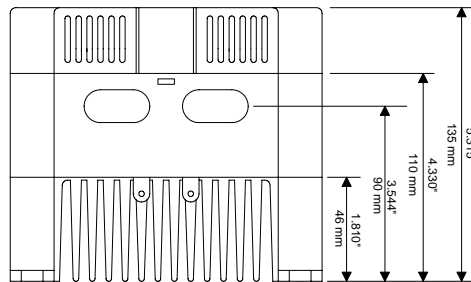
Part Number	Dimensions in/mm				
	L1	L2	W	H	D
MHL60W-100Ω	4.5"/115mm	3.9"/100mm	1.57"/40mm	0.79"/20mm	0.2"/5.3mm
MHL60W-400Ω	4.5"/115mm	3.9"/100mm	1.57"/40mm	0.79"/20mm	0.2"/5.3mm
MHL80W-100Ω	5.5"/140mm	4.9"/125mm	1.57"/40mm	0.79"/20mm	0.2"/5.3mm
MHL80W-400Ω	5.5"/140mm	4.9"/125mm	1.57"/40mm	0.79"/20mm	0.2"/5.3mm
MHL100W-100Ω	6.5"/165mm	5.9"/150mm	1.57"/40mm	0.79"/20mm	0.2"/5.3mm
MHL100W-400Ω	6.5"/165mm	5.9"/150mm	1.57"/40mm	0.79"/20mm	0.2"/5.3mm
MHL120W-100Ω	7.5"/190mm	6.9"/175mm	1.57"/40mm	0.79"/20mm	0.2"/5.3mm
MHL120W-400Ω	7.5"/190mm	6.9"/175mm	1.57"/40mm	0.79"/20mm	0.2"/5.3mm
MHL150W-100Ω	8.46"/215mm	7.9"/200mm	1.57"/40mm	0.79"/20mm	0.2"/5.3mm
MHL150W-400Ω	8.46"/215mm	7.9"/200mm	1.57"/40mm	0.79"/20mm	0.2"/5.3mm
MHL200W-100Ω	6.5"/165mm	5.9"/150mm	2.36"/60mm	1.18"/30mm	0.2"/5.3mm
MHL200W-400Ω	6.5"/165mm	5.9"/150mm	2.36"/60mm	1.18"/30mm	0.2"/5.3mm
MHL300W-100Ω	8.46"/215mm	7.9"/200mm	2.36"/60mm	1.18"/30mm	0.2"/5.3mm
MHL300W-400Ω	8.46"/215mm	7.9"/200mm	2.36"/60mm	1.18"/30mm	0.2"/5.3mm
MHL400W-100Ω	10.43"/265mm	9.85"/250mm	2.36"/60mm	1.18"/30mm	0.2"/5.3mm
MHL400W-400Ω	10.43"/265mm	9.85"/250mm	2.36"/60mm	1.18"/30mm	0.2"/5.3mm
MHL500W-40Ω	13.19"/335mm	12.6"/320mm	2.36"/60mm	1.18"/30mm	0.2"/5.3mm
MHL500W-100Ω	13.19"/335mm	12.6"/320mm	2.36"/60mm	1.18"/30mm	0.2"/5.3mm
MHL1000W-40Ω	15.75"/400mm	15.16"/385mm	3.9"/100mm	1.97"/50mm	0.42"/10.6mm
MHL1000W-100Ω	15.75"/400mm	15.16"/385mm	3.9"/100mm	1.97"/50mm	0.42"/10.6mm



1 to 5 HP Physical Diagram

Model Numbers

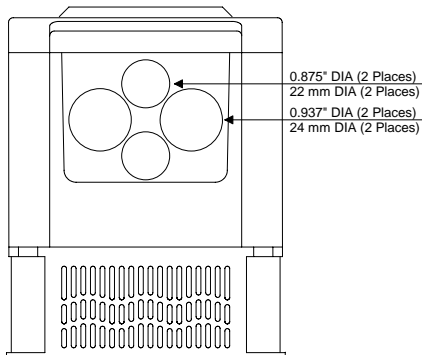
RM5G-2001
RM5G-2002
RM5G-2003
RM5G-2005
RM5G-4001
RM5G-4002
RM5G-4003
RM5G-4005

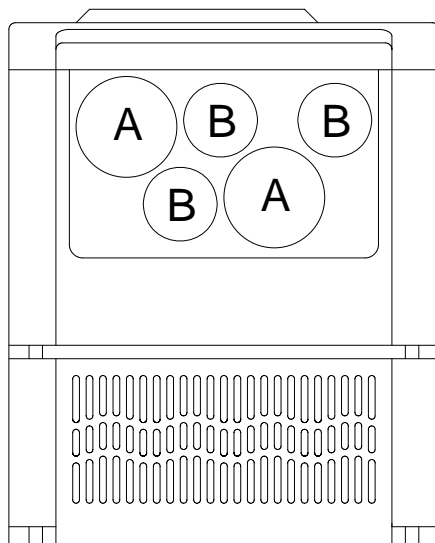
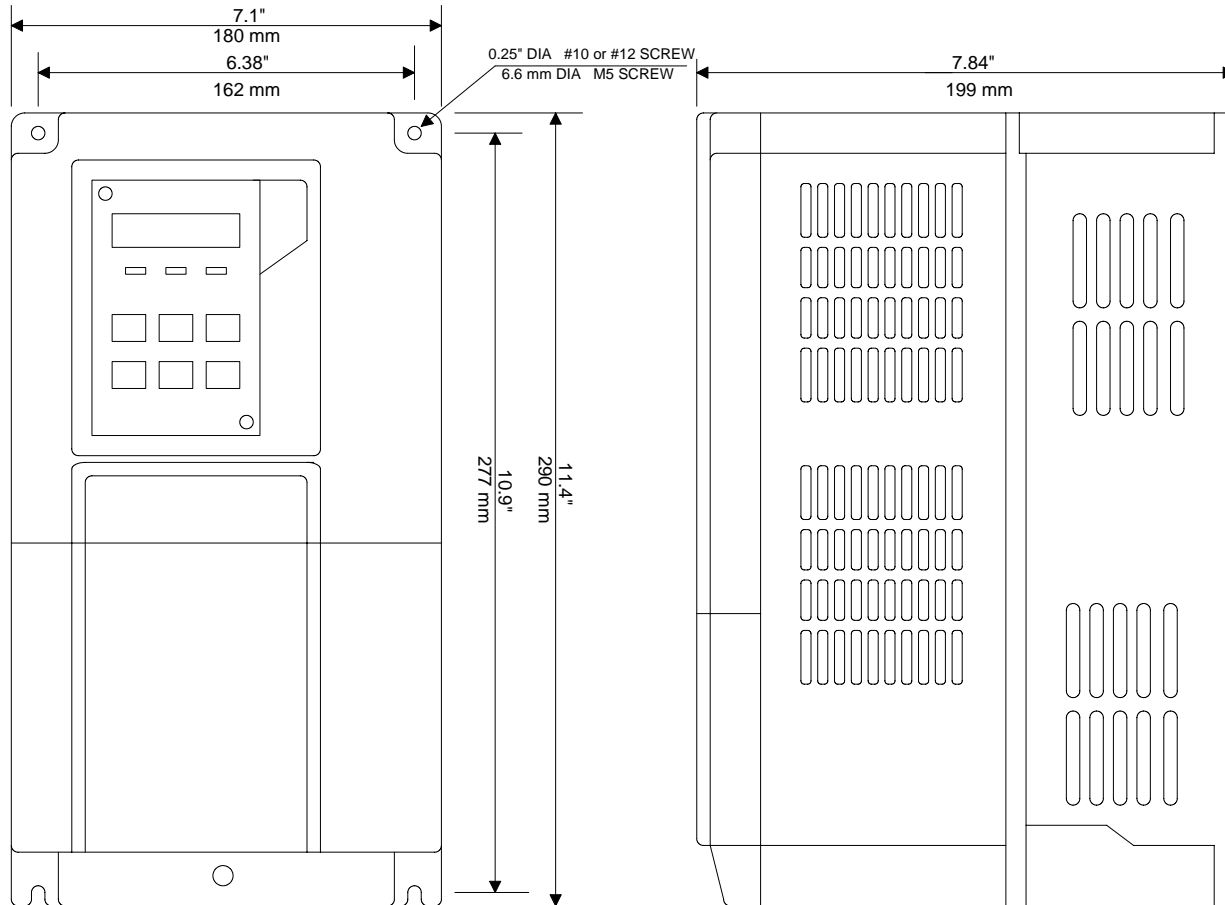


7.5 and 10 HP Physical Diagram

Model Numbers

RM5G-2007
RM5G-2010
RM5G-4007
RM5G-4010





A = DIA 35mm (1.375")
B = DIA 23mm (0.90")

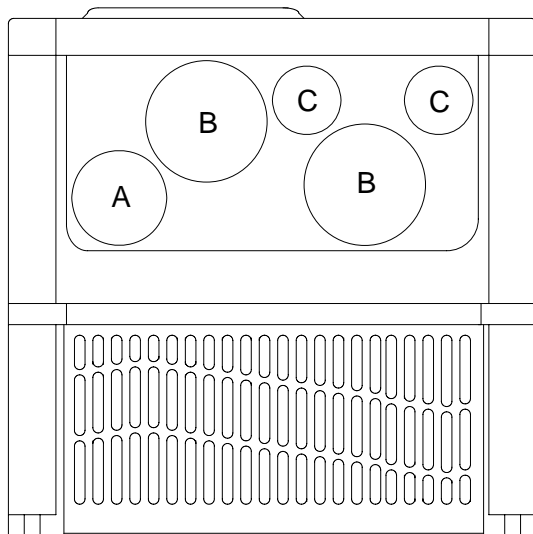
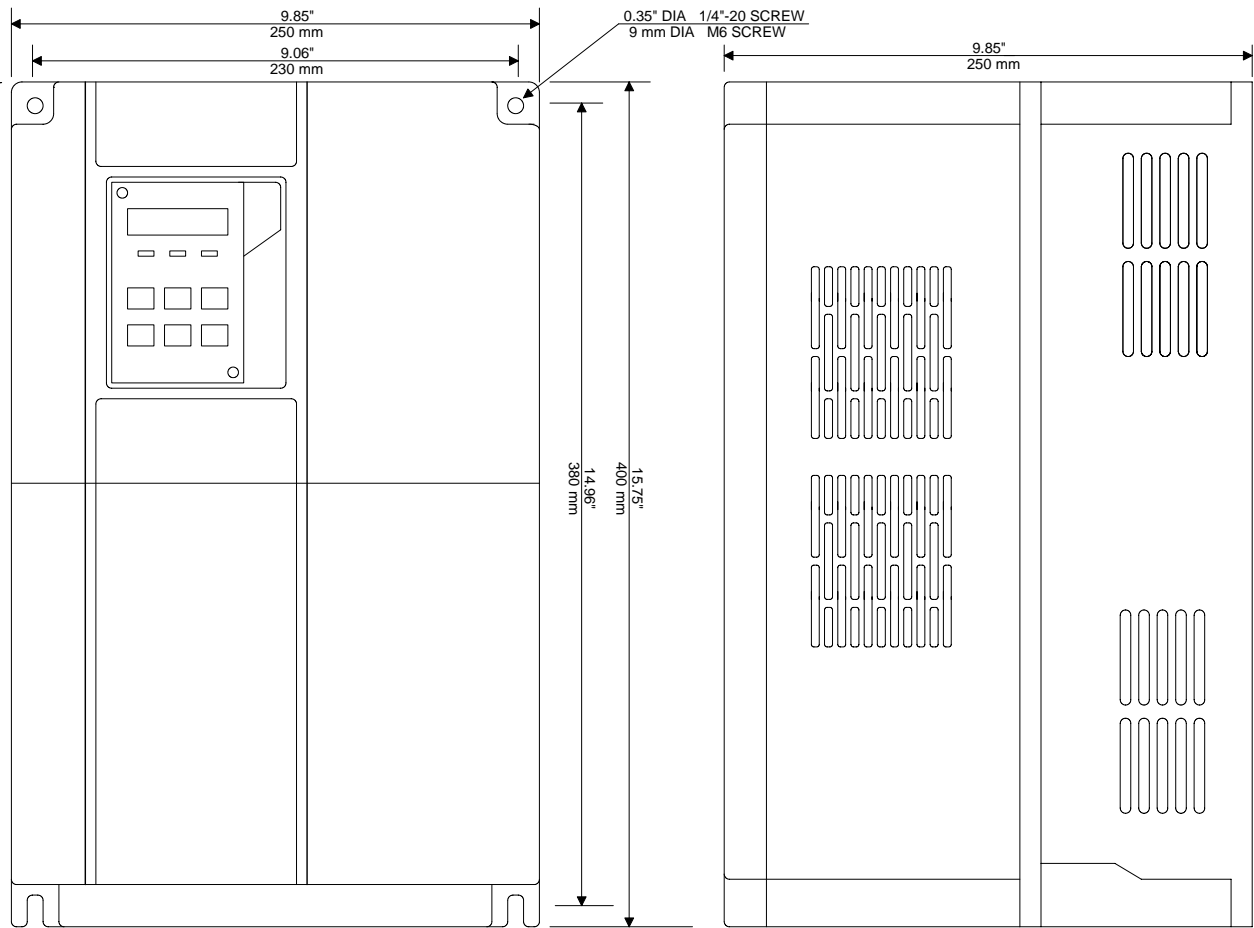
Physical Diagram

Model Numbers

RM5G-2015

RM5G-4015

RM5G-4020

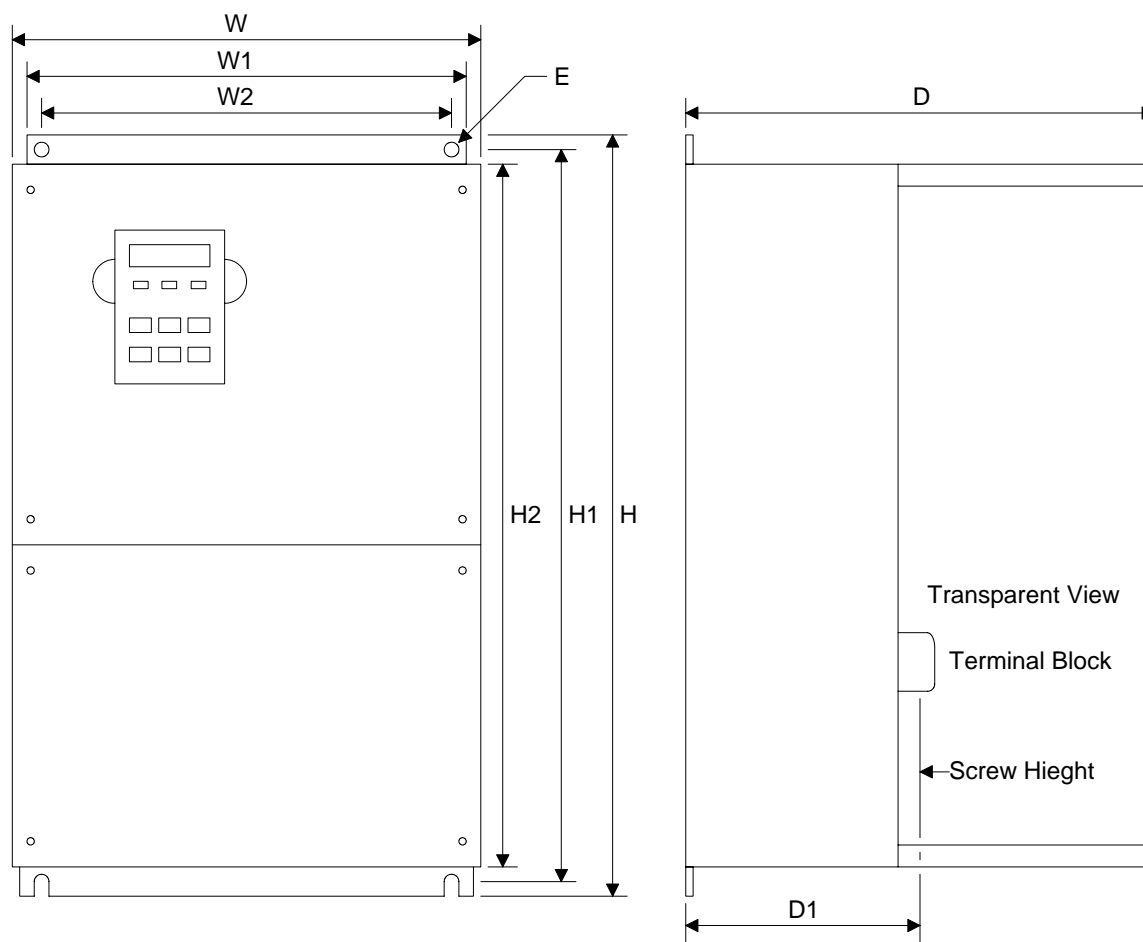


A = DIA 35mm (1.375")
 B = DIA 50mm (1.96")
 C = DIA 23mm (0.90")

Physical Diagram

Model Numbers

RM5G-2020
 RM5G-2030
 RM5G-2040
 RM5G-4030
 RM5G-4040
 RM5G-4050
 RM5G-4060



Model Number	W	W1	W2	H	H1	H2	D	D1	E Screw Size
RM5G-2050									
RM5G-2060	386mm	361mm	275mm	584mm	562mm	539mm	325mm	170mm	M8
RM5G-2075	15.2"	14.2"	10.8"	23"	22.13"	21.22"	12.8"	6.7"	5/16"
RM5G-4075									
RM5G-4100									
RM5G-4150	466mm	418mm	275mm	685mm	660mm	630mm	334mm	172mm	M10
	18.35"	16.46"	10.83"	26.97"	26"	24.8"	13.15"	6.77"	3/8"
RM5G-4200	508mm	479mm	275mm	818mm	785mm	751mm	366mm	183mm	M12
RM5G-4250	20"	18.86"	10.83"	32.2"	30.9"	29.6"	13.23"	7.2"	1/2"
RM5G-4300	696mm	654mm	580mm	1000mm	974mm	929mm	405mm	224mm	M12
RM5G-4420	27.4"	27.75"	22.83"	39.37"	38.35"	36.58"	15.95"	8.82"	1/2"
RM5G-4500	992mm	954mm	710mm	1030mm	1003mm	963mm	419mm	235mm	M12
RM5G-4600	39.06"	37.56"	27.95"	40.55"	39.49"	37.91"	16.5"	9.25"	1/2"

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Function Code Record

Function Code	Factory Default def60	Notes:	Function Code	Factory Default def60	Notes:	Function Code	Factory Default def60	Notes:	Function Code	Factory Default def60	Notes:
F000	--		F040	1.00		F080	0		F120	1	
F001	3		F041	0.00		F081	Varies		F121	--	
F002	1		F042	1.00		F082	0		F122	0	
F003	1		F043	0.00		F083	0		F123	0	
F004	1		F044	0		F084	0.0		F124	1	
F005	1		F045	1.00		F085	0.0		F125	1	
F006	1		F046	1		F086	0.0		F126	0	
F007	20		F047	20		F087	0.0		F127	1.00	
F008	0		F048	Varies		F088	150		F128	0	
F009	60		F049	Varies		F089	0.5		F129	2	
F010	10		F050	0		F090	100		F130	1.00	
F011	20		F051	4P		F091	--		F131	1	
F012	30		F052	3		F092	0		F132	0.5	
F013	0		F053	4		F093	1		F134	--	
F014	0		F054	1		F094	3				
F015	0		F055	2		F095	Varies				
F016	0		F056	7		F096	0.5				
F017	6		F057	6		F097	0.0				
F018	60		F058	3		F098	1				
F019	Varies		F059	2		F099	1				
F020	Varies		F060	11		F100	2				
F021	Varies		F061	2		F101	3				
F022	Varies		F062	2		F102	1				
F023	Varies		F063	0.0		F103	3				
F024	Varies		F064	1.0		F104	15				
F025	Varies		F065	0		F105	15				
F026	Varies		F066	0		F106	0				
F027	Varies		F067	0		F107	0.00				
F028	Varies		F068	160		F108	10				
F029	0		F069	0.1		F109	--				
F030	0		F070	170		F110	1				
F031	60		F071	160		F111	20				
F032	0.5		F072	Varies		F112	17				
F033	Varies		F073	Varies		F113	8				
F034	60		F074	1		F114	5				
F035	Varies		F075	50		F115	3				
F036	0		F076	0.5		F116	1				
F037	0		F077	0.0		F117	0				
F038	0		F078	0		F118	0				
F039	0		F079	Varies		F119	0.01				

RM5G Function Code Table						
	F 000	Drive Information	0) Software Version (Example: P5103F) 1) Model Number 2) Hours of Operation (Running the motor) 3) Hours of Power On (New Drives will have somewhere about 40 hours) 4) Software Check Sum Code 5) Reserve			
Pg 21	F 001	Start, Forward & Reverse	0) Enable terminals FWD and REV to start, Important: See F 083, if reverse is enabled 1) Enable terminals FWD and REV to Start, forward rotation only. 2) Keypad start, Terminals select forward or reverse 3) Keypad start, forward only (Factory Default: 3) 4) Keypad start, reverse only.			
Pg 17	F 002	Speed Adjustment	0) Speed Potentiometer connected to terminals Vin & GND (0~10V) or lin & GND (4~20mA) 1) Keypad arrow keys with Hz display (Factory Default: 1) 2) Keypad arrow keys with RPM displayed when keys are pressed 3) Keypad arrow keys with user defined units (MPM) displayed when keys are pressed 4) Digital Speed Adjustment (Input Terminals X1 through X6, See F 052 through F 057)			
21	F 003	Keypad Stop	0) Disable keypad stop (To Stop Open Terminals FWD or Rev) 1) Enable keypad stop (Factory Default: 1)			
17	F 004	Keypad Speed Adjustment	0) Disable arrow key speed adjustment during motor operation 1) Enable arrow key speed adjustment during motor operation. (Factory Default: 1)			
17	F 005	Speed Memory (Keypad Only)	0) Disable Speed Memory, Keypad speed adjustment only 1) Enable Speed Memory, Stored after 3 minutes of operation. (Factory Default: 1)			
Pg 31	F 006	Keypad Default Display	1) Hertz Output 2) Speed Adjust in Hertz 3) Voltage Output 4) DC Voltage (PN)	5) Amperage Output 6) RPM 7) User Defined Meter (i.e. MPM) 8) Terminal Status	(Factory Default: 1)	
Pg 31	F 007	User Defined Meter	0 to 500 Units per Hz	(Factory Default: 20)		
Pg 31	F 008	Decimal Point Display	0) No Decimal Point 1) One Decimal Point	2) Two Decimal Points 3) Three Decimal Points	(Factory Default: 0)	
29	F 009	Note* Levels 4,5,6 and 7 are only activated when F054 is set to 5 Primary Speed Level	0 to 400 Hz (Factory Default: 60 Hz)	X3*	X2	X1
Pg 29	F 010	Preset Speed Level 1	0 to 400 Hz (Factory Default: 10 Hz)	Off	Off	On
	F 011	Preset Speed Level 2	0 to 400 Hz (Factory Default: 20 Hz)	Off	On	Off
	F 012	Preset Speed Level 3	0 to 400 Hz (Factory Default: 30 Hz)	Off	On	On
	F 013	Preset Speed Level 4	0 to 400 Hz (Factory Default: 0 Hz)	On*	Off*	Off*
	F 014	Preset Speed Level 5	0 to 400 Hz (Factory Default: 0 Hz)	On*	Off*	On*
	F 015	Preset Speed Level 6	0 to 400 Hz (Factory Default: 0 Hz)	On*	On*	Off*
	F 016	Preset Speed Level 7	0 to 400 Hz (Factory Default: 0 Hz)	On*	On*	On*
	F 017	Jog	0 to 400 Hz (Factory Default: 6 Hz, input X3, F 054 set to 1)			
Pg 23	F 018	Acceleration & Deceleration Frequency Scale	0.01 to 400Hz (Factory Default: 60Hz)	Example: When the frequency scale is 60Hz and accel time is set to 15 seconds the motor will accel to 60 Hz in 15 seconds. If the frequency scale is changed to 30Hz the motor will accel to 60Hz in 30 seconds.		
Pg 25	F 019	Primary Acceleration Time and Levels 4, 5, 6, 7 & Jog	0.1 to 3200 Sec	Factory (1/2 to 5HP, 5 sec.) (7.5 to 30HP, 15 sec.) Above 30HP are greater than 15 seconds		
	F 020	Primary Deceleration Time and Levels 4, 5, 6, 7 & Jog	0.1 to 3200 Sec.	Factory (1/2 to 5HP, 5 sec.) (7.5 to 30HP, 15 sec.) Above 30HP are greater than 15 seconds		
Pg 29	F 021	Pre Spd Level 1 Accel	0.1 to 3200 Seconds.	(Factory Default is the same as F 019)		
	F 022	Pre Spd Level 1 Decel	0.1 to 3200 Seconds.	(Factory Default is the same as F 020)		
	F 023	Pre Spd Level 2 Accel	0.1 to 3200 Seconds.	(Factory Default is the same as F 019)		
	F 024	Pre Spd Level 2 Decel	0.1 to 3200 Seconds.	(Factory Default is the same as F 020)		
	F 025	Pre Spd Level 3 Accel	0.1 to 3200 Seconds.	(Factory Default is the same as F 019)		
	F 026	Pre Spd Level 3 Decel	0.1 to 3200 Seconds.	(Factory Default is the same as F 020)		
Pg 25	F 027	Secondary Accel Time	0.1 to 3200 Seconds.	(Factory Default is the same as F 019 and input X4)		
	F 028	Secondary Decel Time	0.1 to 3200 Seconds.	(Factory Default is the same as F 020 and input X4)		
	F 029	S-Curve Accel & Decel	0.0 to 5.0 Seconds	(Factory Default: 0.0 Sec.)		
	F 030	Maximum Voltage Output Options	0) Disable Maximum Output Voltage Limit (Factory Default: 0) 1) Enable Maximum Output Voltage Limit			
32	F 031	Maximum Frequency Output	0.01 to 400Hz (Factory Default: 60Hz)	This setting overrides all others. Note: See F092 about operation above 120Hz		
Pg 36	F 032	Starting Frequency	0.1 to 10 Hz	(Factory Default: 0.5 Hz)		
	F 033	Starting Boost Voltage	208V~ 240V Motor, 0 to 50 Volts 380V~480V Motor, 0 to 100 Volts	(Factory Default: 8 Volts) (Factory Default: 12 Volts)		

Pg 32	F 034	Maximum Frequency of Primary V/F Pattern	0.01 to 400 Hz Factory Default: 60 Hz	The primary frequency scale sets the frequency at maximum voltage (F035). Example: If F034 is 60 Hz and F035 is 220V then at 60 Hz the voltage is 220V. Second Example: If F034 is 120Hz and F035 is F036 220V then at 60Hz the voltage is 110V. Note: Above 120Hz see F092.	
	F 035	Maximum Voltage of Primary V/F Pattern	208 ~ 240V Motor, 0.1 to 255 Volts 380 ~ 480V Motor, 0.1 to 510 Volts	(RM5G-2XXX, Factory Default is 220V) (RM5G-4XXX, Factory Default is 380V)	
	F 036	2nd Segment V/F Pattern Frequency Switch Point	0 to 400 Hz, Factory set: 0 Hz	The V/F pattern can be customized into two or three segments. 1st (lowest), 2nd (middle) and Primary (highest) V/F patterns. F036 sets the maximum frequency of the 1st segment and the switch point to 2nd or primary V/F pattern. When F036 is set:0, it is not active.	
	F 037	2nd V/F Pattern Voltage	208 ~ 240V Motor, 0 to 255 Volts 380 ~ 480V Motor, 0 to 510 Volts	(RM5G-2XXX, Factory Default: 0 Volts) (RM5G-4XXX, Factory Default: 0 Volts)	
	F 038	3rd Segment V/F Pattern Frequency Switch Point	0 to 400 Hz, Factory set: 0 Hz	The 2nd V/F pattern begins at F036 and ends at F038. If F038 is set 0, it is not active.	
	F 039	3rd V/F Pattern Voltage	208 ~ 240V Motor, 0.1 to 255 Volts 380 ~ 480V Motor, 0.1 to 510 Volts	(RM5G-2XXX, Factory Default: 0 Volts) (RM5G-4XXX, Factory Default: 0 Volts)	
Pg 19	F 040	Vin Gain (Speed Reference Scale Max)	0.00 to 2 (Factory Default: 1.00)	The factory default speed reference scale is 0 to 10 volts. The gain (Maximum Voltage) can be programmed from 5V to 10V. Example: (10/1.25=8) Entering 1.25 makes the scale: 0 to 8 V	
	F 041	Vin Bias (Speed Reference Scale Min)	-1 to 1 (Factory Default: 0.00)	The Bias (Minimum Voltage) of the scale is from 0 to 5 volts. Formula: sin(F041x90)x-5 is only valid when F040=1.00. Example: sin(-0.20x90)x-5 = sin-18x-5 = 0.309x5 = 1.545 Volts	
Pg 33	F 042	Maximum Hz Adj Range	0.00 to 1 (Factory Default: 1.00)	F 042 is multiplier of F 031. Example: If F 031 is 60 Hz and F 041 is 0.75 the maximum the output is 45 Hz., (0.75 x 60 = 45)	
	F 043	Minimum Hz Adj Range.	0.00 to 1 (Factory Default: 0.00)	F 043 is a multiplier of F 031. Example: If F 031 is 60 Hz and F042 is 0.5 the minimum output is 30 Hz. (0.5 x 60 = 30)	
Pg 30	F 044	FM+ Option Menu	0) Hertz Output 1) Keypad Speed 2) Amperes Output 3) Vin Input Signal	4) Iin Input Signal 5) DC Voltage (PN) 6) Output Voltage	(Factory Default: 0)
	F 045	FM+ Gain (Max., Output Signal)	00.0 to 2.00 (Factory Default: 1.00)	Factory default scale is 0~10V	
Pg 32	F 046	Slow Overload Protection (Fault Display OL)	0) Disable Motor Over Current Protection 1) Enable Motor Over Current Protection 2) Enable Motor Over Current Protection for separately ventilated motors	(Factory Default: 1)	
17	F 047	Filters the Signal to terminals Vin and Iin	0 to 255 (Factory Default: 20)	Filters the analog input signal to Vin and Iin when F002 is set 2	
Pg 34	F 048	Motor Full Load Amps	Set according to motor's data plate Full Load Amps (FLA)		
Pg 34	F 049	Motor's No Load Current	Set according to motor's data plate (If available)		
33	F 050	Motor Slip Compensation	-9.9 to 10 Hz	Set according to load at constant speed	(Factory Default: 0)
31	F 051	Number of Motor Poles	2 to 10 Poles, Calibrates RPM and Custom Display (MPM)	(Factory Default: 4P)	
Digital Input Terminals X1 through X6			Table for Terminals X1 through X6 (Note: 0...+16 Positive Logic, -1...-16 Negative Logic) 0) X1: Digital Speed Adjustment ±6) Reset 0) X2: DC braking ±7) External fault signal input (thr) 0) X3: Current Limit Enable ±8) Disable Outputs 0) X4: Select Speed Reference ±9) Freewheel (Fr) see Warnings 0) X5: Stop, postivie logic ±10) Speed search from Max Freq 0) X6: Stop, negative logic ±11) Speed search from Set Freq ±1) Jog ±12) Hold Speed ±2) Secondary Accel & Decel ±13) Digital Speed Adjustment Accel ±3) Preset Speed Level 1 ±14) Digital Speed Adjustment Decel ±4) Preset Speed Level 2 ±15) Clear Digital Speed Adjustment ±5) Preset Speed Level 3 ±16) Select Vin or Iin		
Pg 26	F 052	X1 Input Terminal	Factory Default: 3		
	F 053	X2 Input Terminal	Factory Default: 4		
	F 054	X3 Input Terminal	Factory Default: 1		
	F 055	X4 Input Terminal	Factory Default: 2		
	F 056	X5 Input Terminal	Factory Default: 7		
	F 057	X6 Input Terminal	Factory Default: 6		
Pg 30	Digital Output Terminals Y1, Y2 and Relay 1		Table for Y1 and Y2 and Relay 1 (Note: Signal +1 High, -1 Low) ±1) Rotation Detect ±7) Low Input Voltage Detect (LE) ±2) Level Speed (See F061, F062) ±8) Braking ±3) Zero Rotation Detect ±9) Low Voltage Pass-through Detect ±4) Freq., Output Detect (see F063) ±10) General Fault Pass-through Detect ±5) Overload Detect (See F 065) ±11) General Fault Detect ±6) Stall Prevention Detect		
	F 058	Y1 Terminal (Open Collector Transistor)	Factory Default: 3		
	F 059	Y2 Terminal (Open Collector Transistor)	Factory Default: 2		
	F 060	Relay 1 (SPDT) Terminals: Ta1, Tb1, Tc1	Factory Default: 1		

Note: Green indicates the function code can be changed when the motor is running
 Gray indicates the function code can only be changed when the motor is stopped

Pg 35	F 061	Level Speed Detection Bandwidth for Vin or lin	0.0 to 10 Hz, (Factory Default: 2 Hz)	If any of the terminals Y1, Y2, Relay 1 or Relay 2 are programmed to 2 and the frequency is within the bandwidth of F 061 in relation to Vin or lin, the terminal will signal
	F 062	Level Speed Detection Bandwidth for Keypad	0.0 to 10 Hz, (Factory Default: 2 Hz)	If any of the terminals Y1, Y2, Relay 1 or Relay 2 are programmed to 2 and the frequency is within the bandwidth of F 062 in relation to the keypad setting, the terminal will signal
Pg 30	F 063	Output Frequency Detection Signal	0 to 400 Hz (Factory Default: 0.0 Hz)	If terminals Y1, Y2, Relay 1 or Relay 2 are programmed to 4, the setting of F 063 determines when to signal
35	F 064	Automatic Torque Boost	0.0 to 25.5 (Factory Default: 1.0)	Automatic voltage boost during heavy load
Pg 34	F 065	Overload Signal (OLO) Terminals Y1, Y2, Relays T1, T2	0) Disable 1) Enable (Factory Default: 0)	If terminals Y1, Y2, Relay T1 or T2 are programmed to signal OLO, F 065 must be set 1. (See F 058, F 059, F 060 or F 131 setting 5)
	F 066	Overload Conditions (OLO)	0) Signal Overload only when running at level speed 1) Signal Overload at any speed	(Factory Default: 0)
Pg 34	F 067	Fast Overload Stop	0) Disables Overload Stop 1) Enabled, Stops when overload is detected	(Factory Default: 0)
	F 068	Fast Overload Amperage	30% to 200% of the RM5G rating when F069 time is exceeded	(Factory Default: 160%)
	F 069	Overload Delay Time	0.1 to 10 Seconds (Factory Default: 0.1)	
Pg 35	F 070	Stall Prevention during Acceleration	30% to 200% (Factory set: 170%)	Percentage of Motor's rated current (F 048). If stall is detected acceleration will decline or speed levels.
	F 071	Stall Prevention during Level Speed	30% to 200% (Factory set: 160%)	Percentage of Motor's rated current (F 048). If stall is detected the speed is reduced.
	F 072	Stall Recovery Acceleration Time	0.1 to 3200 sec. Factory Default Varies with HP	Acceleration Time after recovering from a stall at level speed.
	F 073	Stall Prevention Deceleration Time during Level Speed	0.1 to 3200 sec. Factory Default Varies with HP	If stall conditions are detected when running at level speed, the speed will be reduced at the deceleration rate of F073
35	F 074	Deceleration Stall Prevention	0) Disable Stall Prevention during deceleration 1) Enable Stall Prevention during deceleration	(Factory Default: 1)
Pg 23	F 075	DC Braking Amperage	0 to 150% Of the RM5G ampere rating on data label	(Factory Default: 50%)
	F 076	DC Braking Time	1 to 200 Sec. (Factory Default: 0.5)	If F 082 is 2, while stopping, the motor will coast for the time setting of F 089 then DC is applied for the time of F076 Important: See page 21, section 4.17C
	F 077	Pre-start Motor Magnetizing Time	0 to 20 Sec. (Factory Default: 0.0)	F 077 assists motors with starting problems. F077 delays start while applying DC to the motor. F 075 sets the DC Amperage
Pg 24	F 078	Power Interruption Response	0) Disable Passthrough 1) Enable Passthrough 2) Switch Off when power is interrupted, motor coasts to stop 3) Enable Controlled Deceleration Stop (See: F103, F104, F105, F106)	(Factory Default: 0)
24	F 079	Low Voltage Switch Off	220V motor, 130V to 192V 480V motor, 230V to 384V	(Factory Default: 175V) (Factory Default: 320V)
Pg 37	F 080	Limit of General Fault Passthroughs	0 to 16 (Factory Default: 0)	If a fault is detected and then quickly corrects without intervention. The RM5G will continue to run (passthrough). F080 sets the number of permissible passthroughs
Pg 36	F 081	Switching Frequency (i.e. Carrier Frequency)	Factory Default Varies with HP	0) 800 Hz 2) 5000 Hz 4) 10000 Hz 6) 15000 Hz 1) 2500 Hz 3) 7500 Hz 5) 12500 Hz
Pg 23	F 082	Stop Parameters	0) Controlled Deceleration Stop 1) Coast to Stop (i.e. Freewheeling) 2) Coast then DC Braking, See F 076 and F 075	(Factory Default: 0)
21	F 083	Reverse	0) Enable Reverse 1) Disable Reverse	(Factory Default: 0)
Pg 33	F 084	Frequency Bypass 1	0 to 400 Hz, To avoid resonance problems	(Factory Default: 0.0)
	F 085	Frequency Bypass 2	0 to 400 Hz, To avoid resonance problems	(Factory Default: 0.0)
	F 086	Frequency Bypass 3	0 to 400 Hz, To avoid resonance problems	(Factory Default: 0.0)
	F 087	Frequency Bypass Bandwidth	0 to 25.5 Hz (Factory Default: 0.0)	F 087 applies to F 084, F 085 and F 086. Example: To create a bypass from 30 to 35Hz. Set F 084 to 32.5Hz and F 087 to 2.5 Hz.

Note: Green indicates the function code can be changed when the motor is running

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	F 088	Amperage Tracking (i.e. Current Limit)	0 to 200% Factory Default 150%	If the Amperage exceeds F 088, the speed (frequency) will be reduced. F 088 is in percentage of the RM5G output rating on the data label	
Pg 23	F 089	DC Braking Delay Time	0.0 to 5.0 sec Factory Default 0.5	When F 082 is 2, F 089 is the delay time (coasting time) before DC braking is applied	
	F 090	V/F Pattern Tracking Start Point	0 to 100% Factory Default 100%		
37	F 091	Fault History	Displays the last five faults		
Pg 37	F 092	Locks Function Codes and 120Hz or 400Hz Operation	0) Unlock functions codes: Max frequency is up to 120 Hz 1) Lock function code: Max frequency is up to 120 Hz 2) Unlock function codes: Max frequency is up to 400 Hz 3) Lock function codes: Max frequency is up to 400 Hz		(Factory Default: 0)
	F 093	Automatic Voltage Regulation (AVR)	0) Disable AVR 1) Enable AVR		(Factory Default: 1)
34	F 094	Overload Protection	0) Disable Overload Protection 1) Thermal Protection 2) Amperage Protection 3) Both Thermal and Amperage Protection		(Factory Default: 3)
15	F 095	Input Voltage (Reference for Program)	RM5G-2*** RM5G-4***	190 to 240 Volts 340 to 480 Volts	(Factory Default: 220V) (Factory Default: 380V)
Pg 36	F 096	Creeping Start Frequency	0.0 to 400 Hz Factory Default: 0.5	Description for both F 096 and F 097 F 096 holds the frequency for the time length of F 097 This function helps avoid excessive slip during acceleration (Rotor catch-up time)	
	F 097	Creeping Start Time	0.0 to 25.5 sec. Factory Default: 0.0		
	F 098	Ground Fault (GF)	0) Disable GF 1) Enable GF		(Factory Default: 1)
Pg 31	F 099 F 100 F 101	Digital Meter 1 Digital Meter 2 Digital Meter 3	Factory Default: 1 Factory Default: 2 Factory Default: 3	<u>Digital Meter Table</u> 0) None (No Display) 3) Voltage Output 6) RPM 1) Hertz Output 4) DC Voltage (PN) 7) User Defined Meter 2) Speed Adjust, Hz 5) Amperage Output 8) Terminal Status	
Pg 32	F 102	V/F Pattern Selection	0) Linear (Factory Default: 1) 1) Economy: adjusts the voltage to the minimum required to maintain speed 2) Squared Curve 3) 1.7th Power Curve 4) 1.5th Power Curve		
Pg 24	F 103	Power Interruption Frequency Reduction	0 to 20 Hz Factory Default: 3	When the power is interrupted the frequency will immediately be reduced by this setting. A large decrease will cause hard braking. Example: The motor is running at 60 Hz and F 103 is set 3 Hz. When the power is shut off, the frequency immediately be reduced to 57 Hz (60-3 =57).	
	F 104	Power Interruption 1st Deceleration Time from F 103 to F 106	0 to 3200 sec. Factory Default:15	If the power is interrupted and F 106 is set 0 Hz and F 104 is set 15 sec., the motor will decel to a stop in 15 sec. If F 106 is set 30 Hz the motor will decel to 30 Hz in 15 sec.	
	F 105	Power Interruption 2nd Deceleration Time from F 106 to stop	0 to 3200 sec. Factory Default:15	If the power is interrupted and F 106 is set 0 Hz and F 104 is set 15 sec., the motor will decel to a stop in 15 sec. If F 106 is set 30 Hz the motor will decel to 30 Hz in 15 sec.	
	F 106	Power Interruption Switch Point Frequency from 1st to 2nd decel time	0.0 to 400 Hz, Factory Default:0	This frequency is the piont when the 1st decel time switches to the 2nd decel time. If F 106 is set 0 Hz, F106 is disabled.	
	F 107	Vin and lin Signal Filter	0.00 to 2.55 Factory Default: 0.00	F 107 filters the amount of signal change (i.e. deadband) to Vin or lin to adjust the speed. Increasing F 107 will affect the linearity of speed adjustment	
Pg 18	F 108	Digital Input Response Time	5 to 16 ms Factory Default: 10 ms	Signals to the digital inputs must exceed the time setting of F 108. Example: The Factory default time setting, the digital input will not respond to signals of less than 10 ms.	
	F 109	Reserved			
Function codes F 110 through F 117 are for the KP-202B keypad See section 5 on pages 41, 42 and 43 about these function codes					

Note: Green indicates the function code can be changed when the motor is running
Gray indicates the function code can only be changed when the motor is stopped

Pg 18	F 118	Digital Speed Adjustment Memory	0) Clear the speed from memory when power is switched off. 1) Save the speed in memory when power is switched off.	(Factory Default: 0)
	F 119	Digital Speed Adjustment Frequency Increments	0) 0.01Hz 1) 0.05Hz 2) 0.10Hz 3) 0.15Hz 4) 0.20Hz 5) 0.25Hz 6) 0.30Hz 7) 0.35Hz 8) 0.40Hz 9) 0.50Hz	10) 1.00Hz 11) 1.10Hz 12) 1.20Hz 13) 1.30Hz 14) 1.40Hz From 10 to 250 the speed is increased by 0.10Hz
	F 120	Digital Speed Adjustment Operating Mode	1) 1 second 2) 2 seconds 3) 3 seconds 4) 4 seconds 5) 5 seconds 6) One Increment	First Example: If F 119 is 10 and F 120 is 6, When a signal is recieved the speed will only increase 1Hz. Second Example: If F 119 is 10 and F 120 is 2. When a signal is kept on, the speed will immediatly increase by an increment of 1 Hz then stays level for 2 seconds, after 2 seconds the speed will increase continuously.
	F 121	Keypad Adjustment of Digital Speed Adjustment	When digital speed adjustment is used. The user can adjusted the speed with the keypad by entering F 121. Important, don't operate F 121 and digital speed adjustment at the same time.	
Pg 20	F 122	Secondary Speed Adjustment	0) Analog Speed Reference Signal 1) Keypad Speed Adjustment 2) Digital Speed Adjustment	(Factory Default: 0) Note: X4 must be set: 0 See F 055
Pg 20	F 123	Terminals Vin and lin Properties	0) Vin and lin are both enabled, The speed is the sum of both. 1) Vin enabled, lin disabled 2) lin enabled, Vin disabled 3) Vin or lin selected by X terminal programmed to +16 or -16	(Factory Default: 0)
	F 124	Vin Properties	0) Frequency Limit 1) Speed Adjustment 2) Current Limit 3) Voltage Limit	(Factory Default: 1)
	F 125	lin Properties	0) Frequency Limit 1) Speed Control 2) Current Limit 3) Voltage Limit	(Factory Default: 1)
Pg 19	F 126	lin Scale	0) 4~20mA (2 ~ 10V) 1) 0~20mA (0 ~ 10V)	(Factory Default:0)
Pg 19	F 127	lin Maximum Scale (lin Gain)	0.00 ~ 2.00 (Factory Default: 1.00)	
	F 128	lin Minimum Scale (lin Bias)	-1.00 ~ 1.00 (Factory Default: 0.00)	
Pg 30	F 129	AM+ (Analog Output)	0) Hertz to motor 1) Speed Adjustment Signal 2) Amperes 3) Vin signal	4) lin signal 5) DC Voltage (PN) 6) Voltage to motor (Factory Default: 2)
	F 130	AM+ Maximum Signal (AM+ Gain)	0.00 ~ 2.00 (Factory Default: 1.00)	
Pg 30	F 131	Relay 2 (SPST) Terminals Ta2, Tc2	Table for relay Ta2, Tc2 (Note: Relay +1 Open, -1 Close) Factory Default: 1 ±1) Rotation Detect ±2) Level Speed Detect (F 061, F 062) ±3) Zero Rotation Detect ±4) Freq., Output Detect (See F 063) ±5) Overload Detect (see F 065) ±6) Stall Prevention Detect ±7) Low Input Voltage Detect ±8) Braking ±9) Low Voltage Passthrough Detect ±10) General Fault Passthrough Detect ±11) General Fault Detect	
	F 132	Dynamic Braking Ending Frequency	0.1 ~ 60.0 Hz (Factory Default: 0.5)	Dynamic Braking ends when the speed crosses below the frequency setting of F 132.
	F 133	Keypad Display Current Limit	0 to 150%	Entering F133 permits viewing the current limit setting in percentage Note: If F001 is programmed 2 or 3, the Run and Stop keys are disabled
Pg 37	F 134	Commands Default Display: 0	Table for F 134 0) Not active CLF) Clear faults F 091 dEF60) Factory 60Hz settings dEF50) Factory 50Hz settings Instructions for F 134. Scroll to the function required then press and hold the FUN/DATA key and wait for the word "end" to appear. SAu) Save Program rES) Restore Previous settings rd_EE) Copy RM5 settings to Keypad Uur_EE) Copy Keypad settings to RM5G	

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 Gray indicates the function code can only be changed when the motor is stopped

RM5G Elementary Diagram

