AMERICAN CONTROL ELECTRONICS

RGM SERIES

USER MANUAL

RGM400-1.5
RGM400-10

Dear Valued Consumer:

Congratulations on your purchase of the **RGM Series** drive. This User Manual was created for you to get the most out of your new device and assist with the initial setup. Please visit www.americancontrolelectronics.com to learn more about our other drives.

Thank you for choosing **American Control Electronics**!

Safety First!

SAFETY WARNINGS

Text in gray boxes denote important safety tips or warnings. Please read these instructions carefully before performing any of the procedures contained in this manual.

- DO NOT INSTALL, REMOVE, OR REWIRE THIS EQUIPMENT WITH POWER APPLIED. Have a qualified electrical technician install, adjust and service this equipment. Follow the National Electrical Code and all other applicable electrical and safety codes, including the provisions of the Occupational Safety and Health Act (OSHA), when installing equipment.
- Reduce the chance of an electrical fire, shock, or explosion by using proper grounding techniques, over-current protection, thermal protection, and enclosure. Follow sound maintenance procedures.

It is possible for a drive to run at full speed as a result of a component failure. American Control Electronics (ACE) strongly recommends the installation of a master switch in the main power input to stop the drive in an emergency.

Circuit potentials are at 115 VAC or 230 VAC above earth ground. Avoid direct contact with the printed circuit board or with circuit elements to prevent the risk of serious injury or fatality. Use a non-metallic screwdriver for adjusting the calibration trim pots. Use approved personal protective equipment and insulated tools if working on this drive with power applied.

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Section 1. Regenerative Drives

Most non-regenerative, variable speed, DC drives control current flow to a motor in one direction. The direction of current flow is the same direction as the motor rotation. Non-regenerative drives operate in Quadrant I, and also in Quadrant III if the drive is reversible (see Figure 1). Motors must stop before reversing direction. Unless dynamic braking is used, non regenerative drives cannot decelerate a load faster than coasting to a lower speed.

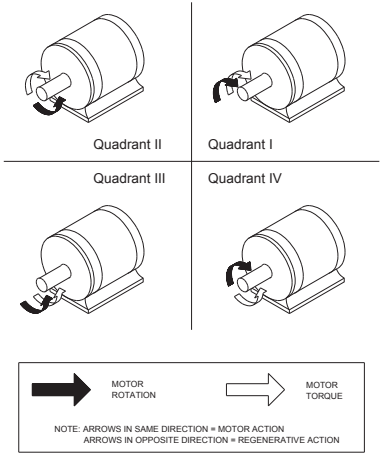


Figure 1. Four Quadrant Operation

Regenerative drives operate in two additional quadrants: Quadrant II and Quadrant IV. In these quadrants, motor torque is in the opposite direction of motor rotation.

This allows regenerative drives to reverse a motor without contractors or switches, to control an overhauling load, and to decelerate a load faster than it would to coast to a lower speed.

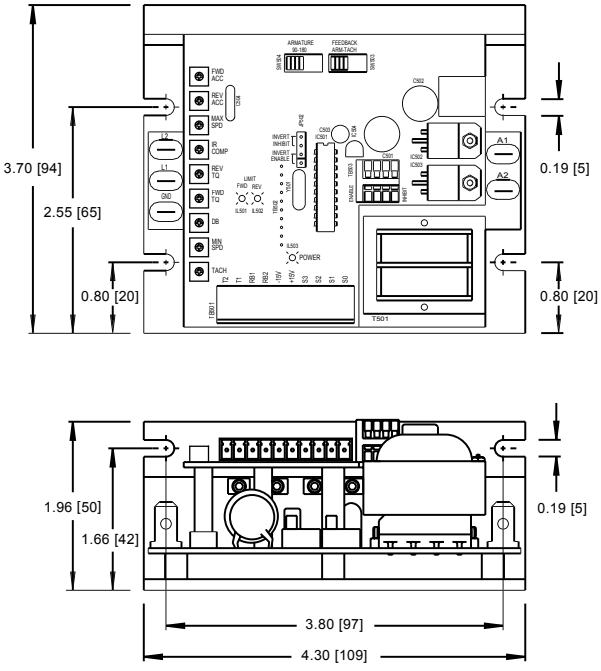
Section 2. Specifications

Model	*Maximum Armature Current (ADC)*	*HP Range with 90 VDC Motor*	*HP Range with 180 VDC Motor*	*Enclosure*
RGM400-1.5	*1.5*	*1/20 - 1/8*	*1/10 - 1/4*	*Chassis*
RGM400-10	*10.0**	*1/8 - 1*	*1/4 - 2*	*Chassis*

* Heat sink kit part number HSK-0001 must be used when the continuous current output is over 5 amps.

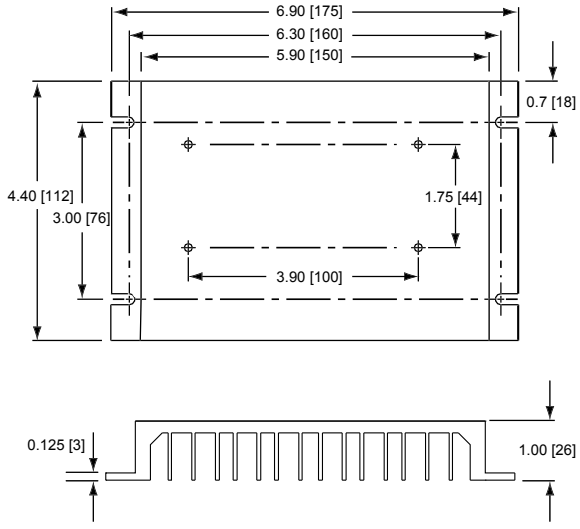
AC Line Voltage	115 / 230 VAC ± 10%, 50/60 Hz, single phase
DC Armature Voltage	
with 115 VAC Line Voltage	0 - 90 VDC
with 230 VAC Line Voltage	0 - 180 VDC
Acceleration Time Range	0.5 - 6 seconds
Deceleration Time Range	0.5 - 6 seconds
Analog Input Range (signal must be isolated (S0 to S2)	0 to ± 10 VDC
Input Impedance (S0 to S2)	30K ohms
Form Factor	1.37 at base speed
Load Regulation	
with Armature Feedback	1% base speed or better
with Tachogenerator Feedback	0.1% of base speed or better
Speed Range	60:1
Vibration	0.5G maximum (0 - 50 Hz) 0.1G maximum (> 50 Hz)
Safety Certifications	UL/cUL Listed Equipment, File # E132235
Ambient Temperature Range	10°C - 55°C

Section 3. Dimensions



ALL DIMENSIONS IN INCHES [MILLIMETERS]

Figure 2. RGM Dimensions



ALL DIMENSIONS IN INCHES [MILLIMETERS]

Figure 3. HSK-0001 Dimensions

Section 4. Installation

Do not install, rewire, or remove this control with input power applied. Failure to heed this warning may result in fire, explosion, or serious injury. Make sure you read and understand the Safety Precautions on page i before attempting to install this product.

Heat Sinking

Model RGM400-10 requires an additional heat sink when the continuous armature current is above 5 amps. Use American Control Electronics heat sink kit part number HSK-0001. All other chassis drives have sufficient heat sinking in their basic configuration. Use a thermally conductive heat sink compound (such as Dow Corning® 340 Heat Sink Compound) between the chassis and the heat sink surface for optimum heat transfer.

Mounting

- Drive components are sensitive to electrostatic discharge. Avoid direct contact with the circuit board. Hold the drive by the chassis or heat sink only.
- Protect the drive from dirt, moisture, and accidental contact.
- Provide sufficient room for access to the terminals and calibration trim pots.
- Mount the drive away from heat sources. Operate the drive within the specified ambient operating temperature range.
- Prevent loose connections by avoiding excessive vibration of the drive.
- Mount the drive with its board in either a horizontal or vertical plane. Eight 0.19" (5 mm) wide slots in the chassis accept #8 pan head screws. Fasten either the large base or the narrow flange of the chassis to the subplate.
- The chassis should be earth grounded. Use a star washer beneath the head of at least one of the mounting screws to penetrate the anodized surface and to reach bare metal.

Speed Adjust Potentiometer

> **WARNING!** Be sure that the potentiometer tabs do not make contact with the potentiometer's body. Grounding the input will cause damage to the drive.

If using a remote potentiometer with a chassis drive, mount the speed adjust potentiometer through a 0.38 in. (10 mm) hole with the hardware provided (Figure 4). Install the circular insulating disk between the panel and the 10K ohm speed adjust potentiometer.

Twist the speed adjust potentiometer wire to avoid picking up unwanted electrical noise. If the speed adjust potentiometer wires are longer than 18 in. (46 cm), use shielded cable. Keep the speed adjust potentiometer wires separate from power leads (L1, L2, A1, A2).

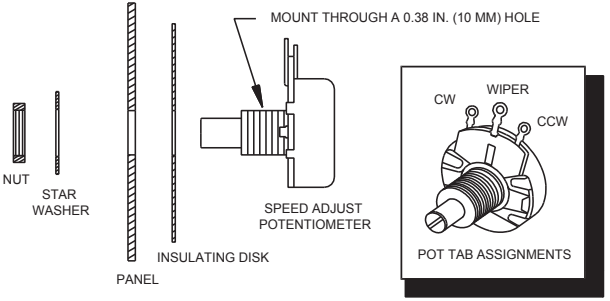


Figure 4. Speed Adjust Potentiometer

Wiring

Do not install, rewire, or remove this control with input power applied. Failure to heed this warning may result in fire, explosion, or serious injury.

Circuit potentials are at 115 or 230 VAC above ground. To prevent the risk of injury or fatality, avoid direct contact with the printed circuit board or with circuit elements.

Do not disconnect any of the motor leads from the drive unless power is removed or the drive is disabled. Opening any one motor lead while the drive is running may destroy the drive.

This product does not have internal solid state motor overload protection. It does not contain speed-sensitive overload protection, thermal memory retention or provisions to receive and act upon signal from remote devices for over temperature protection. If motor over protection is needed in the end-use product, it needs to be provided by additional equipment in accordance with NEC standards.

- Use 18 - 24 AWG wire for logic wiring. Use 14 - 16 AWG wire for AC line and motor wiring.

Shielding Guidelines

Under no circumstances should power and logic level leads be bundled together. Induced voltage can cause unpredictable behavior in any electronic device, including motor controls.

As a general rule, it is recommended to shield conductors. If it is not practical to shield power conductors, it is recommended to shield all logic-level leads. If shielding of all logic-level leads is not practical, the user should twist all logic leads with themselves to minimize induced noise.

It may be necessary to earth ground the shielded cable. If noise is produced by devices other than the drive, ground the shield at the drive end. If noise is generated by a device on the drive, ground the shield at the end away from the drive. Do not ground both ends of the shield.

If the drive continues to pick up noise after grounding the shield, it may be necessary to add AC line filtering devices, or to mount the drive in a less noisy environment.

Logic wires from other input devices, such as motion controllers and PLL velocity controllers, must be separated from power lines in the same manner as the logic I/O on this drive.

Line Fusing

Drives should be fused for protection. Use fast acting fuses rated for 250 VAC or higher and 150% of maximum armature current. Fuse HOT L1 only when the line voltage is 115 VAC. Fuse both L1 and L2 when the line voltage is 230 VAC. Table 1 lists the recommended line fuse sizes.

Table 1. Recommended Line Fuse Sizes

90 VDC Motor Horsepower	*180 VDC Motor Horsepower*	*Maximum DC Armature Current (amps)*	*AC Line Fuse Size (amps)*
1/20	*1/10*	*0.5*	*1*
1/15	*1/8*	*0.8*	*1.5*
1/8	*1/4*	*1.5*	*3*
1/6	*1/3*	*1.7*	*3*
1/4	*1/2*	*2.5*	*5*
1/3	*3/4*	*3.5*	*8*
1/2	*1*	*5.0*	*10*
3/4	*1 ½*	*7.5*	*15*
1	*2*	*10*	*15*

See Section 10: Accessories and Replacement Parts for fuse kit part numbers.

Short-circuit current rating (SCCR) is the maximum short-circuit current that the speed control can safely withstand when protected by a specific over-current protective device(s).

Table 2. Short Circuit Current Ratings

Drive Model	Short Circuit Current Rating		Types of Branch Circuit Protection		Maximum Rating of Overcurrent Protection
	Maximum Current, A	Maximum Voltage, V			
RGM400-10	10,000	240 V	Non-time Delay K5 Fuse	Inverse Time Circuit Breaker	30 A

Connections

Do not connect this equipment with power applied. Failure to heed this warning may result in fire, explosion, or serious injury.

American Control Electronics strongly recommends the installation of a master power switch in the voltage input line, as shown in Figure 7 (page 14). The switch contacts should be rated at a minimum of 200% of motor nameplate current and 250 volts.

Quick Disconnect Terminal Block

The quick-disconnect terminal block, used for logic connections on the top board, is composed of a 10-pin header block and 10-screw terminal plug (Figure 5 on page 13). To use the quick-disconnect terminal block:

1. Carefully pull terminal plug from header block.
2. With a small flat-head screwdriver, turn terminal plug screw counterclockwise to open wire clamp.
3. Insert stripped wire into the large opening in front of the plug.
4. Turn the terminal plug screw clockwise to clamp the wire.
5. Repeat steps 2–4 for each terminal until all connections are made.
6. Insert plug into header until securely fastened.

Cage Clamp Terminal Block

RGM series drives use a cage-clamp terminal block for the enable and inhibit connections. To connect a wire to the cage-clamp terminal block (see Figure 6), use a small screwdriver to press down on the lever arm. Insert a wire stripped approximately 0.25 inches (6 mm) into the opening in front of the terminal block. Release the lever arm to clamp the wire.

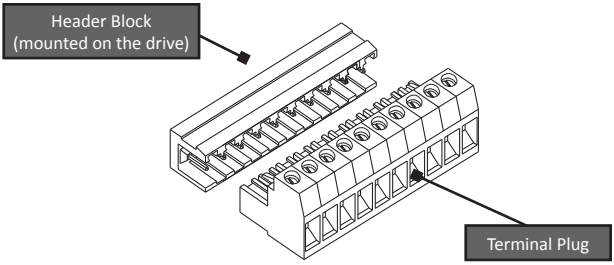


Figure 5. Quick Disconnect Terminal Block

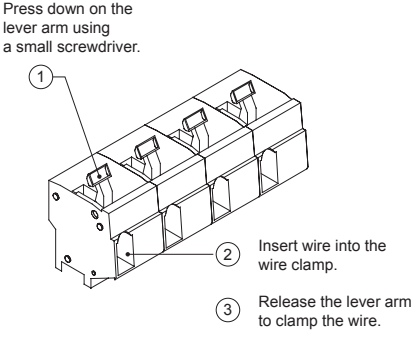


Figure 6. Cage Clamp Terminal Block

Power Input

Connect the AC line power leads to terminals L1 and L2. American Control Electronics recommends the use of a single-throw, double-pole master power switch. The switch should be rated at a minimum of 250 volts and 200% of motor current. Refer to Figure 7.

Motor

Drives supply motor armature voltage from A1 and A2 terminals. It is assumed throughout this manual that, when A1 is positive with respect to A2, the motor will rotate clockwise (CW) while looking at the output shaft protruding from the front of the motor. If the motor does not spin in the desired direction, remove power and reverse the A1 and A2 connections.

Connect a DC motor to terminals A1 and A2. Refer to Figure 7. Ensure that the motor voltage rating is consistent with the drive's output voltage.

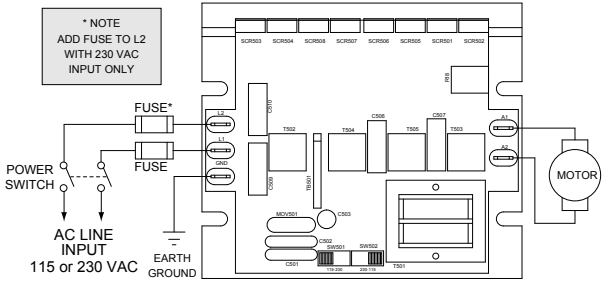


Figure 7. Power and Motor Connections (bottom board)

Speed Adjust Potentiometer

Use a 10K ohm, 1/4 W potentiometer for speed control. The motor can operate in one direction (unidirectional) or two directions (bidirectional) depending on how the speed adjust potentiometer is connected to the drive.

For unidirectional operation in the foward direction, connect the speed adjust potentiometer as shown in Figure 8(a).

For unidirectional operation in the reverse direction, connect the speed adjust potentiometer as shown in Figure 8(b).

For bidirectional operation, connect the speed adjust potentiometer as shown in Figure 8(c). The motor does not operate when the potentiometer is in the center position. Turning the potentiometer clockwise (CW) from the center position causes the motor to rotate in the forward direction, while turning the potentiometer counterclockwise (CCW) causes rotation in the reverse direction.

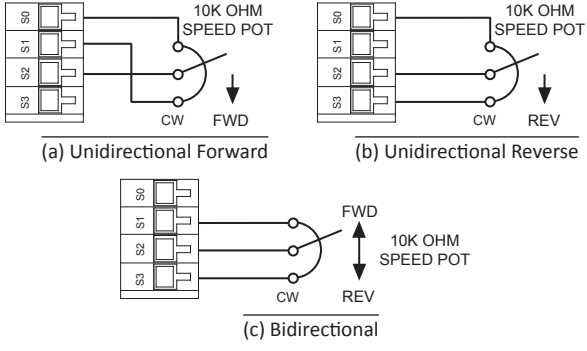


Figure 8. Speed Adjust Potentiometer Connections

Analog Input Signal

Instead of using a speed adjust potentiometer, the drive may be wired to follow an analog input voltage signal that is isolated from earth ground (Figure 9). Connect the signal common (–) RB1. Connect the signal input (+) to S2. A potentiometer can be used to scale the analog input voltage.

An analog input voltage range of -10 to 10 VDC is required to produce an armature voltage range of -90 to 90 VDC with 115 VAC line voltage or -180 to 180 VDC with 230 VAC line voltage.

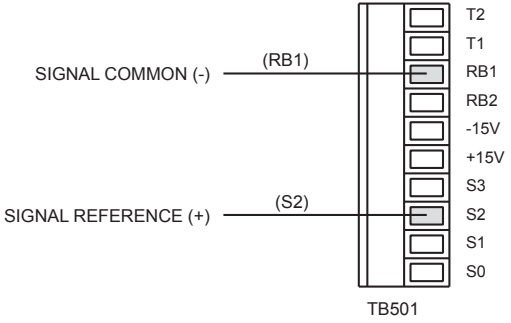


Figure 9. Analog Input Signal Connections

American Control Electronics offers a field installable isolation adder board, part number ISO402-1, to convert a RGM400 into a RGM403. This adder board allows the drive to follow a -10 to 10 VDC or 4 - 20 mA analog input signal that is isolated or non-isolated.

Enable, Regen Brake, and Inhibit

See the “Starting and Stopping Methods” section on pages 21 through 26 for a detailed description of the Enable, Inhibit, and Regen Braking connections.

Tachogenerator Feedback

Using tachogenerator feedback improves speed regulation from approximately 1% of motor base speed to approximately 0.1% of motor base speed. Use tachogenerators rated from 7 VDC per 1000 RPM to 50 VDC per 1000 RPM. Connect the tachogenerator to terminals T1 and T2 of terminal block TB501. The polarity is positive (+) for T1 and negative (-) for T2 when the motor is running in the forward direction. Place SW503 in the TACH position. The TACH trim pot must be adjusted prior to operating with tachogenerator feedback. Refer to the Calibration section for instructions on calibrating the TACH trim pot.

Section 5. Operation

Change voltage switch settings only when the drive is disconnected from AC line voltage. Make sure both switches are set to their correct position. If the switches are improperly set to a lower voltage position, the motor will not run at full voltage and may cause damage to the transformer. If the switches are improperly set to a higher voltage position, the motor will overspeed, which may cause motor damage, or result in bodily injury or loss of life.

Dangerous voltages exist on the drive when it is powered. BE ALERT. High voltages can cause serious or fatal injury. For your safety, use personal protective equipment (PPE) when operating this drive.

If the motor or drive does not perform as described, disconnect the AC line voltage immediately. Refer to the Troubleshooting section, page 47, for further assistance.

Before Applying Power

1. Verify that no foreign conductive material is present on the printed circuit board.
2. Ensure that all switches and jumpers are properly set.

Select Switches

Input Voltage Select (SW501, SW502)

Set the input voltage select switches SW501 and SW502 to either 115 or 230 to match the AC line voltage. See Figure 10.

Feedback Select (SW503)

Set the feedback select switch SW503 to either ARM for armature feedback or TACH for tachogenerator feedback. See Figure 10.

Armature Voltage Select (SW504)

Set the armature voltage select switch SW504 to either 90 or 180 to match the maximum armature voltage. See Figure 10.

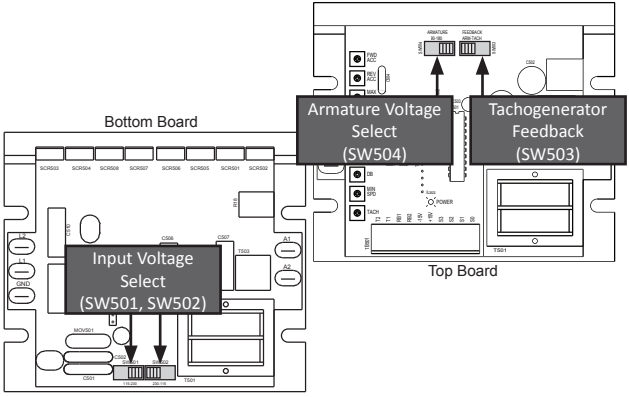


Figure 10. Select Switch Locations

Startup

1. Turn the speed adjust potentiometer or input voltage signal to minimum speed.
2. Apply AC line voltage.
3. Slowly advance the speed adjust potentiometer clockwise (CW) or increase the input voltage signal. The motor slowly accelerates as the potentiometer is turned CW or as the input voltage signal is increased. Continue until the desired speed is reached.
4. Remove AC line voltage from the drive to coast the motor to a stop.

Starting and Stopping Methods

Regenerative braking, coasting to a stop, or decelerating to minimum speed is recommended for frequent starts and stops. Do not use any of these methods for emergency stopping. They may not stop a drive that is malfunctioning. Removing AC line power (both lines) is the only acceptable method for emergency stopping.

For this reason, American Control Electronics strongly recommends installing an emergency stop switch on both AC line inputs (see Figure 7 on page 14).

Frequent starting and stopping can produce high torque. This may cause damage to motors, especially gearmotors that are not properly sized for the application.

Automatic Restart Upon Power Restoration

All drives automatically run to set speed when power is applied and the the Enable, Regen Brake, and Inhibit are set to run.

Line Starting and Stopping

Line starting and stopping (applying and removing AC line voltage) is recommended for infrequent starting and stopping of a drive only. When AC line voltage is applied to the drive, the motor accelerates to the speed set by the speed adjust potentiometer or analog signal. When AC line voltage is removed, the motor coasts to a stop.

Inhibit - Regenerative Brake to Zero Speed

Activate the INHIBIT terminals to regeneratively brake the motor to zero speed. The inhibit bypasses both the MIN SPD trim pot and the deceleration rate set by the FWD ACC or REV ACC trim pots. Deactivate the INHIBIT terminals to accelerate the motor to set speed. See Figure 15 on page 26 for INHIBIT terminal location.

For a normally open connection, leave pins 1 and 2 open on JP502. For a normally closed connection, jumper pins 1 and 2 on JP502.

Twist inhibit wires and seperate them from other power-carrying wires or sources of electrical noise. Use shielded cable if the inhibit wires are longer than 18 in. (46 cm). If shielded cable is used, ground only one end of the shield to earth ground. Do not ground both ends of the shield.

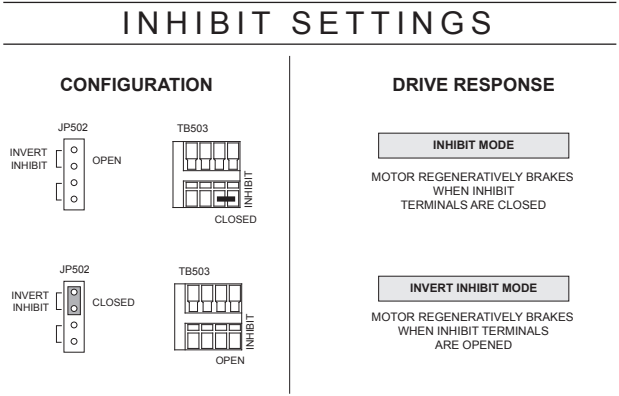


Figure 11. Inhibit Switch Settings

Regen Brake - Regenerative Decel to Zero Speed

Short the RB1 and RB2 terminals to regeneratively brake the motor to zero speed. See Figure 12. The RB1 and RB2 circuit follows the deceleration rate set by the FWD ACC and REV ACC trim pots. Open the RB1 and RB2 terminals to accelerate the motor to set speed.

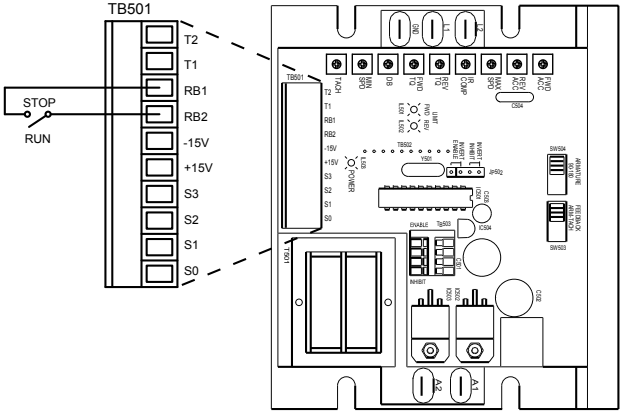


Figure 12. Regenerative Brake Switch

Regenerative Brake to Minimum Speed

The switch shown in Figure 13 may be used to decelerate a motor to a stop. Closing the switch between S0 and S2 decelerates the motor from a set speed to a stop at a deceleration rate determined by the FWD ACC and REV ACC trim pots. Set the switch to the Run position to accelerate the motor to set speed. Figure 13 shows the switch with a potentiometer wired for unidirectional forward mode. For other possible wiring setups, see pages 15 and 36.

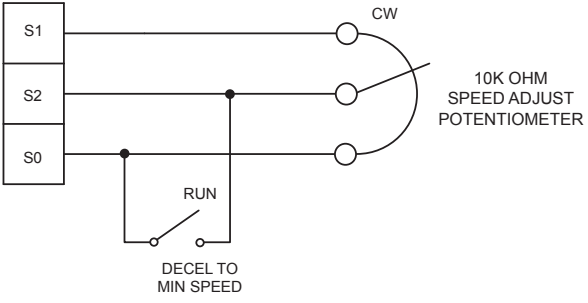


Figure 13. Run/Stop Switch

Enable - Coast to Zero Speed

Activate the ENABLE terminals to coast the motor to zero speed. The enable bypasses both the MIN SPD trim pot and the deceleration rate set by the FWD ACC or REV ACC trim pots. Deactivate the ENABLE terminals to accelerate the motor to set speed. See Figure 15 on page 26 for ENABLE terminal location.

For a normally open connection, leave pins 3 and 4 open on JP502. For a normally closed connection, jumper pins 3 and 4 on JP502.

Twist enable wires and seperate them from other power-carrying wires or sources of electrical noise. Use shielded cable if the enable wires are longer than 18 in. (46 cm). If shielded cable is used, ground only one end of the shield to earth ground. Do not ground both ends of the shield.

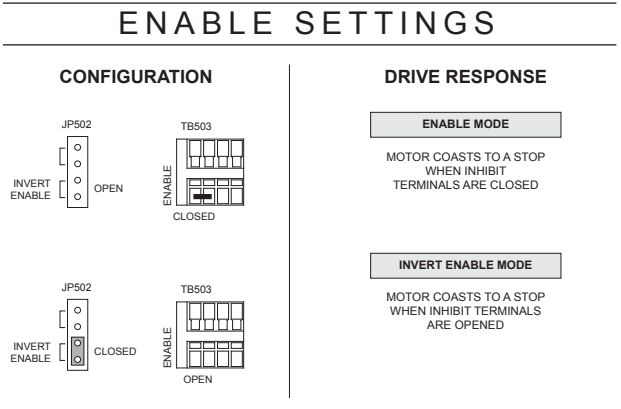


Figure 14. Enable Switch Settings

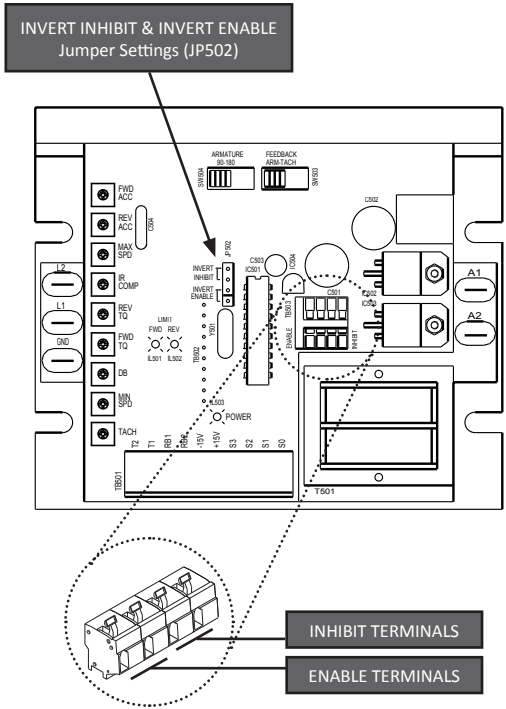


Figure 15. Inhibit / Enable Locations

Section 6. Calibration

Dangerous voltages exist on the drive when it is powered. When possible, disconnect the voltage input from the drive before adjusting the trim pots. If the trim pots must be adjusted with power applied, use insulated tools and the appropriate personal protection equipment. **BE ALERT.** High voltages can cause serious or fatal injury.

RGM series drives have user-adjustable trim pots. Each drive is factory calibrated to its maximum current rating. Readjust the calibration trim pot settings to accommodate lower current rated motors.

All adjustments increase with CW rotation, and decrease with CCW rotation. Use a non-metallic screwdriver for calibration. Each trim pot is identified on the printed circuit board.

Minimum Speed (MIN SPD)

The MIN SPD setting determines the minimum motor speed in unidirectional operation when the speed adjust potentiometer or input voltage or current signal is set for minimum speed.

To calibrate the MIN SPD:

1. Set the speed adjust potentiometer or input voltage signal for minimum speed.
2. Adjust MIN SPD until the desired minimum speed is reached or is just at the threshold of rotation.

Maximum Speed (MAX SPD)

The MAX SPD setting determines the maximum motor speed when the speed adjust potentiometer or input voltage signal is set for maximum speed.

To calibrate MAX SPD:

1. Set the MAX SPD trim pot full CCW.
2. Set the speed adjust potentiometer or input voltage signal for maximum speed.
3. Adjust MAX SPD until the desired maximum speed is reached.

Note: Check the MIN SPD and MAX SPD adjustments after recalibrating to verify that the motor runs at the desired minimum and maximum speed.

Forward Torque (FWD TQ)

FWD TQ should be set to 120% of motor nameplate current rating. Continuous operation beyond this rating may damage the motor. If you intend to operate beyond the rating, contact your American Control Electronics representative for assistance.

The FWD TQ setting determines the maximum torque for accelerating and driving the motor in the forward direction. To calibrate FWD TQ, refer to the recommended FWD TQ settings in Figure 16 on page 32 or use the following procedure:

1. With the power disconnected from the drive, connect a DC ammeter in series with the armature.
2. Set the FWD TQ trim pot to minimum (full CCW).
3. Set the speed adjust potentiometer full CW or input voltage signal to maximum speed.
4. Carefully lock the motor armature. Be sure that the motor is firmly mounted.
5. Apply line power. The motor should be stopped.
6. Slowly adjust the FWD TQ trim pot CW until the armature current is 120% of motor rated armature current.
7. Turn the speed adjust potentiometer CCW or decrease the input voltage signal.
8. Remove line power.
9. Remove the stall from the motor.
10. Remove the ammeter in series with the motor armature if it is no longer needed.

Reverse Torque (REV TQ)

REV TQ should be set to 120% of motor nameplate current rating. Continuous operation beyond this rating may damage the motor. If you intend to operate beyond the rating, contact your American Control Electronics representative for assistance.

The REV TQ setting determines the maximum torque for accelerating and driving the motor in the reverse direction. To calibrate REV TQ, refer to the recommended REV TQ settings in Figure 16 on page 32 or use the following procedure:

1. With the power disconnected from the drive, connect a DC ammeter in series with the armature.
2. Set the REV TQ trim pot to minimum (full CCW).
3. Set the speed adjust potentiometer full CW or input voltage signal to maximum speed.
4. Carefully lock the motor armature. Be sure that the motor is firmly mounted.
5. Apply line power. The motor should be stopped.
6. Slowly adjust the REV TQ trim pot CW until the armature current is 120% of motor rated armature current.
7. Turn the speed adjust potentiometer CCW or decrease the input voltage signal.
8. Remove line power.
9. Remove the stall from the motor.
10. Remove the ammeter in series with the motor armature if it is no longer needed.

IR Compensation (IR COMP)

The IR COMP setting determines the degree to which motor speed is held constant as the motor load changes.

Use the following procedure to recalibrate the IR COMP setting:

1. Set the IR COMP trim pot to minimum (full CCW).
2. Increase the speed adjust potentiometer or input voltage signal until the motor runs at midspeed without load (for example, 900 RPM for an 1800 RPM motor). A handheld tachometer may be used to measure motor speed.
3. Load the motor armature to its full load armature current rating.The motor should slow down.
4. While keeping the load on the motor, rotate the IR COMP trim pot until the motor runs at the speed measured in step 2. If the motor oscillates (overcompensation), the IR COMP trim pot may be set too high (CW). Turn the IR COMP trim pot CCW to stabilize the motor.
5. Unload the motor.

See Figure 16 on page 32 for recommended IR COMP settings.

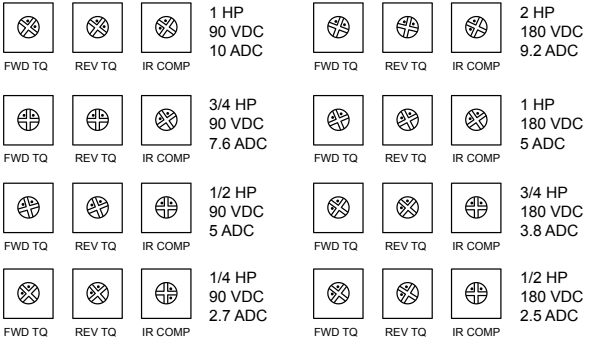


Figure 16. Recommended FWD TQ, REV TQ, and IR COMP Settings (actual settings may vary with each application)

Forward Acceleration (FWD ACC)

The FWD ACC setting determines the time the motor takes to ramp to either a higher speed in the forward direction or a lower speed in the reverse direction, within the limits of available torque. The FWD ACC setting is factory set for its fastest forward acceleration time.

Turn the FWD ACC trim pot CW to increase the forward acceleration time, and CCW to decrease the forward acceleration time.

Reverse Acceleration (REV ACC)

The REV ACC setting determines the time the motor takes to ramp to either a higher speed in the reverse direction or a lower speed in the forward direction, within the limits of available torque. The REV ACC setting is factory set for its fastest reverse acceleration time.

Turn the REV ACC trim pot CW to increase the reverse acceleration time, and CCW to decrease the reverse acceleration time.

Deadband (DB)

The deadband trim pot determines the time that will elapse between the application of current in one direction before current is applied in the opposite direction.

The deadband trim pot affects the resistance that a motor has to changes in shaft position at zero speed. It does this by applying AC voltage to the motor armature.

Deadband is factory calibrated with the notch at approximately the 3 o'clock position for 60 Hz AC line operation. Recalibrate the deadband with the notch at the 9 o'clock position for 50 Hz AC line operation. If you hear motor noise (humming), the deadband might be set too high. Turn the deadband trim pot CCW until the motor noise ceases.

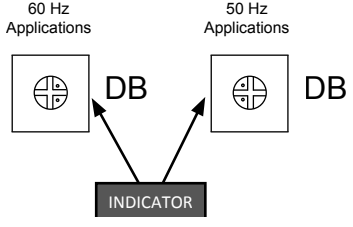


Figure 17. Deadband Settings

Tachogenerator (TACH)

Calibrate the TACH setting only when a tachogenerator is used.

The TACH setting, like IR COMP setting, determines the degree to which motor speed is held constant as the motor load changes. To calibrate the TACH trim pot:

1. Connect the tachogenerator to T1 and T2. The polarity is positive (+) for T1 and negative (-) for T2 when the motor is running in the forward direction.
2. Set the feedback select switch SW503 to ARM for armature feedback.
3. Set the speed adjust potentiometer or input voltage signal to maximum forward speed. Measure the armature voltage across A1 and A2 using a voltmeter.
4. Set the speed adjust potentiometer or input voltage signal to zero speed.
5. Set SW503 to TACH for tachogenerator feedback.
6. Set the IR COMP trim pot to full CCW.
7. Set the TACH VOLTS trim pot to full CW.
8. Set the speed adjust potentiometer or input voltage signal to maximum forward speed.
9. Adjust the TACH trim pot until the armature voltage is the same value as the voltage measured in step 3.

Check that the TACH is properly calibrated. The motor should run at the same set speed when SW503 is set to either ARM or TACH.

Section 7.Application Notes

Direction Switch

For a Forward/Reverse switch, use a single-pole, two-position switch with a single speed adjust potentiometer to regeneratively reverse the motor (Figure 18). If a Forward/Stop/Reverse switch is desired, use a single-pole, three-position switch (Figure 19). The MIN SPD setting is in effect for either direction.

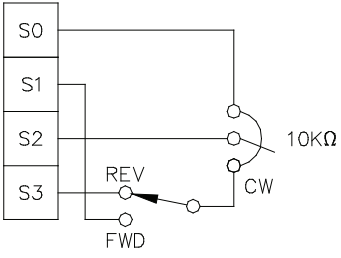


Figure 18. Forward-Reverse Switch

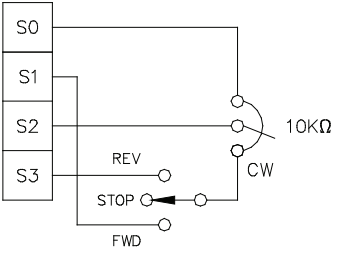


Figure 19. Forward-Stop-Reverse Switch

Direction Switch With End Of Travel Limit Switches

Use a single-pole, two-position switch with a single speed adjust potentiometer for a direction switch as shown in Figure 20. Wire a normally closed limit switch in series with S1 (forward limit) and another (reverse limit) in series with S3.

If you desire any type of automatic cycling with the limit switches, use switching logic board 200-0386A.

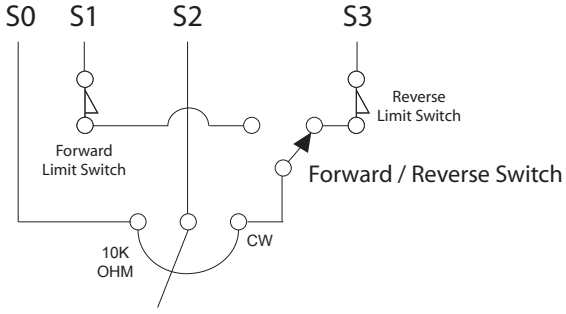


Figure 20. Direction Switch With End Of Travel Limit Switches

Multiple Fixed Speeds

Replace the speed adjust potentiometer with a series of resistors with a total series resistance of 10K ohms (Figure 21). Add a single pole, multi-position switch with the correct number of positions for the desired number of fixed speeds.

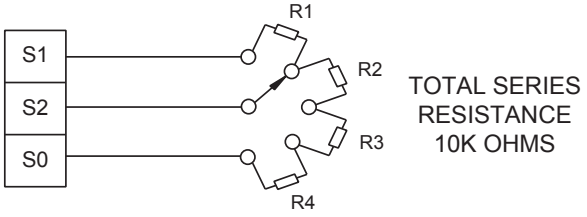


Figure 21. Multiple Fixed Speeds

Adjustable Speeds Using Potentiometers In Series

Replace the speed adjust potentiometer with a series of resistors with a total series resistance of 10K ohms (Figure 22). Add a single pole, multi-position switch with the correct number of positions for the desired number of fixed speeds.

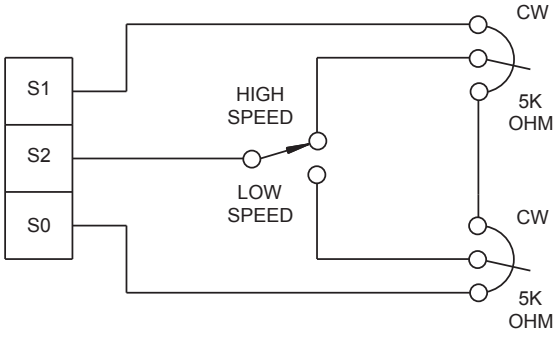


Figure 22. Adjustable Speeds Using Potentiometers In Series

Independent Adjustable Speeds

Replace the speed adjust potentiometer with a single pole, multi-position switch, and two or more potentiometers in parallel, with a total parallel resistance of 10K ohms. Figure 23 shows the connection of two independent speed adjust potentiometers that can be mounted at two separate operating stations.

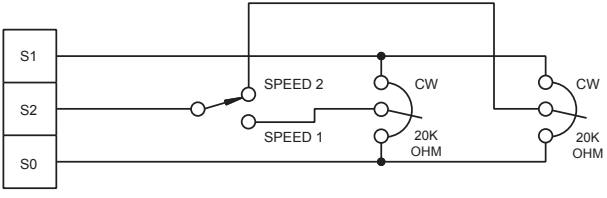


Figure 23. Independent Adjustable Speeds

Independent Adjustable Forward and Reverse Speeds

Replace the speed adjust potentiometer with a single pole, multi-position switch, and two or more potentiometers in parallel, with a total parallel resistance of 10K ohms. Figures 24 and 25 show the connection of two independent forward and reverse speed adjust potentiometers that can be mounted at two separate operating stations.

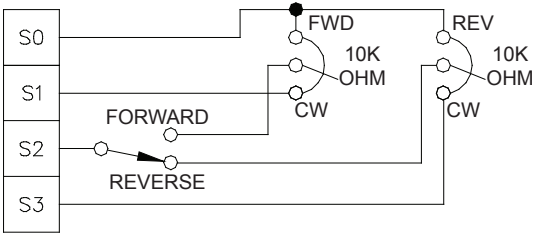


Figure 24. Independent Adjustable Forward and Reverse Speeds

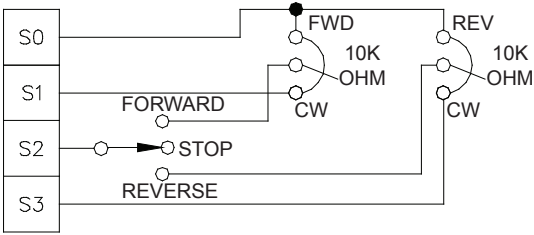


Figure 25. Independent Adjustable Forward and Reverse Speeds with Stop

RUN/JOG Switch - Inhibit Connection

Use a single pole, two position switch for the RUN/JOG switch, and a single pole, normally closed, momentary operated pushbutton for the JOG pushbutton.

Connect the RUN/JOG switch and JOG pushbutton to the inhibit terminals as shown in Figure 26. The motor coasts to a stop when the RUN/JOG switch is set to JOG. Press the JOG pushbutton to jog the motor. Return the RUN/JOG switch to RUN for normal operation.

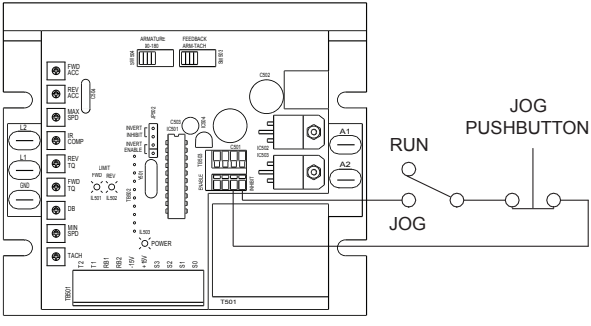


Figure 26. RUN/JOG Switch - Inhibit Connection

RUN/JOG Switch - Potentiometer Connection

Connect the RUN/JOG switch and the JOG pushbutton as shown in Figure 27. When the RUN/JOG switch is set to JOG, the motor decelerates to zero speed. Press the JOG pushbutton to jog the motor. Return the RUN/JOG switch to RUN for normal operation.

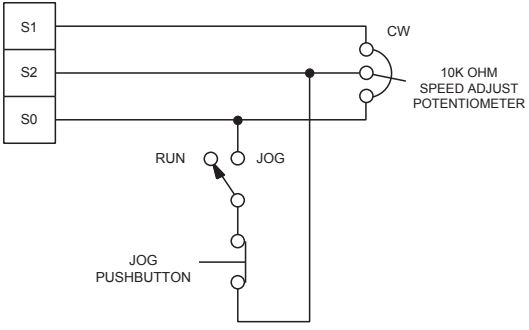


Figure 27. RUN/JOG Switch - Speed Adjust Potentiometer Connection

Leader-Follower Application

In this application, use a ISO202-1 to monitor the speed of the leader motor (Figure 28). The ISO202-1 isolates the leader motor from the follower drive, and outputs a voltage proportional to the leader motor armature voltage. The follower drive uses this voltage reference to set the speed of the follower motor. An optional ratio potentiometer may be used to scale the ISO202-1 output voltage.

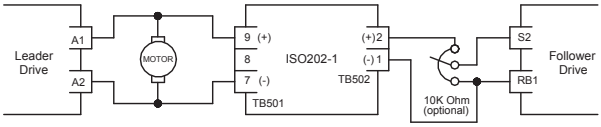


Figure 28. Leader-Follower Application

Single Speed Potentiometer Control Of Multiple Drives

Multiple drives can be controlled with a single speed adjust potentiometer using a ISO101-8 at the input of each drive to provide isolation (Figure 29). Optional ratio potentiometers can be used to scale the ISO101-8 output voltage, allowing independent control of each drive.

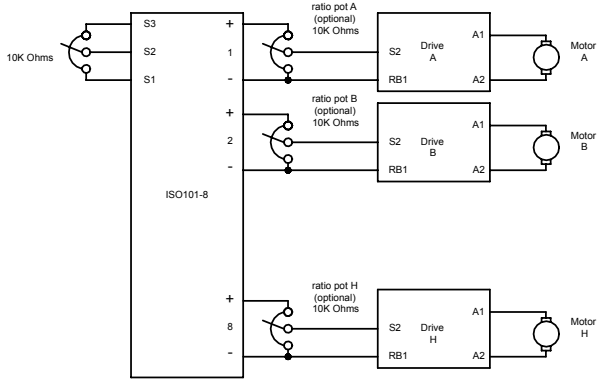


Figure 29. Single Speed Potentiometer Control of Multiple Drives

Section 8. Diagnostic LEDs

RGM series drives are equipped with three diagnostic LEDs:

- Power (POWER): Green LED lights whenever AC line voltage is applied to the drive.
- Forward Current Limit (FWD CL): Red LED lights whenever the drive reaches current limit in the forward direction.
- Reverse Current Limit (REV CL): Red LED lights whenever the drive reaches current limit in the reverse direction.

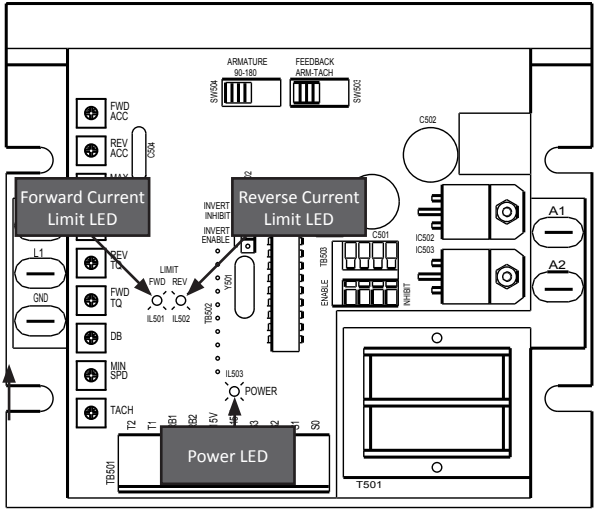


Figure 30. Diagnostic LED Locations

Section 9. Troubleshooting

Dangerous voltages exist on the drive when it is powered. When possible, disconnect the drive while troubleshooting. High voltages can cause serious or fatal injury.

Before Troubleshooting

Perform the following steps before starting any procedure in this section:

1. Disconnect AC line voltage from the drive.
2. Check the drive closely for damaged components.
3. Check that no conductive or other foreign material has become lodged on the printed circuit board.
4. Verify that every connection is correct and in good condition.
5. Verify that there are no short circuits or grounded connections.
6. Check that the drive's rated armature is consistent with the motor ratings.

For additional assistance, contact your local American Control Electronics distributor or the factory direct:

(844) AMCNTRL or FAX: (800) 394-6334

PROBLEM	POSSIBLE CAUSE	SUGGESTED SOLUTIONS
Line fuse blows.	1. Line fuse is the wrong size.	1. Check that the line fuse is correct for the motor size.
	2. Motor cable or armature is shorted to ground.	2. Check motor cable and armature for shorts.
	3. Nuisance tripping caused by a combination of ambient conditions and high-current spikes (i.e. reversing).	3. Add a blower to cool the drive components, decrease FWD TQ / REV TQ settings, resize motor and drive for actual load demand, or check for incorrectly aligned mechanical components or "jams". See pages 29 or 30 for information on adjusting the FWD TORQUE / REV TQ trim pot.
Line fuse does not blow, but the motor does not run.	1. Speed adjust potentiometer or input voltage signal is set to zero speed.	1. Increase the speed adjust potentiometer setting or input voltage signal.
	2. Inhibit is active.	2. Remove the short from the inhibit terminals
	4. Drive is in current limit.	4. Verify that the motor is not jammed. Increase FWD TQ / REV TQ setting if set too low.
	5. Drive is not receiving AC line voltage.	5. Apply AC line voltage.
	6. Motor is not connected.	6. Remove power. Connect the motor to A1 and A2. Reapply power.
Motor does not stop when the speed adjust potentiometer is full CCW.	1. MIN SPD setting is too high.	1. Decrease MIN SPD setting.
	2. Noise on logic wires.	2. Place a .01 µF capacitor across terminals S0 and S2.

PROBLEM	POSSIBLE CAUSE	SUGGESTED SOLUTIONS
Motor runs in the opposite direction	1. Motor connections to A1 and A2 are reversed.	1. Remove power. Reverse connections to A1 and A2. Reapply power.
Motor runs too fast.	1. MAX SPD is set too high.	1. Calibrate MAX SPD.
Motor will not reach the desired speed.	1. MAX SPD setting is too low.	1. Increase MAX SPD setting.
	2. IR COMP setting is too low.	2. Increase IR COMP setting.
	3. FWD TQ / REV TQ setting is too low.	3. Increase FWD TQ / REV TQ setting.
	4. Motor is overloaded.	4. Check motor load. Resize the motor and drive if necessary.
Motor pulsates or surges under load.	1. IR COMP is set too high.	1. Adjust the IR COMP setting slightly CCW until the motor speed stabilizes.
	2. Motor bouncing in and out of current limit.	2. Make sure motor is not undersized for load; adjust FWD TQ / REV TQ trim pot CW.

Section 10. Accessories & Replacement Parts

Displays

Closed Loop..... OLD100-1
Open Loop..... CLD100-1

Heat Sinks

HSK-0001..... HSK-0001

Kits

Potentiometer & Connector
10K Pot, Insulating Washer..... KTP-0001
9 Pin Terminal Block, 5 Insulated Tabs, 2 Jumpers
(included with RGM models)..... KTP-0007

Fuse
2 1.5 Amp 250V 3AG Fast-blow Glass Fuses..... KTF-0001
2 3 Amp 250V 3AG Fast-blow Glass Fuses..... KTF-0002
2 5 Amp 250V 3AG Fast-blow Glass Fuses..... KTF-0003
2 8 Amp 250V 3AG Fast-blow Glass Fuses..... KTF-0004
2 10 Amp 250V 3AB Normal-blow Ceramic Fuses..... KTF-0005
2 15 Amp 250V 3AB Normal-blow Ceramic Fuses..... KTF-0006

Logic Cards

Current Sensing
5 Amps.....CMC100-5
20 amps.....CMC100-20

Isolation Cards
Adder Board ISO402-1
Unidirectional, 8 outputs.....ISO101-8

Unconditional Warranty

A. Warranty

American Control Electronics warrants that its products will be free from defects in workmanship and material for twelve (12) months or 3000 hours, whichever comes first, from date of manufacture thereof. Within this warranty period, American Control Electronics will repair or replace, at its sole discretion, such products that are returned to American Control Electronics, 14300 De La Tour Drive, South Beloit, Illinois 61080 USA.

This warranty applies only to standard catalog products, and does not apply to specials. Any returns of special controls will be evaluated on a case-by-case basis. American Control Electronics is not responsible for removal, installation, or any other incidental expenses incurred in shipping the product to and from the repair point.

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RGM400-1.5

RGM400-10

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