



Specifications

Model	Line Voltage (VAC)	Armature Voltage Range (VDC)	Continuous Armature Current (Amps)	Armature Horsepower Range
RGM403-1.5	115 230	0 - 90 0 - 180	1.5	1/20 - 1/8 1/10 - 1/4
RGM403-10	115 230	0 - 90 0 - 180	10.0*	1/4 - 1 1/2 - 2

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

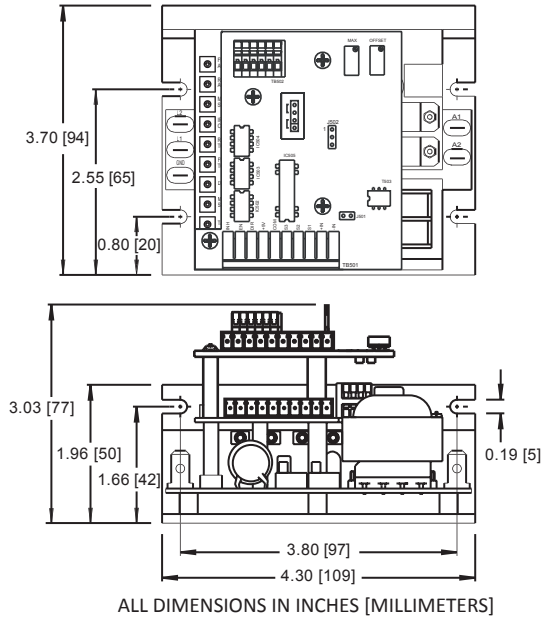
AC Line Voltage.....	115/230 VAC $\pm 10\%$, 50/60 Hz, single phase
Form Factor.....	1.37 at base speed
Acceleration Time Range.....	0.5 - 6 seconds
Deceleration Time Range.....	0.5 - 6 seconds
Analog Input Voltage Range.....	0 to ± 10 VDC
Current Range.....	4 - 20 mA
Input Impedance (-IN to +IN, Voltage Mode).....	>100K ohms
(-IN to +IN, Current Mode).....	500 ohms
Load Regulation with Armature Feedback.....	1% base speed
with Tachogenerator Feedback.....	0.1% base speed
Speed Range with Armature Feedback.....	50:1
with Tachogenerator Feedback.....	60:1
Vibration (0 - 50 Hz).....	0.5G maximum
(>50 Hz).....	0.1G maximum
Ambient Temperature Range.....	10°C - 55°C
Weight.....	1.2 lbs
Safety Certifications.....	UL/cUL Listed Equipment, file # E132235

Safety Warnings

READ ALL SAFETY WARNINGS BEFORE INSTALLING THIS EQUIPMENT

- **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.
- **Circuit potentials are at 115 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 protection equipment and insulated tools if working on this drive with power applied.
- 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.
- **ACE strongly recommends the installation of a master power switch in the line voltage input.** The switch contacts should be rated for 250 VAC and 200% of motor nameplate current.
- **Removing AC line power is the only acceptable method for emergency stopping.** Do not use regenerative braking, decelerating to minimum speed, or coasting to a stop for emergency stopping. They may not stop a drive that is malfunctioning. Removing AC line power is the only acceptable method for emergency stopping.
- Line starting and stopping (applying and removing AC line voltage) is recommended for infrequent starting and stopping of a drive only. Regenerative braking, decelerating to minimum speed, or coasting to a stop is recommended for frequent starts and stops. Frequent starting and stopping can produce high torque. This may cause damage to motors.
- **Do not disconnect any of the motor leads from the drive** unless power is removed or the drive is disabled. Opening any one lead while the drive is running may destroy the drive.
- 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, the motor will overspeed, which may cause motor damage, or result in bodily injury or loss of life.
- Under no circumstances should power and logic level wires be bundled together.
- Be sure potentiometer tabs do not make contact with the potentiometer's body. Grounding the input will cause damage to the drive.

Dimensions



Installation

Mounting

- Drive components are sensitive to electrostatic discharge. Avoid direct contact with the circuit board. Hold the drive by the chassis only.
- Protect the drive from dirt, moisture, and accidental contact.
- Provide sufficient room for access to the terminal block 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. Six 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 chassis surface and to reach bare metal.

Heat Sinking

The RGM403-10 requires an additional heat sink when the continuous armature current is above 5 amps. Use ACE heat sink kit part number HSK-0001. Use a thermally conductive heat sink compound (such as Dow Corning 340® Heat Sink Compound) between the chassis and the heat sink surface for optimal heat transfer.

Wiring

Use 18 - 24 AWG wire for logic wiring.
Use 14 - 16 AWG wire for AC line (L1, L2) and motor (A1, A2) wiring.

Shielding Guidelines

As a general rule, ACE recommends shielding of all conductors. If it is not practical to shield power conductors, ACE recommends shielding all logic-level leads. If shielding of logic-level leads is not practical, the user should twist all logic leads with themselves to minimize induced noise. Refer to the user's manual for details on earth grounding shielded wires and filtering.

Fusing

ACE drives require an external line fuse for protection. Use fast acting fuses rated for 250 VAC or higher and 150% of the maximum armature current. Fuse the HOT leg of the AC line when using 115 VAC and both lines when using 230 VAC.

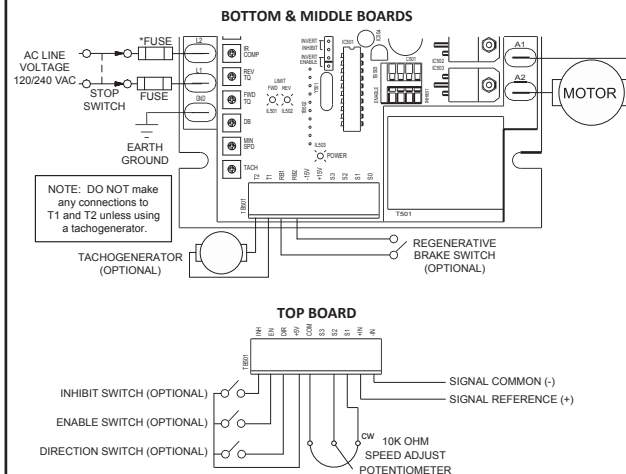
Connections

Line Input

Connect the AC line power leads to terminals L1 and L2, or to a double-throw, single-pole master power switch (recommended). The switch should be rated at a minimum of 250 VAC and 200% of motor current.

Motor

Connect the DC armature leads to terminals A1 and A2. If the motor does not spin in the desired direction, power down the drive and reverse these connections.



Speed Potentiometer

Use a 10K ohm, 1/4 W potentiometer for speed control. Connect the counter-clockwise end of the potentiometer to COM, wiper to S2, and the clockwise end to S1. If the potentiometer works inversely of desired functionality, (i.e. to increase motor speed, you must turn the potentiometer counterclockwise), power off the drive and swap the COM and S1 connections. See the Operation section for alternative wiring setups.

Analog Input Signal Range

Instead of using a speed adjust potentiometer, RGM403 series drives may be wired to follow an analog input signal. This input signal can be in the form of voltage (0 \pm 10 VDC) or current (4 - 20 mA). Because these drives have built in isolation, the input signal can be grounded or ungrounded (floating). Connect the signal common (-) to terminal -IN. Connect the signal reference (+) to terminal +IN.

Inhibit

Short terminals INH and +5V to regeneratively brake the motor to zero speed. The inhibit bypasses the DECEL trim pot. Open the INH and +5V terminals to accelerate the motor to set speed. See the Operation section for setting the inhibit for normally closed operation. **Do not use the inhibit for emergency stopping.**

Enable

Short terminals EN and +5V to coast the motor to zero speed. Open the EN and +5V terminals to accelerate the motor to set speed. See the Operation section for setting the enable for normally closed operation. **Do not use the enable for emergency stopping.**

Direction

Short terminals DIR and +5V to change the direction of the motor. If no direction switch is desired, leave this connection open.

Regenerative Brake

Short terminals RB1 and RB2 to regeneratively brake the motor to zero speed. The regenerative brake circuitry follows the DECEL trim pot. Open terminals RB1 and RB2 to accelerate the motor to set speed. **Do not use the regenerative braking for emergency stopping.**

Tachogenerator

Using tachogenerator feedback improves speed regulation from approximately 1% of motor base speed to 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 (positive) and T2 (negative).

+15 and -15

RGM series drive can supply a regulated +15 and -15 VDC voltage (each sourcing 20 mA maximum) with respect to RB1 or T1 to isolated, external devices.

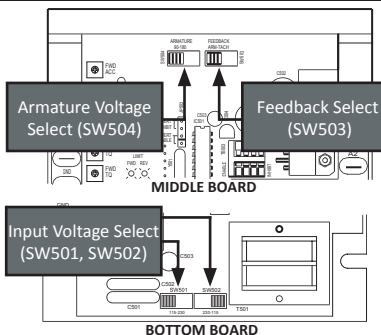
Startup

SELECT SWITCHES

Input Voltage Select (SW501, SW502)
Set the voltage switches SW501 and SW502 to either 115 or 230 to match the AC line voltage.

Armature Voltage Select (SW504)
Set the voltage switch SW504 to either 90 or 180 to match the maximum armature voltage.

Feedback Select (SW503)
Set the feedback select switch SW503 to either ARM for armature feedback or TACH for tachogenerator feedback.



STARTUP

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

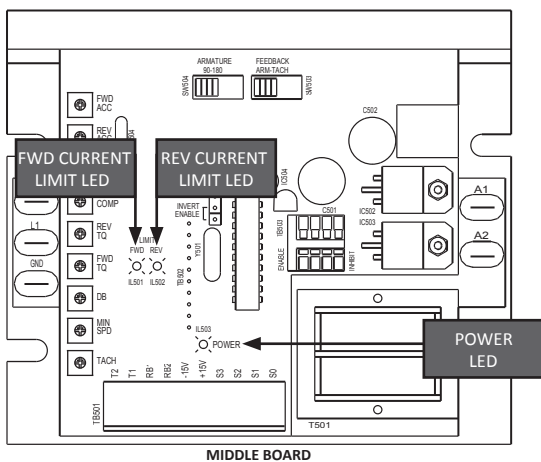
1. Turn the speed adjust potentiometer full counterclockwise (CCW) or set the analog input voltage or current signal to minimum.
2. Apply AC line voltage.
3. Make sure the drive is enabled.
4. Slowly advance the speed adjust potentiometer clockwise (CW) or increase the analog input voltage or current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

LEDs

Forward Current Limit (LIMIT FWD): Red LED lights whenever the drive reaches current limit in the forward direction.

Reverse Current Limit (LIMIT REV): Red LED lights whenever the drive reaches current limit in the reverse direction.

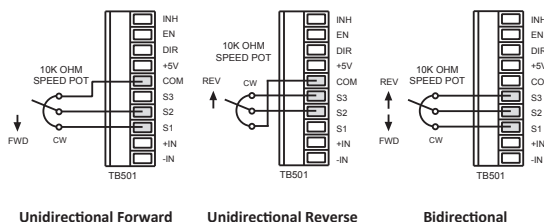
Power (POWER): Green LED lights whenever AC line voltage is applied to the drive.



MIDDLE BOARD

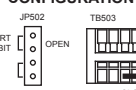
Operation

POTENTIOMETER WIRING

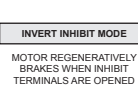
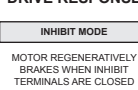


INHIBIT SETTINGS

CONFIGURATION

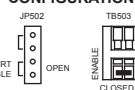


DRIVE RESPONSE

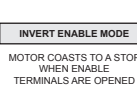
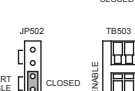
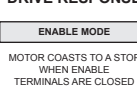


ENABLE SETTINGS

CONFIGURATION



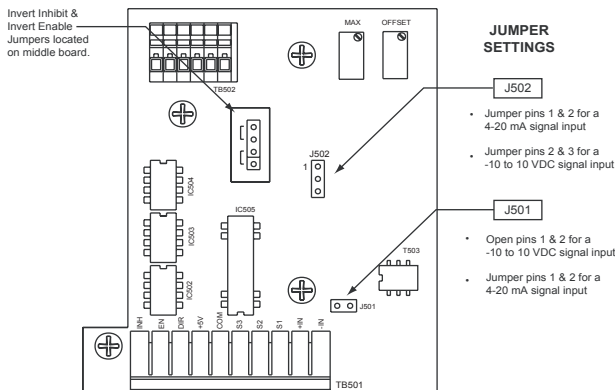
DRIVE RESPONSE



NOTE: The RGM series drive will operate in normal running mode when all jumpers on JP502 and all terminals on TB503 are simultaneously opened. Likewise, it will operate in normal running mode when all jumpers and terminals are simultaneously closed.

WARNING: The INHIBIT setting cannot be inverted if using a 4-20 mA signal.

JUMPER SETTINGS



TOP BOARD TRIM POTS

Maximum Speed (MAX): The MAX setting determines the maximum motor speed when the speed adjust potentiometer or input voltage or current signal is set for maximum speed. To calibrate the MAX:

1. Set the MAX trim pot to full CCW. Turn the speed adjust potentiometer or input voltage or current signal to full speed.
2. Adjust the MAX trim pot until the desired maximum motor speed is reached.

Offset (Offset): The OFFSET is used to eliminate motor drift when the speed potentiometer is set to zero speed or when the analog input signal is set to minimum. This trim pot is factory set to guarantee motor stability in a stopped motor and should not need adjustment. Do not adjust this trim pot unless you are experiencing drift problems. To calibrate the OFFSET:

1. Ensure that the input power is off.
2. Set the speed adjust potentiometer or input voltage or current signal to minimum.
3. Set the OFFSET trim pot to the approximate midrange of 50%.

Note: This trim pot is a 25-turn potentiometer. After setting the trim pot to zero (full CCW), make 12.5 full rotations to reach midrange, or 50%.

4. Apply power and observe the motor.
5. If the motor shaft drifts, or slowly rotates with minimum signal applied, adjust the OFFSET trim pot until the motor shaft stops. The direction and amount of trim pot adjustment depends on the direction of the shaft rotation and connection of the motor leads.

Calibration

MIDDLE BOARD TRIM POTS

Minimum Speed (MIN SPD): The MIN SPD setting determines the minimum motor speed when the speed adjust potentiometer is set for minimum speed. It is factory set for zero speed. The minimum speed applies only when the drive is operating in unidirectional mode. To calibrate the MIN SPD:

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

Maximum Speed (MAX SPD): Set the MAX SPD trim pot to full CW. Calibrate the maximum speed with the MAX trim pot on the top board.

Forward Torque (FWD TQ) and Reverse Torque (REV TQ): The FWD TQ and REV TQ settings determine the maximum torque for accelerating and driving the motor in the forward and reverse direction.

To calibrate the FWD TQ:

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 or current signal to maximum forward speed (full CW).
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 150% of motor rated armature current.
7. Turn the speed adjust potentiometer (full CCW) or input voltage or current signal to minimum speed.
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.

To calibrate the REV TQ:

1. Follow the steps for calibrating the forward torque using the REV TQ trim pot and with the motor set to run in the reverse direction.

IR Compensation (IR COMP): The IR COMP setting determines the degree to which motor speed is held constant as the motor load changes. To calibrate the IR COMP:

1. Set the IR COMP trim pot full CCW.
2. Increase the speed adjust potentiometer or input voltage or current signal until the motor runs at midspeed without load. 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.

Forward Acceleration (FWD ACC): The FWD ACC setting determines the time the motor takes to ramp to a higher speed in the forward direction or to a lower speed in the reverse direction. To calibrate the FWD ACC, 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 a higher speed in the reverse direction or to a lower speed in the forward direction. To calibrate the REV ACC, turn the REV ACC trim pot CW to increase the reverse acceleration time, and CCW to decrease the reverse acceleration time.

Tachogenerator Feedback (TACH): 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 A1 is positive in respect to A2.
2. Set the feedback select switch SW503 to ARM for armature feedback.
3. Set the speed adjust potentiometer or input voltage or current signal to maximum speed. Measure the armature voltage across A1 and A2 using a voltmeter.
4. Set the speed adjust potentiometer or input voltage or current signal to minimum speed.
5. Set SW503 to TACH for tachogenerator feedback.
6. Set the IR COMP trim pot to full CCW.
7. Set the TACH trim pot to full CW.
8. Set the speed adjust potentiometer or input voltage or current signal to maximum 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.

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 an AC voltage to the motor armature. Deadband is factory calibrated to approximately the 3 o'clock position for 60 Hz AC line operation. Recalibrate the deadband to the 9 o'clock position for 50 Hz 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.