RGT SERIES

USER MANUAL

RGT300U
RGT300U-PCM
RGT310U
RGT310U-PCM
RGT400U
RGT400U-PCM

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. Minarik Drives 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.

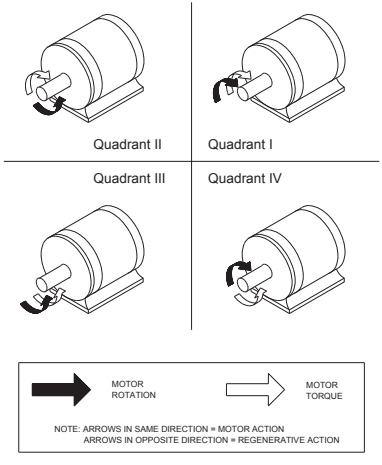


Figure 1. Four Quadrant Operation

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

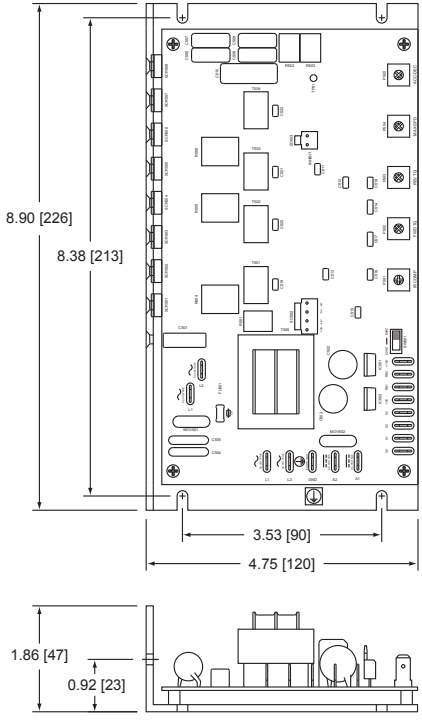
Model	*Line Voltage (VAC)*	*Armature Voltage Range (VDC)*	*Maximum Armature Current (ADC)*	*HP Range*
RGT310U *RGT310U-PCM*	*115*	*0 - 90*	*3.0*	*1/20 - 1/4*
RGT300U *RGT300U-PCM*	*115*	*0 - 90*	*10.0**	*1/4 - 1*
RGT400U *RGT400U-PCM*	*230*	*0 - 180*	*10.0**	*1/2 - 2*

* Heat sink kit part number 223-0235 must be used when the continuous current output is over 7 amps.

AC Line Voltage	115 or 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	
Non -PCM models (signal must be isolated; S0 to S2)	0 to ± 10 VDC
-PCM models (NEG to POS)	1-5, 4-20, 10-50 mA or 0 to ± 250 VDC
Input Impedance (S0 to S2)	32K ohms
Form Factor	1.37 at base speed
Load Regulation	1% 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 CSA Certified Component, File # LR41380
Ambient Temperature Range	10°C - 55°C

Section 3. Dimensions



ALL DIMENSIONS IN INCHES [MILLIMETERS]

Figure 2. RGT Dimensions

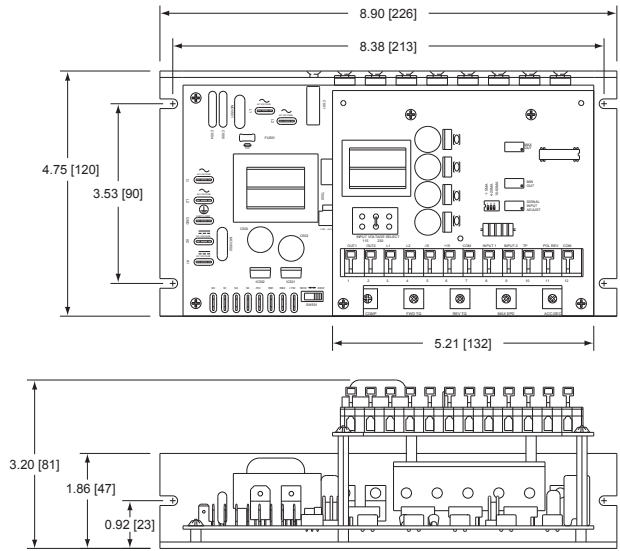


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Figure 3. RGT-PCM Dimensions

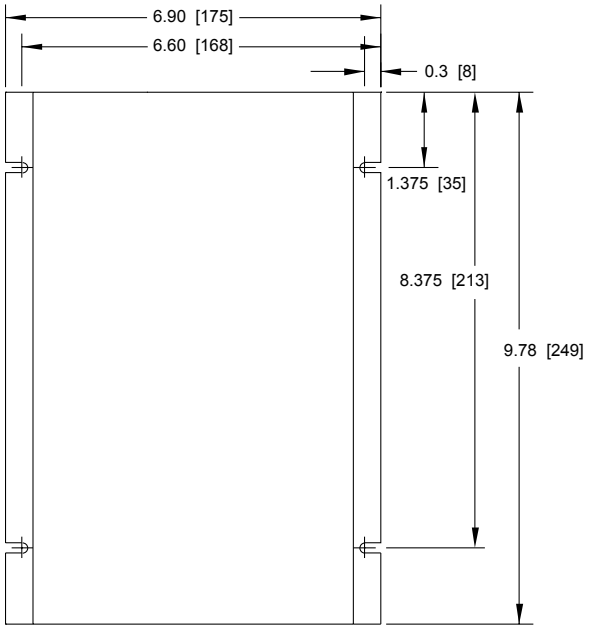

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Figure 4. 223-0235 Dimensions

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

Models RGT300U, RGT300U-PCM, RGT400U, and RGT400U-PCM require an additional heat sink when the continuous armature current is above 7 amps. Use Minarik Drives heat sink kit part number 223-0235. 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. 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 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 5). 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).

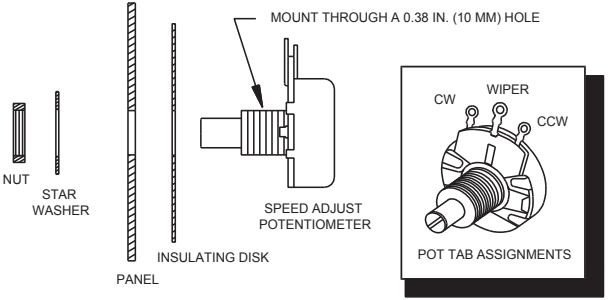


Figure 5. Speed Adjust Potentiometer

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, Minarik Drives recommends shielding of all 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*

Minarik Drives offers fuse kits. See Section 9: Accessories and Replacement Parts for fuse kit part numbers.

Short Circuit Current Rating (SCCR)

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, kA	Maximum Voltage, V			
RGT400U	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.

Minarik Drives strongly recommends the installation of a master power switch in the voltage input line, as shown in Figure 6 (page 15). The switch contacts should be rated at a minimum of 200% of motor nameplate current and 250 volts.

Power Input

Connect the AC line power leads to terminals L1 and L2. Minarik Drives 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 6 on page 15.

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 6 on page 15. Ensure that the motor voltage rating is consistent with the drive's output voltage.

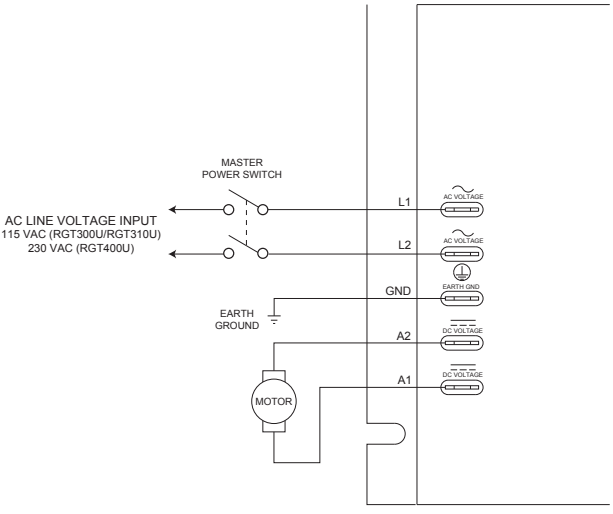


Figure 6. Power and Motor Connections

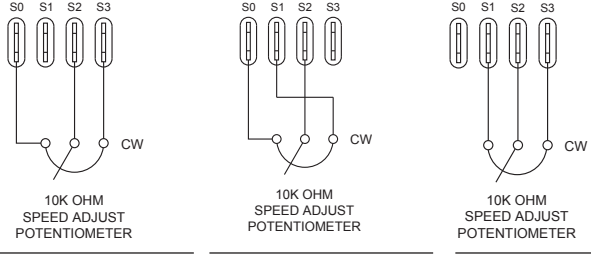
Speed Adjust Potentiometer

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 7(a).

For unidirectional operation in the reverse direction, connect the speed adjust potentiometer as shown in Figure 7(b).

For bidirectional operation, connect the speed adjust potentiometer as shown in Figure 7(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.



(a) Unidirectional Forward (b) Unidirectional Reverse (c) Bidirectional

Figure 7. Speed Adjust Potentiometer Connections

Analog Input Signal (non -PCM models)

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 8). Connect the signal common (–) S0. Connect the signal input (+) to S2. A potentiometer can be used to scale the analog input voltage. An interface device, such as Minarik Drives model PCM4, may be used to scale and isolate an 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.

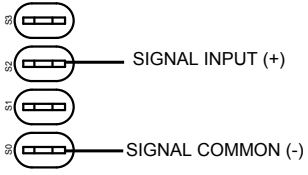


Figure 8. RGT Analog Input Signal Connections

Analog Input Signal (RGT-PCM models)

Instead of using a speed adjust potentiometer, the drive may be wired to follow an analog input voltage signal that is isolated or non-isolated (Figure 9). Connect the signal common (–) to terminal 7 (COM). Connect the signal input (+) to terminal 8 (INPUT 1) is using an analog current signal or a voltage signal less than 25 VDC, otherwise connect to terminal 9 (INPUT 2). A potentiometer can be used to scale the analog input voltage.

Acceptable analog input ranges are 1 -5 mA, 4 - 20 mA, 10 - 50 mA, and any voltage range less than 250 VDC.

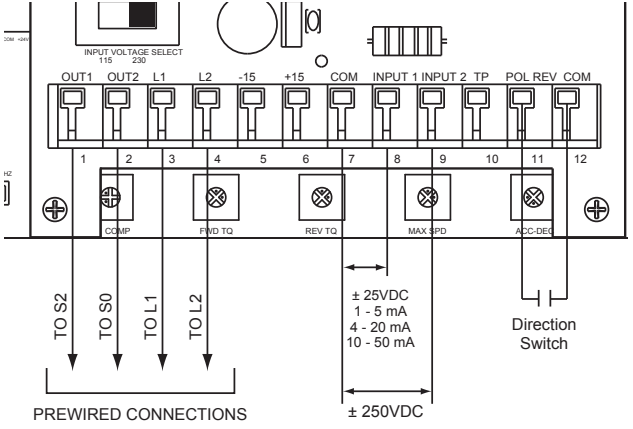


Figure 9. RGT-PCM Connections

Direction Switch

For RGT models, refer to page 35 for wiring a direction switch.

For RGT-PCM models, a single-pole, single-throw switch can be used as a reversal switch. Connect the switch to terminals 11 (POL REV) and 12 (COM). Close the switch to reverse the motor. Open the switch to return the motor back to it's original direction. Refer to Figure 9 on page 18.

Regen Brake and Inhibit

See the "Starting and Stopping Methods" section on pages 24 through 26 for a detailed description of the Inhibit and Regen Braking connections.

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 44, 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 are properly set.

Select Switches

Line Frequency Select (SW501)

Set the line frequency select switch to 60 HZ if the line frequency is 60 Hz or to 50 HZ if the line frequency is 50 Hz. See Figure 10.

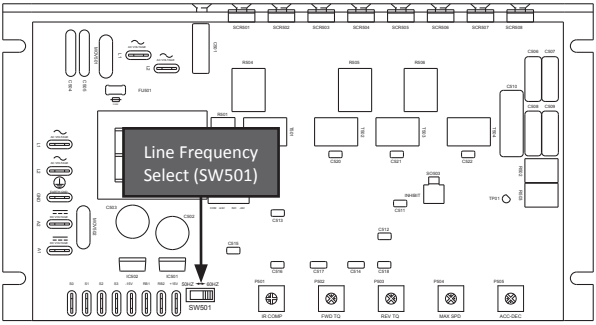


Figure 10. Line Frequency Select Switch Location

Select Switches (-PCM models)

Analog Input Signal Select (SW501)

Set the analog input signal select switch SW501 to match the appropriate input signal. See Figure 11 for location and Table 3 on page 33 for configuration.

AC Line Voltage Select (SW502)

Set the input voltage select switch SW502 to either 115 or 230 to match the AC line voltage. See Figure 11.

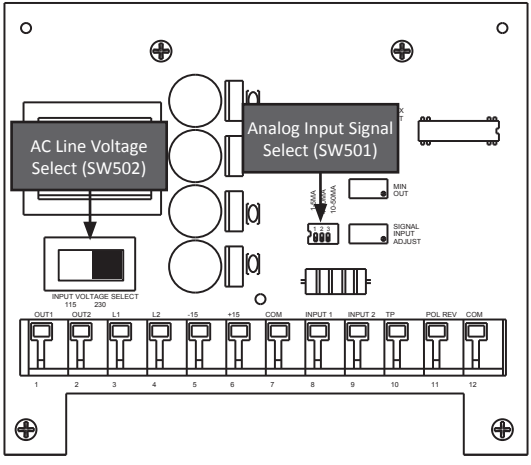


Figure 11. RGT-PCM Select Switch Locations

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, Minarik Drives strongly recommends installing an emergency stop switch on both AC line inputs (see Figure 6 on page 15).

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 Regen Brake and Inhibit are open.

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

Short the inhibit terminals to regeneratively brake the motor to zero speed (see Figure 12). The inhibit bypasses the deceleration rate set by the ACC-DEC trim pot. Open the inhibit terminals to accelerate the motor to set speed.

Twist inhibit wires and separate them from power-carrying wires or sources of electrical noise. Use shielded cable if the inhibit wires are longer than 18 inches (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.

SO502 terminals are installed for future interfaces. Leave the factory installed jumper (INH and -24 terminals) in place.

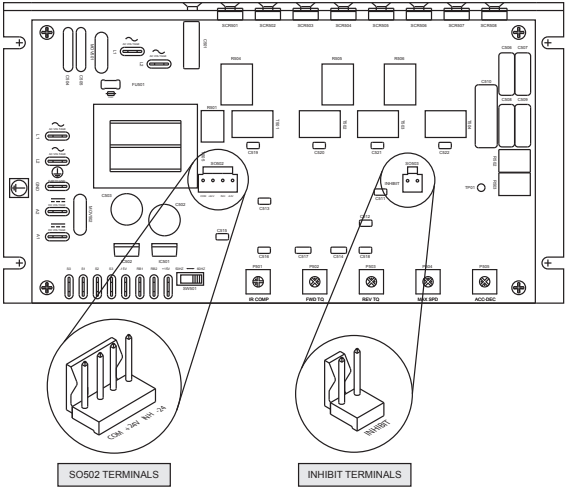


Figure 12. Inhibit Switch

Regen Brake - Regenerative Decel to Zero Speed

Short the regen brake terminals RB1 and RB2 to regeneratively brake the motor to zero speed (see Figure 13). The regen brake decelerates at a rate set by the ACC-DEC trim pot. Open the regen brake terminals to accelerate the motor to set speed.

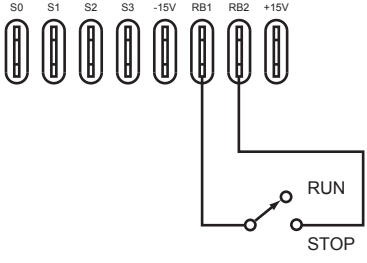


Figure 13. Regen Brake Switch

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.

RGT 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.

Maximum Speed (MAX SPEED)

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.

If using a -PCM model, set the MAX SPD trim pot fully CW.

Acceleration-Deceleration (ACC-DEC)

The ACC-DEC trim pot setting determines the time the motor takes to accelerate to a higher speed or decelerate to a lower speed within the limits of available torque. ACC-DEC is set for its fastest acceleration and deceleration time (full CCW).

Turn the ACC-DEC trim pot CW to increase the acceleration and deceleration time, or CCW to decrease the acceleration and deceleration time.

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 Minarik Drives 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 14 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 Minarik Drives 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 14 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 14 on page 32 for recommended IR COMP settings.

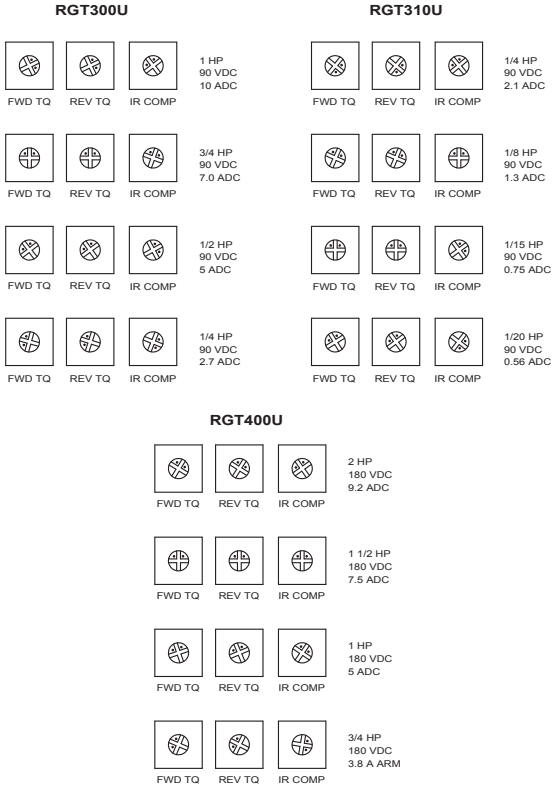


Figure 14. Recommended FWD TQ, REV TQ, and IR COMP Settings (actual settings may vary with each application)

Input Signal Calibration with -PCM Models

The following values should be known:

S_{min} - Minimum analog input signal (e.g. 0 VDC or 4 mA)
S_{max} - Maximum analog input signal (e.g. 10 VDC or 20 mA)
O_{min} - Minimum output voltage signal to base RGT unit (typically 0 VDC)
O_{max} - Maximum output voltage signal to base RGT unit (typically 10 VDC)

For example, if using a 4-20 mA signal and you wanted to run the motor from 0 RPM to full RPM, your values would be;

$S_{min} = 4$ $O_{min} = 0$
$S_{max} = 20$ $O_{max} = 10$

O_{min} and O_{max} are measured between OUT1 and OUT2 (terminals 1 and 2).Use a voltmeter for voltage measurements and an ammeter for current measurements.

Calibration Procedure

1. Set the SW501 DIP switches to the following positions based on the input signal to be used.

Table 3. DIP Switch SW501 Configurations

Input Signal Range	DIP Switch Settings		
	1	2	3
VDC	OFF	OFF	OFF
1 - 5 mA	ON	OFF	OFF
4 - 20 mA	OFF	ON	OFF
10 - 50 mA	OFF	OFF	ON

2. Connect (but do not power) the input signal as follows.
   - Connect the signal negative (-) to COM (terminal 7).
   - If using a current signal or voltage signal up to 25 VDC, connect the signal positive to INPUT 1 (terminal 8).
   - If using a signal greater than 25 VDC, connect the signal positive (+) to INPUT 2 (terminal 9).

3. Set the MAX SPD trim pot on the RGT unit fully CCW.

4. Apply both the AC line voltage and the minimum analog input signal.

5. Adjust the MIN OUT trim pot so that the output voltage between terminals 1 and 2 (OUT1 and OUT2) is O_{min}.

6. Set the input signal to it's max, S_{max}.

7. Calculate the test point voltage, V_{tp}.

$$V_{tp} = \frac{S_{min} * m}{2} \qquad \text{where} \qquad m = \frac{O_{max} - O_{min}}{S_{max} - S_{min}}$$

8. Adjust the SIGNAL INPUT ADJ trim pot so that the voltage between COM (terminal 7) and TP (terminal 10) is V_{tp}.

9. Adjust the MAX OUT trim pot so that the output voltage between terminals 1 and 2 (OUT1 and OUT2) is O_{max}.

10. Repeat steps 4, 5, 6, 8, and 9. Use the same values that you previously calculated.

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 15). If a Forward/Stop/Reverse switch is desired, use a single-pole, three-position switch (Figure 16).

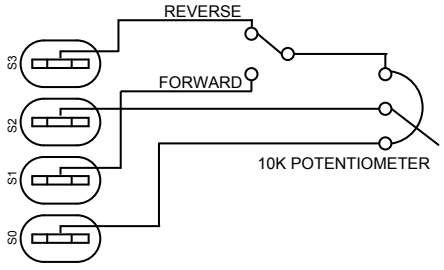


Figure 15. Forward-Reverse Switch

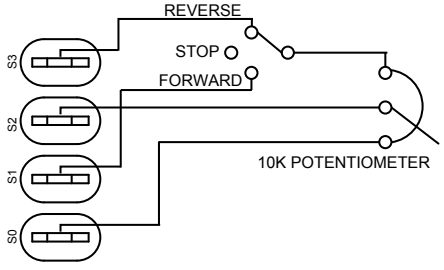


Figure 16. Forward-Stop-Reverse Switch

Multiple Fixed Speeds

Replace the speed adjust potentiometer with a series of resistors with a total series resistance of 10K ohms (Figure 17). Add a single pole, multi-position switch with the correct number of positions for the desired number of fixed speeds.

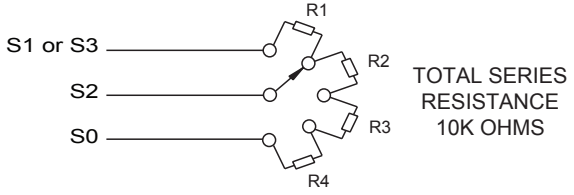


Figure 17. Multiple Fixed Speeds

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 18). Add a single pole, multi-position switch with the correct number of positions for the desired number of fixed speeds.

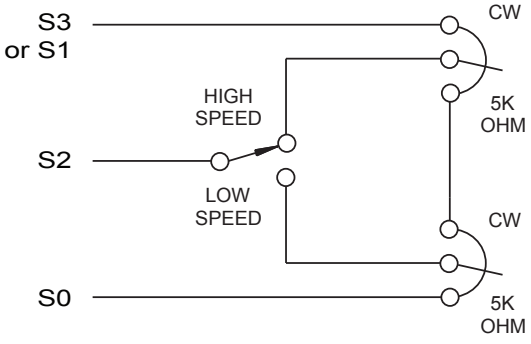


Figure 18. Adjustable Speeds Using Potentiometers In Series

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 19 shows the connection of two independent speed adjust potentiometers that can be mounted at two separate operating stations.

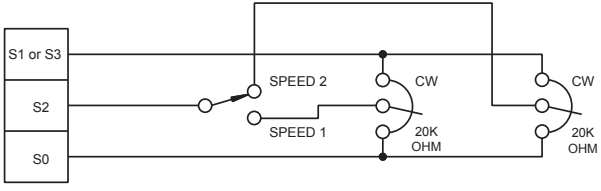


Figure 19. Independent Adjustable Speeds

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 20 and 21 show the connection of two independent forward and reverse speed adjust potentiometers that can be mounted at two separate operating stations.

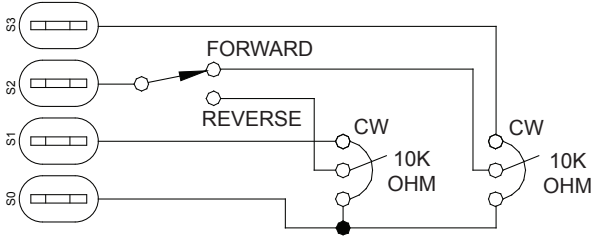


Figure 20. Independent Adjustable Forward and Reverse Speeds

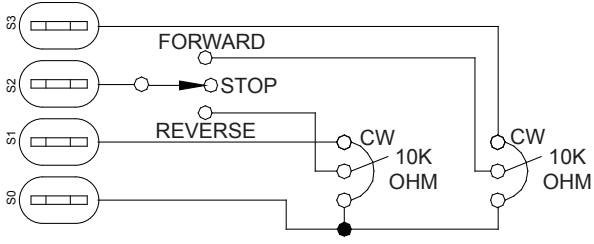


Figure 21. Independent Adjustable Forward and Reverse Speeds with Stop

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 22. 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.

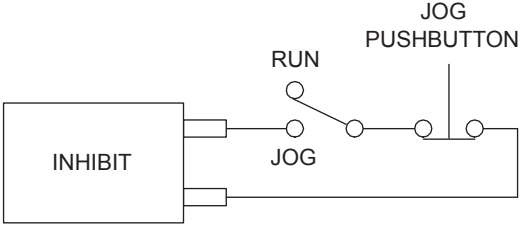


Figure 22. RUN/JOG Switch - Inhibit Connection

RUN/JOG Switch - Potentiometer Connection

Connect the RUN/JOG switch and the JOG pushbutton as shown in Figure 23. 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.

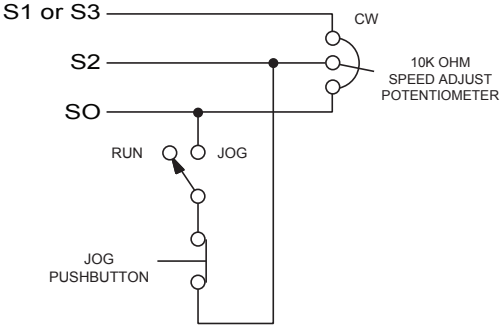


Figure 23. RUN/JOG Switch - Speed Adjust Potentiometer Connection

Leader-Follower Application

In this application, use a PCM4 to monitor the speed of the leader motor (Figure 24). The PCM4 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 PCM4 output voltage.

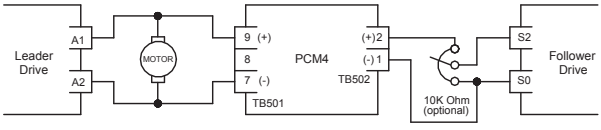


Figure 24. Leader-Follower Application

Single Speed Potentiometer Control Of Multiple Drives

Multiple drives can be controlled with a single speed adjust potentiometer using a USIM-8 at the input of each drive to provide isolation (Figure 25). Optional ratio potentiometers can be used to scale the USIM-8 output voltage, allowing independent control of each drive.

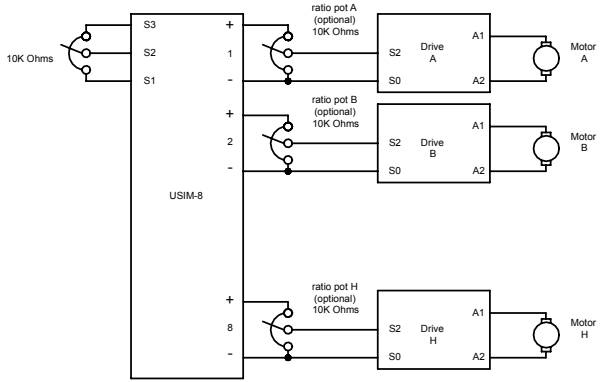


Figure 25. Single Speed Potentiometer Control of Multiple Drives

Section 8. Troubleshooting

Dangerous voltages exist on the drive when it is powered. When possible, disconnect the drive while troubleshooting. High voltages can cause seroius 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 Minarik Drives distributor or the factory direct:

(800) MINARIK 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 TQ / REV TQ trim pots.
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. Noise on logic wires.	1. 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 9. Accessories & Replacement Parts

Displays

Closed Loop..... DLC600
Open Loop..... VT-8

Kits

Potentiometer & Connector
Pot Kit (RGT models)..... 202-0003
Fuse
1.5 - 5 Amp Fuse Kit..... 050-0066
1 - 8 Amp Fuse Kit with Pico Fuse..... 050-0068
3 - 8 Amp Fuse Kit with Pico Fuse..... 050-0069
5 - 15 Amp Fuse Kit..... 050-0071

Logic Cards

Current Sensing
5 Amps..... CSC1-5
20 amps..... CSC1-20
Isolation Cards
Unidirectional, 8 outputs (stand-alone) USIM-8
Bidirectional, 1 output (included with -PCM models) 200-0416

Unconditional Warranty

A. Warranty

Minarik Drives 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, Minarik Drives will repair or replace, at its sole discretion, such products that are returned to Minarik Drives, 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. Minarik Drives is not responsible for removal, installation, or any other incidental expenses incurred in shipping the product to and from the repair point.

B. Disclaimer

The provisions of Paragraph A are Minarik Drives's sole obligation and exclude all other warranties of merchantability for use, expressed or implied. Minarik Drives further disclaims any responsibility whatsoever to the customer or to any other person for injury to the person or damage or loss of property of value caused by any product that has been subject to misuse, negligence, or accident, or misapplied or modified by unauthorized persons or improperly installed.

C. Limitations of Liability

In the event of any claim for breach of any of Minarik Drives's obligations, whether expressed or implied, and particularly of any other claim or breach of warranty contained in Paragraph A, or of any other warranties, expressed or implied, or claim of liability that might, despite Paragraph B, be decided against Minarik Drives by lawful authority, Minarik Drives shall under no circumstances be liable for any consequential damages, losses, or expenses arising in connection with the use of, or inability to use, Minarik Drives's product for any purpose whatsoever.

An adjustment made under warranty does not void the warranty, nor does it imply an extension of the original 12-month warranty period. Products serviced and/or parts replaced on a no-charge basis during the warranty period carry the unexpired portion of the original warranty only.

If for any reason any of the foregoing provisions shall be ineffective, Minarik Drives's liability for damages arising out of its manufacture or sale of equipment, or use thereof, whether such liability is based on warranty, contract, negligence, strict liability in tort, or otherwise, shall not in any event exceed the full purchase price of such equipment.

Any action against Minarik Drives based upon any liability or obligation arising hereunder or under any law applicable to the sale of equipment or the use thereof, must be commenced within one year after the cause of such action arises.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