

MACTM•2000

Motor Acceleration Control

Instruction Manual



Electromotive Systems

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Part Number: 005-1028

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Introduction

The MAC™•2000 is a solid state motor acceleration control that provides reduced starting torque and controlled acceleration for single and two speed induction motors. When used in conjunction with a magnetic contactor motor control, the MAC•2000 reduces the initial inrush current to the motor while allowing smooth starting and travel of a crane bridge or trolley. This occurs from zero to low to high speed, while an adjustable acceleration time offers a smooth transition to maximum speed with minimum load swing.

Safety

- Read this manual carefully before operating the equipment and follow its instruction.
- Installation, operation and maintenance should be in strict accordance with this manual, national codes and good practice. Installation or operation not performed in strict accordance with these instructions will void manufacturer's warranty.
- Disconnect all power inputs before servicing the soft starter and/or the motor.

Warnings

- **Do not attempt to make any adjustments while power is applied to the unit!** Terminals on the MAC•2000 are at line voltage. Shorting out or accidentally contacting any of the line voltage components of this control can cause personal injury and damage to the equipment.
- Starter must be properly grounded to ensure correct operation and safety.
- When main voltage is connected to the starter, even if a start signal is not given, full voltage may appear on motor's terminals.
- External motor overload protection must be provided.

Specifications

- Nominal voltage:
Model MAC2024–230/480V ±10%, 50/60Hz
Model MAC2050–575V ±10%, 50/60Hz
- Full Load Current:
Model MAC2024–15.2 Amp
Model MAC2050–15.2 Amp
- Rated CMAA Class “D” Service
- Operating temperature range: 14 to 104°F (-10 to 40°C).
- Maximum relative humidity 85% non-condensing.
- Heatloss: 62 watts

Installation

- The MAC•2000 must be protected against a short circuit by non-semi conductor type (Class CC, 600V, 25 Amp) fuse. Input fusing should be sized according to motor FLA.
- The starter must be mounted vertically onto a flat, non-flammable panel at least ¼” from enclosure surface, allowing sufficient space of at least 1 inch above and below the starter for suitable air flow. Enclosure must be selected to allow surrounding air temperature not to exceed 50°C.
- Do not mount the starter near heat source.
- Protect the starter from dust and corrosive atmosphere.

Connections

- Connect line voltage to terminal L1, L2, L3.
- Connect motor to terminals T1, T2, T3.
- Use copper wire with a minimum 75°C temperature rating.
- Wire size and type should be determined by local electrical codes.
- Low voltage wires shall be wired with class 1 wiring.
- When connecting a motor to the output terminals, include a separate ground wire. Attach ground wire solidly to motor frame and to ground terminal.
- For single speed motor applications connect a jumper wire to terminals 1 & 2 (see Figure 1: Single speed wiring diagram).
- Motor will soft start when FWD/REV contactor closes and will stop when contactor opens.
- See Figure 1 for single speed connections or Figure 2 for two speed connections.
- For two speed motor applications, connect a voltage free, N.O. contact to terminals 1&2 and 3&4 (see Figure 2: Two speed wiring diagram).
- External motor overload protection must be provided.

NOTE: Connection of voltage to terminals 1 thru 4 will damage the starter.

Typical Wire Sizing for Main Circuit

Model Number	MAC	Terminal Symbol	Wire Size (AWG)	Tightening Torque (lb-in)
2024, 2050		L1, L2, L3, T1, T2, T3, GND	16-10	5 to 7

Typical Wire Sizing Chart for Control Terminals

Terminal	Function
1 and 2	Single Speed Enable (see figure 1)
3 and 4	Second Speed Enable (see figure 2)

Figure 1 below illustrates the interconnection for the MAC•2000 in a single-speed application. The MAC•2000 is connected between the motor thermal overload and the FWD/REV reversing contactor. Figure 2 below illustrates the interconnection for the MAC•2000 in a two speed application. The MAC•2000 is connected between the motor HIGH/LOW speed contactor and the FWD/REV reversing contactor. If the motor is equipped with an AC brake, it must be connected to the *line* side of the MAC•2000.

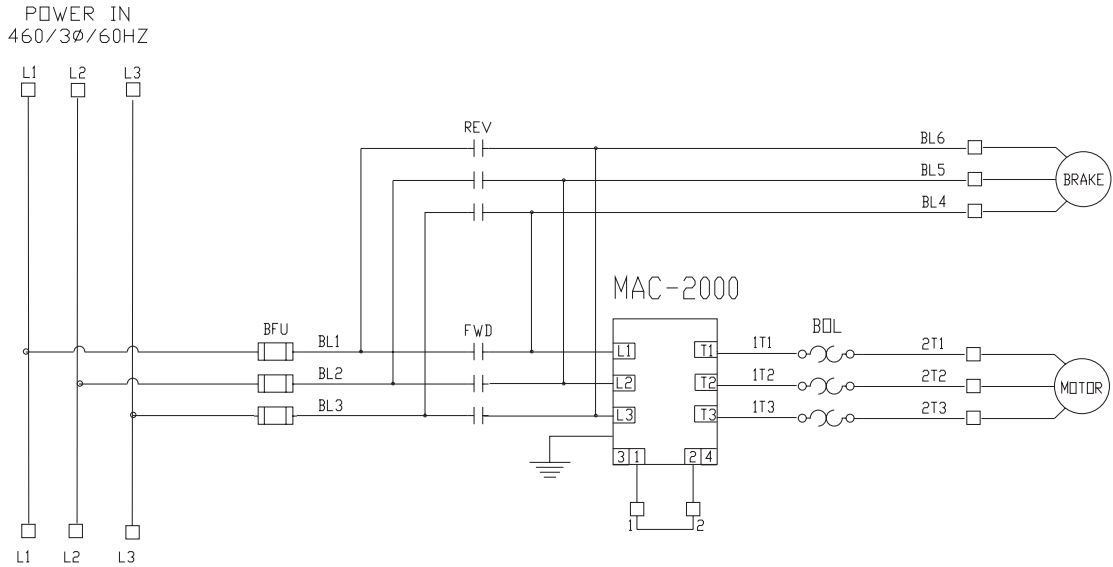


Figure 1: Wiring Diagram—Single Speed Application With MAC•2000

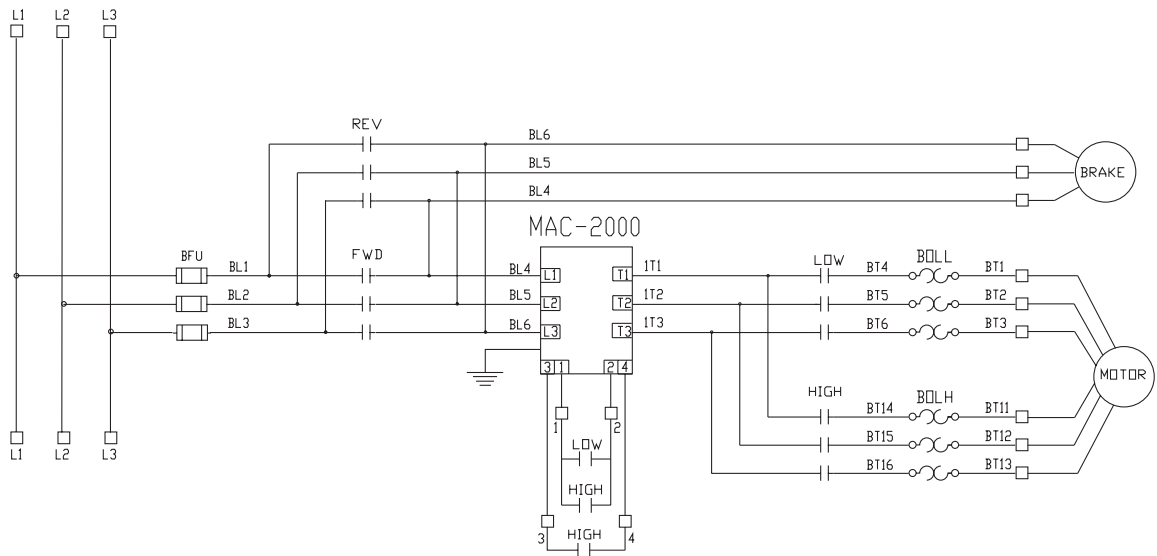


Figure 2: Wiring Diagram—Two Speed Application With MAC•2000

Settings

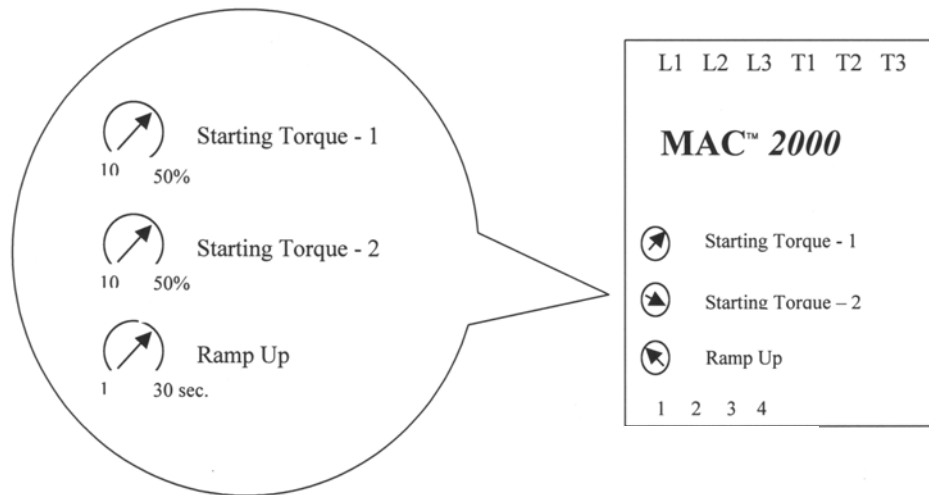


Figure 3: Settings

Torque 1

The starting torque-1 potentiometer adjusts the amount of starting torque the motor will deliver by presetting the amount of torque that is initially supplied to the motor upon starting. If the starting torque is too high, the system will start abruptly and part of the benefit of the control will be lost. If, however, the starting torque is too low to move the load, there will be a lag between a command for motor and the resulting motion as the torque is increased by the MAC•2000. To determine an optimum setting for the Starting Torque 1 adjustment, the motor should be loaded with a load typical of those to be encountered regularly. If the range of the loads to be encountered is very wide, the heaviest typical load should be chosen for adjustment. The Starting Torque 1 potentiometer may be increased or decreased as required, in small increments, until the desired objective of a soft smooth start is achieved. Turning the Starting Torque 1 adjustment in a clockwise direction will increase the amount of starting torque generated by the motor.

Torque 2

The Torque 2 Setting is used only when the MAC•2000 is used to control a 2 speed motor.

The Starting Torque 2 potentiometer adjusts the initial value of torque the motor will deliver when a command is given to go from low to high speed. The adjustment procedure for this control is the same as that of the Starting Torque 1 adjustment. Turning the Speed Torque 2 potentiometer *clockwise* increases the initial torque generated by the motor. In contrast, turning the Starting Torque 2 potentiometer *counterclockwise* decreases the initial torque generated by the motor. Again, if the Starting Torque 2 setting is too high, the transition from low to high speed will be abrupt and jerky. If the setting is too low, there will be a drop in speed in the “low to high speed transition”.

NOTE: *You must complete the adjustment of Starting Torque 1 before adjusting Starting Torque 2. After satisfactory performance in low speed has been achieved, adjust the Starting Torque 2 control to provide a smooth increase from low to high speed of the motor when the high speed command is received by the MAC•2000.*

Ramp Up Time

The potentiometer labeled “Ramp Up” adjusts the length of time for the motor to accelerate from zero to full speed. Turning the Ramp Up control *counterclockwise* will decrease the acceleration time. Inversely, a *clockwise* adjustment to the Ramp Up control will increase the acceleration time. To adjust the Ramp Up:

1. Remove power from the MAC•2000.
2. Determine the direction of adjustment required (increase or decrease).
3. Turn the Ramp Up control in the desired direction, no more than 30° at a time.
4. Test after each adjustment until desired performance is achieved.

Start Up Procedure

1. Set Starting Torque—1 to 30%
2. Set Ramp Up Time to 30 sec. (Full clockwise rotation)
3. Start the motor.
4. If motor starts turning softly and smoothly immediately upon start signal, leave settings as is.
 - a) If the initial mechanical shock or inrush current is too high, reduce Starting Torque to 25% and restart motor. Continue to reduce Starting Torque until motor accelerates in a soft and smooth manner.
 - b) If however, upon receiving a start signal, there appears to be a delay in motor rotation, or if the motor does not accelerate smoothly to full speed, increase Starting Torque setting to 35% and restart motor again. Continue to increase starting torque until motor accelerates in a soft and smooth manor.
 - c) Slightly increase the final Starting Torque setting to allow for some load variations.
5. Set Ramp up Time for desired acceleration ramp time.

Dimensions

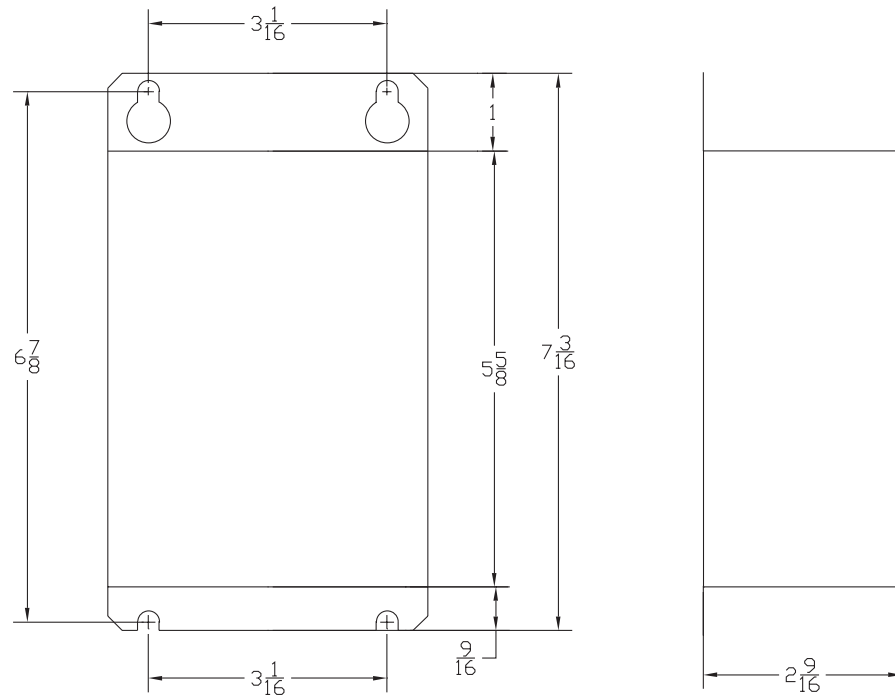


Figure 4: Dimensions