

# Instructions for Installation and Operation

Type WPM Filtered PWM Speed Controls for Permanent Magnet DC Brush Motors

- Models 0790 & 0791, NEMA 1 enclosure

## SPECIFICATIONS

<b>Input Voltage</b>	115 VAC ±10%, 50/60 Hz, single phase
<b>Maximum Input Current, Continuous</b>	
Model 0790	2.5 Amps RMS
Model 0791	5.7 Amps RMS
<b>Output Voltage</b>	0-130 VDC
<b>Ambient Temperature</b>	0-40° C.
<b>Maximum Output Current, Continuous</b>	
Model 0790	2.00 Amps DC*
Model 0791	3.20 Amps DC
<b>Maximum Output Current, Peak</b>	
Model 0790	2.20 Amps DC
Model 0791	5.00 Amps DC
<b>Speed Regulation</b>	1% of rated speed obtainable with most motors
<b>Acceleration/Deceleration Time</b>	Adjustable, 0.1-15 seconds
<b>Means for Speed Adjustment</b>	10K Ohm potentiometer
<b>Means for Drive Inhibit</b>	switch closure
<b>Diagnostics</b>	green power LED, red current limit LED

\* Thermal rating only. Actual max. continuous output current is 1.25 Amps.

## INSTALLATION

**WARNING:** This control should only be installed by a qualified person familiar with its operation and associated hazards. The National Electrical Code (NEC), local electrical and safety codes, and when applicable, the Occupational Safety and Health Act (OSHA) should be observed to reduce hazards to personnel and property.

### Step 1: Mounting the Control

The control may be mounted using any two or all four mounting holes. The mounting holes have clearance for 1/4-20 or M6 screws.

### Step 2: Preliminary Setup

**HORSEPOWER & ACCELERATION SELECTOR SWITCHES**—Control models 0790 and 0791 are packaged with the enclosure cover unattached. Remove the cover to set the horsepower and acceleration selector switches. **Figure 4** shows the location of a bank of 8 dip switches. Set switches 1 through 6 to match the type, speed, and current ratings on the Bodine motor nameplate per **Figure 2** (consult Bodine on settings for non-Bodine motors). Set switches 7 and 8 to select the acceleration/deceleration time range per **Figure 3**.

### Step 3: Electrical Connections

The enclosure cover must be removed as shown in **Figure 4** to make the electrical connections.

**WARNING**—All parts of the circuit operate at voltages capable of causing serious injury or death.

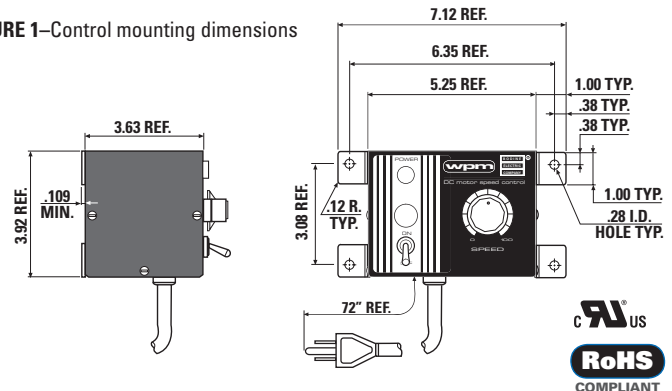
**WARNING**—The AC power line to the control should be the last connection made.

**CAUTION**—The control board signal common is not at ground potential. Any external signal or equipment connected to the control must be electrically isolated from ground.

**INHIBIT SWITCH (OPTIONAL)**—A mechanical switch or relay with contacts rated for low voltage may be connected to terminals "H1" and "H2". With the switch open, the motor will run. With the switch closed, the motor will coast to a stop.

**WARNING**—The inhibit switch should not be used to disable motor or control when servicing these or driven equipment. Disconnect the AC power instead.

**FIGURE 1**—Control mounting dimensions



**FIGURE 2**—Setup of Dip Switches 1 through 6

Control	Motor Ratings				Control Setup		
	Motor Type	Armature RPM@ 130V <sup>1</sup>	Motor Rated Amps <sup>2</sup>	Motor HP	Dip Switches On	Peak Output Amps <sup>3</sup>	Continuous Input Current <sup>4</sup>
Model 0790	24A0	2500	0.22	1/50	Consult Bodine Factory		
	24A2	2500	0.3	1/29	1,2	0.6	0.8
	24A4	2500	0.48	1/17	1,2,3	1.0	1.1
	24A4	2500	.56   .81	1/23   1/11	3,5,6	1.2	1.4
	33A3	2500	.78   1.0	1/16   1/8	2,4,5,6	2.1	1.9
	33A3	2500	0.74	1/12	3,5,6	1.2	1.4
	33A3	2000	0.71	1/12	3,5,6	1.2	1.2
	33A5	2500	0.91	1/8	2,4,5,6	2.1	1.9
	42A3	2500	1	1/8	2,4,5,6	2.0	2.0
	42A4	2000	1.3	1/6	1,2,4,5,6	2.2	2.5
Model 0791	24A4	11500	1.1	1/7	3 <sup>5</sup>	1.7	1.9
	33A3	2500	0.74	1/12	1	1	1.4
	33A3	2500	.78   1.0	1/16   1/8	3	1.7	1.9
	33A3	2000	0.71	1/12	1	1	1.4
	33A5	2500	1.4(1.3)   1.8(1.7)	1/8   1/4	2,3	2.0	2.5
	33A5	2000	1.4	1/6	3	1.7	1.9
	33A5	2500	0.91	1/8	3	1.7	1.9
	33A7	2500	1.8   2.4	1/6   1/3	3,5	4.1	3.6   4.8
	42A3	2500	1	1/8	1,3	1.9	2
	42A4	2000	1.3	1/6	2,3	2	2.5
	42A5	2500	1.9   1.8	3/16   1/4	3	1.7	1.9
	42A5	2500	1.8	1/4	3,5	4.1	3.6
	42A5	2500	2.7	1/3	3,5	4.1	4.8
	42A7	2500	2.3	1/3	2,3,5	4.9	4.0
42A7	2500	3.4	1/2	2,3,5	5.0	5.7	
42A7	2500	3.3	7/16	2,3,5	5.0	5.7	

**FIGURE 3**—Setup of dip switches 7 and 8

Switches		Acceleration/Deceleration Time Range (seconds) <sup>6</sup>	
7	8	ACC pot fully CCW (factory setting)	ACC pot fully CW
Off	Off	.1	.3
Off	On	.5	2.0
On	Off	3.5	12.0
On	On	4.0	15.0

1. For armature speed of a geared motor, multiply the output speed at the driveshaft by the gear ratio.
2. If the user desires to install their own armature fuse on the control output to protect the motor from continuous overloads, base fuse ratings on the motor rating in this column.
3. Peak current available with TORQ pot in fully CW position (factory setting). This current exceeds the continuous rating of the motor and is for intermittent overload conditions only.
4. Use this column for sizing a line fuse on the control input.
5. The REG potentiometer must be turned fully CCW (off) for high-speed type 24ABEPM motor.
6. Time for voltage across A1 and A2 to ramp up to 130 V when speed pot is turned from 0 to 100; or to ramp down to 0 V when it is turned from 100 to 0. The time for a motor to accelerate from 0 to 2500 rpm or decelerate from 2500 to 0 rpm is dependent on motor size and loading conditions.

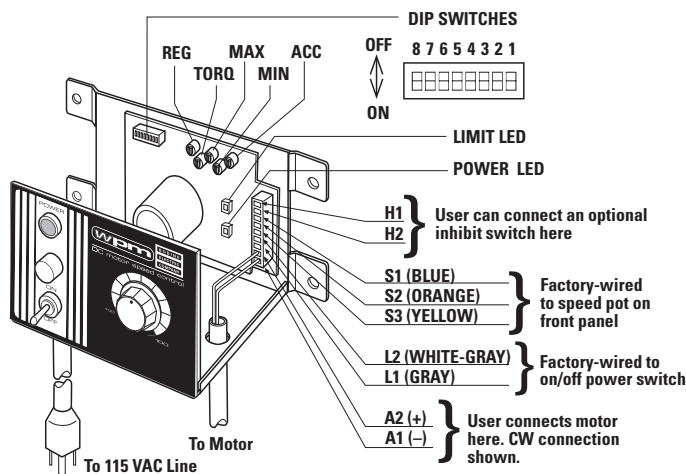
## INSTALLATION, continued

**MOTOR CONNECTIONS**—Feed the motor cable through the opening in the bottom of the enclosure. For clockwise armature rotation, connect the “+” motor wire (white wire on Bodine motors) to terminal “A2” and the “-” motor wire (black wire on Bodine motors) to terminal “A1”. For counterclockwise rotation, reverse the motor connections. Reinstall enclosure cover.

**LINE FUSE**—Models 0790 and 0791 are equipped with a fuseholder on the front panel that is accessible to users for field replacement of the fuse. A four amp fuse is factory installed in model 0790 and an eight amp fuse is factory installed in model 0791.

**AC POWER CONNECTIONS**—Models 0790 and 0791 are equipped with a six foot long cable having a standard connector for 115 VAC outlet. When all other connections are made, plug it in.

FIGURE 4—Electrical connections and internal adjustments



## OPERATION

### Step 4: Preliminary Checks Before Starting

1. Before starting the control, check all fuses, connections, and adjustments such as horsepower switch settings.
2. Check all rotating members. Be sure keys, pulleys, etc. are securely fastened and safety guards are in place.
3. Check for proper mounting and alignment of products, and verify safe loading on shafts and gears.
4. Check that motor is securely mounted.
5. Test the motor unloaded first to verify proper connections.

### Step 5: Operating the Control

1. With AC power switch OFF, set the speed pot to ZERO (fully counterclockwise).
2. Turn the AC power switch ON.
3. Turn the speed pot until motor rotates at desired speed. Note that “SCR rated” motors, or motors rated 90 VDC, will run faster with a filtered control because of the 130 VDC max. output voltage.
4. If the motor does not start promptly and run smoothly, turn the AC power switch OFF, unplug the control, and refer to “TROUBLESHOOTING,” below.

### Step 6: Internal Adjustments

Most users will find the factory calibration of the control to be acceptable for their application. For those who want to fine-tune the control, five trim pots are accessible on the PC board. First, remove the enclosure cover. Figure 4 shows the locations of the internal adjustment potentiometers.

**WARNING**—Use a non-metallic or insulated adjustment tool for internal adjustments. Circuit components are at high potential and accidental short-circuiting and shock hazard may occur with conductive tools.

**MINIMUM SPEED LIMIT**—Turn the MIN pot clockwise to make the motor run faster than 0 rpm when the speed pot is set at “0”. With the MIN pot fully clockwise and the speed pot set at “0” output voltage will be about 50 VDC. Increasing the minimum speed will also increase the maximum speed, so the MAX pot may need to be adjusted.

**MAXIMUM SPEED LIMIT**—Turn the MAX pot counterclockwise to make the motor run slower than full speed when the speed pot is set at “100”. With the MAX pot fully counterclockwise and the speed pot set at “100” the motor will run at about 60% of full speed.

**TORQUE LIMIT**—Turn the TORQ pot counterclockwise to reduce the peak torque capability of the motor. Most Bodine motors will produce about 200% of rated torque with the horsepower switches set per Figure 2 and the TORQ pot turned fully clockwise. The motor must be properly sized for the application so that it only produces this peak torque intermittently. Turning the TORQ pot fully counterclockwise will produce 0% torque (stall).

**ACCELERATION/DECELERATION TIME**—Turn the ACC pot to simultaneously adjust the acceleration and deceleration time within the range selected by dip switches 7 and 8. Refer to Figure 3. Clockwise rotation of ACC pot increases acceleration or deceleration time.

**SPEED REGULATION**—The REG pot sets the gain of the IR compensation. It is factory-set so that the speed of most Bodine motors varies no more than 2% from no load to full load at full speed when the horsepower switches are set per Figure 2. The REG pot normally requires no adjustment by the user unless better speed regulation is needed or no speed regulation is needed. Turn the REG pot clockwise to increase IR compensation. Turning it too much will make the system unstable. If this happens, turn the REG pot counterclockwise to reduce the IR compensation. When using the WPM control in a closed-loop system with another control device, turn the REG pot fully counterclockwise to eliminate IR compensation.

## TROUBLESHOOTING

**WARNING**—Disconnect the control from the AC power source before working on the control, motor, or driven equipment.

If the motor does not operate, disconnect the AC power and double check all connections and fuses. Make sure the TORQ pot is not turned fully counterclockwise. If a fuse is blown and the motor is not locked (stalled) or overloaded, do not replace the fuse. The control may be damaged. If the motor is overloaded, reduce the load and replace the blown fuses with new ones of the proper type and rating. If the problem persists, contact your source of purchase or a Bodine Authorized Service Center and describe the problem in detail. Include all nameplate data for both motor and control.

### BODINE LIMITED WARRANTY

The Bodine Electric Company warrants all products it manufactures to be free of defects in workmanship and materials when applied in accordance with nameplate specifications. Bodine motors and gearmotors purchased with and used only with appropriately applied Bodine controls are covered by this warranty for a period of 24 months from the date of purchase or 30 months from date of manufacture, whichever comes first. Bodine motors and gearmotors used with non-Bodine controls and Bodine controls used with non-Bodine motors and gearmotors are covered by a 12 month warranty period. The Bodine Electric Company will repair, replace, or refund at its option, any of its products which has been found to be defective and within the warranty period, provided that the product is shipped freight prepaid, with previous authorization, to Bodine or to a Bodine Authorized Service Center. Bodine is not responsible for removal, installation, or any other incidental expenses incurred in shipping the products to or from Bodine. This warranty is in lieu of any other expressed or implied warranty—including, but not limited to, any implied warranties of merchantability and/or fitness for a particular use. Bodine’s liability under this warranty shall be limited to repair or replacement of the Bodine product and Bodine shall not be liable, under any circumstances, for any consequential, incidental or indirect damages or expenses associated with the warranted products. Proof of purchase of motor or gearmotor and matching control as a system must be provided with any claim.

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