

# Instructions for Installation and Operation

Type UPM Unfiltered SCR Speed Control for Permanent Magnet DC Brush Motors

• Model 0867, NEMA 1 enclosure



## SPECIFICATIONS

Input Voltage	115 VAC ±10%, 50/60 Hz, single phase
Max. Input Current, Continuous:	4.2 Amps RMS
Output Voltage	0-90 VDC
Ambient Temperature	0-40° C
Max. Output Current, Continuous	2.1 Amps DC
Max. Output Current, Peak	5.1 Amps DC
Speed Regulation	1% of rated speed obtainable with most motors
Acceleration Time (0-90 VDC)	Adjustable, 0.2-10 seconds
Deceleration Time (90-0 VDC)	Adjustable, 0.2-10 seconds
Means for Speed Adjustment	10K ohm potentiometer

## 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.

**NOTE:** The control does not provide motor over temperature protection. The user is responsible for providing this protection in the equipment where this control is used (Remarque: La détection de la surchauffe du moteur n'est pas assurée par cette control).

### 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.

**CAUTION:** Exposed circuit boards should be protected from electrostatic discharge. The control board uses CMOS circuitry. Static discharge into the control board must be avoided to prevent component damage.

### Step 2: Preliminary Setup

**HORSEPOWER SELECTOR SWITCHES**—The model 0867 control is packaged with the enclosure cover unattached. Remove the cover to set the horsepower selector switches. **Figure 3** shows the location of a bank of 8 dip switches on the PC board. Set the switches to match the motor per **Figure 2**.

### Step 3: Electrical Connections

The enclosure cover must be removed as shown in **Figure 3** to make the electrical connections.

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

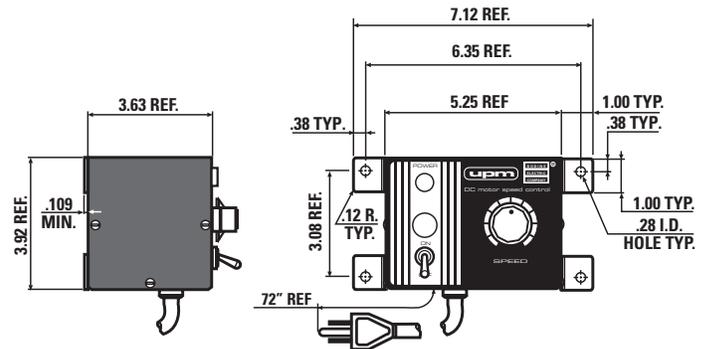
**WARNING**—The AC power line to the control should be the last connection made.

**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

Bodine Motor Type	Rated Volts (DC)	Armature Speed (RPM) <sup>1</sup>	Rated Current (Amps) <sup>2</sup>	Motor Power (HP)	DIP Switches ON	Typical Current Range of TORQ. Pot. (DC Amps) <sup>3</sup>	Typical Input Current at Max. TORQ Setting (RMS Amps) <sup>4</sup>
24A0	130	2500	0.22	1/50	Consult Bodine Support		
24A2	130	2500	0.30	1/29	4,5,6,7	0-0.65	1.0
24A4	130	2500	0.48	1/17	3,4,6,7	0-0.8	1.3
24A4	90	2500	0.58	1/20	4	0-.98	1.3
24A4	90   130	2500	.56   .81	1/23   1/11	4	0-0.92	1.3
24A4 <sup>6</sup>	115	11500	1.1	1/7	3,5	0-1.5	8.2
33A3 <sup>5</sup>	90   130	2500	.78   1.0	1/16   1/8	3,5	0-2.4	2.6
33A3	130	2500	0.74	1/12	4	0-0.92	1.3
33A3	130	2000	0.71	1/12	3	0-1.36	1.6
33A5 <sup>5</sup>	130	2500	0.91	1/8	2,7	0-2.4	2.7
33A5	90	2500	1.6	1/7	2,4,5	0-3.0	3.8
33A5 <sup>5</sup>	90   130	2500	1.4   1.8	1/8   1/4	3,4,5	0-2.2	2.5
33A5 <sup>5</sup>	90   130	2500	1.3   1.7	1/8   1/4	3,4,5	0-2.2	2.5
33A5	130	2000	1.4	1/6	3	0-1.38	1.8
33A7 <sup>5</sup>	90   130	2500	1.8   2.4	1/6   1/3	2,4,5	0-3.0	3.8
42A3 <sup>5</sup>	130	2500	1.0	1/8	2,5,7	0-3.0	4.9
42A4 <sup>5</sup>	130	2000	1.3	1/6	2,5,7	0-2.7	4.3
42A5	90	2500	2.2 <sup>7</sup>	1/4	2,3,4,5	0-4.0	5.4
42A5 <sup>5</sup>	90   130	2500	1.9   1.8	3/16   1/4	1,3,4	0-4.3	6.9
42A5 <sup>5</sup>	90   130	2500	2.1   2.8	3/16   3/8	1,3,4	0-4.3	6.9
42A5 <sup>5</sup>	130	2500	1.8	1/4	2,4,5	0-3.0	3.9
42A5 <sup>5</sup>	130	2500	2.7	1/3	2,4,5	0-3.0	4.2
42A7 <sup>5</sup>	130	2500	2.3	1/3	2,3,4,5	0-3.8	5.3
42A7 <sup>5</sup>	130	2500	3.4	1/2	1,2,3,4,5	0-5.9	7.5
42A7 <sup>5</sup>	130	2500	3.3	7/16	2,3,4,5	0-3.8	5.3

- Armature speeds are based on 130VDC (or 180VDC). For armature speed of a geared motor, multiply the output speed at the driveshaft by the gear ratio. Note that "PWM rated" motors, or motors rated at 130 VDC, will run about 69% slower with an unfiltered control because of the 90VDC max output voltage.
- 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 current rating in this column. The fuse should be sized at 1.2 times the current rating in this column.
- Peak current available with TORQ pot in fully CW position. This current may exceed the continuous rating of the motor, in which case it is intended for intermittent overload conditions only. It is the user's responsibility to make sure the application does not exceed continuous rating of the motor or gearing.
- Use this column for sizing a line fuse on the control input. The fuse should be sized at 1.2 times the current rating in this column.
- These motors are capable of exceeding the continuous output rating of the control. The loading on these motors must be limited to keep their continuous current draw at 2.1A or less.
- The REG potentiometer must be turned fully CCW (off) for high-speed type 24A4BEPM motor.
- The load/current of our 42A5 "SCR Rated", 90V, 2500 rpm gearmotors may not exceed 2.1 amps (max) rating of control.

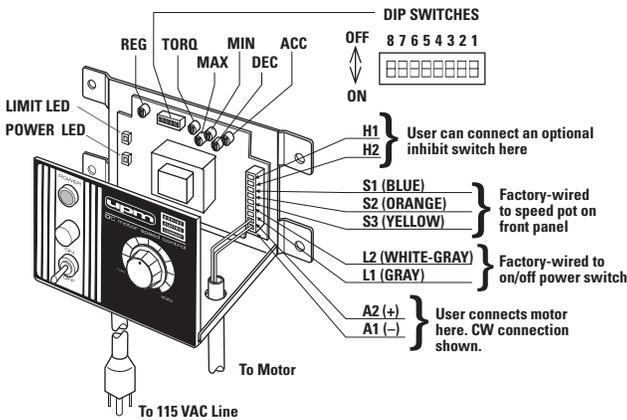
## INSTALLATION, continued

**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**—Model 0867 is 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 0867.

**AC POWER CONNECTIONS**—Model 0867 is 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 3**—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). If an inhibit switch is used, close the switch.
2. Turn the AC power switch ON. Open the inhibit switch, if used.
3. Turn the speed pot until motor rotates at desired speed. Note that “PWM rated” motors, or motors rated 130 VDC, will run slower with an unfiltered control because of the 90 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 3** 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 TIME**—Turn the ACC pot clockwise for a “soft start”. The ACC pot controls the time it takes for the output voltage to ramp up from zero to the voltage set by the speed pot when the control is switched on; or from a lower voltage to a higher voltage when the speed pot is turned up. With the speed pot set at “100” and the ACC pot turned fully counterclockwise, it will take about 0.2 seconds for the output voltage to ramp up from 0 to 90 VDC after switching the control on. Under the same conditions except with the ACC pot turned fully clockwise, it will take about 10 seconds.

**DECELERATION TIME**—Turn the DEC pot clockwise for a “soft stop”. The DEC pot controls the time it takes for the output voltage to ramp down from the voltage set by the speed pot to a lower voltage when the speed pot is turned down. With the speed pot set at “100” and the DEC pot turned fully counterclockwise, it will take about 0.2 seconds for the output voltage to ramp down from 90 to 0 VDC after instantly turning the speed pot down to “0”. Under the same conditions except with the DEC pot turned fully clockwise, it will take about 10 seconds.

**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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