



PENNBARRY™

MS

MULTI- SPEED CONTROLLER INSTALLATION AND OPERATIONS MANUAL

DUAL SET-POINT ECM
INTERFACE MODULE

VERSION 1.0



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2. MULTI-SPEED (MS) CONTROLLER OVERVIEW

2.0. PURPOSE:

The purpose of this manual is to assist the user in successfully installing, configuring, and commissioning the Multi-Speed controller (MS) from PennBarry™.

2.1. INTRODUCTION:

The Multi-speed controller (MS) is a dual set-point ECM interface module that allows the user to set the motor speed and remotely switch the speed through an open-closed contact (switch). The unit contains two onboard potentiometers to allow the user to manually set both speeds.

Outputs: One (1) Analog Output 0-10 VDC signal for EC motor control.

One (1) Digital Output (PWM) for EC motor control.

The Multi-speed controller (MS) provides remote interface for setting, monitoring and switching between two independent motor speeds for a single motor/fan. The MS includes onboard digital multi-meter nodes to provide set-point and RPM measurements. The remote open-close contact selects which potentiometer setting to apply. The unit is powered by a remote 24VAC isolated step-down transformer (provided by others).

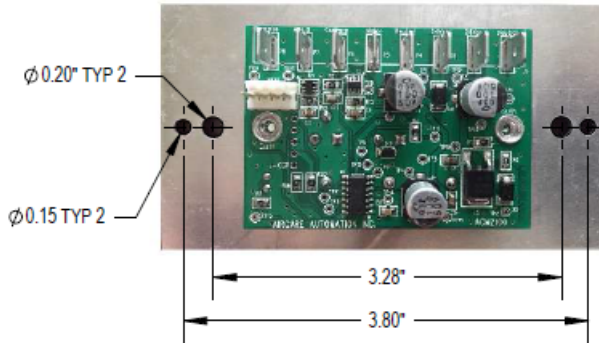
2.2. SPECIFICATIONS REFERENCE TABLE:

Electrical Specifications	Min	Typical	Max	Units
Transformer Ratings 50/60Hz, 2.4VA	-	24	-	VAC
Input Voltage Range, AC	12	-	30	VAC
Input Voltage Range, DC	14	18	30	VDC
Input Current			25	mA
Motor Speed, Analog Output	0		10	VDC
Motor Speed, Digital Output (PWM)	0		10	VDC
Motor Enable, Digital Output	0		10	VDC
Open-Closed Contact Impedance	0		500	Ohms
Environmental Specifications	Min	Typical	Max	Units
Ambient Operating Temperature (Celsius)	-18	25	55	°C
Ambient Operating Temperature (Fahrenheit)	0	77	131	°F

Front View



Back View



Installation



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3. INSTALLATION:

In this section, recommendations are provided to guide you through the installation process. Where and how to identify a suitable mounting location for the MS controller as well as preparatory steps, precautions and step-by-step installation procedures are provided.

3.0. INSTALLATION SEQUENCE:

1. Read Installation Instructions before starting installation
2. Locate suitable area (per section 3.1 and 3.2) to mount the MS controller
3. The MS controller consists of a faceplate mounted printed circuit board and is designed to fit in a standard electrical junction box (j-box) enclosure (provided by others).
4. Make electrical connections to back of the MS controller (per section 3.1)
5. With electrical connections made, secure MS controller to the j-box using fastening screws and mount in the desired location.

3.1. INSTALLATION PRECAUTIONS:

Read these installation instructions carefully before installing and commissioning the MS controller. **Failure to follow these instructions may result in personal injury or equipment damage.** Before installing the MS controller verify the area conditions around the installation site.

The MS controller is not rated for installation in wet or outdoor environments. Do not install in an explosive or hazardous environment.

The MS controller is a precision electronic device; avoid areas with electrical noise created by high power equipment and devices. Avoid locations with severe vibrations, extreme heat, or excessive moisture.

Take electrostatic discharge precaution during installation. Protect internal components from dirt, dust, metal chips, and other debris. Failure to protect components from debris may cause an internal electrical short or overheating of components during operation.

3.2. INSTALLATION LOCATION:

Locate the MS controller in an accessible area where it can be monitored and adjusted as needed. It is recommended the controller be located within 50m (150 ft) of the fan with EC motor or VFD.

The area must have clearance space around the MS controller for the electrical connections. The MS controller can be located and mounted on any vertical non-heated surface using a standard j-box enclosure (provided by others). Avoid mounting near fans, louvers, or doorways. Avoid locations with vibrations, extreme heat, or excessive moisture. Do not mount near high voltage equipment or conductors.

4. ELECTRICAL:

4.0. ELECTRICAL – GENERAL SET-UP INFORMATION:

Review the supplied wiring diagram(s) and verify the application connections before attempting to connect the MS controller or the associated equipment.

The MS controller requires 24 VAC input power to operate. The MS controller may be installed with either conduit and a conduit coupler or a cable gland type fitting through the j-box enclosure.

Notes:

Follow all local electrical and safety codes, as well as the National Electrical Code (NEC) and the National Fire Protection Agency (NFPA), where applicable. Follow the Canadian Electric Code (CEC) in Canada.

Use caution when grounding the secondary of a power supply or when wiring multiple devices. Ensure that the circuit ground points are the same on all devices.

Use shielded cable for all variable voltage analog signal conductors. Do not run in the same conduit with high voltage wiring or wiring used to supply inductive loads such as motors.

4.1. ELECTRICAL WIRING DIAGRAM:

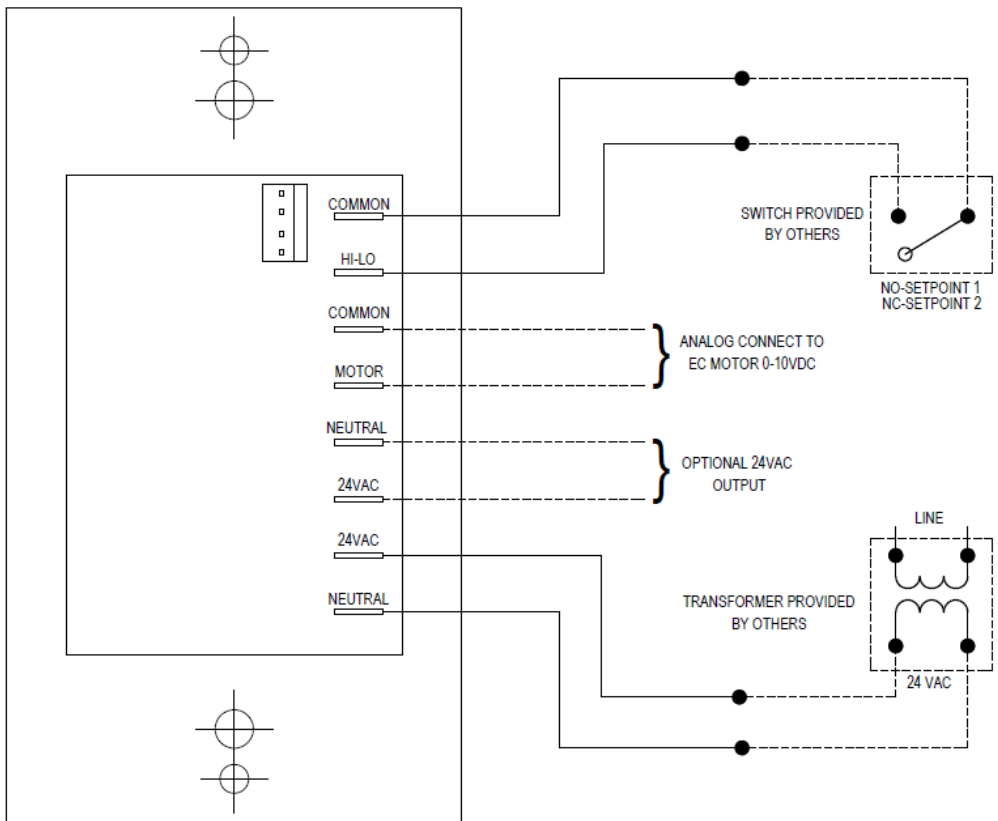


Figure 1: Terminal Block Wiring Diagram

Operations



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5. OPERATIONS:

5.0. FRONT VIEW:

The MS controller includes two onboard potentiometers to manually set two operation speeds, as well as digital multimeter nodes for set-point and RPM measurements.

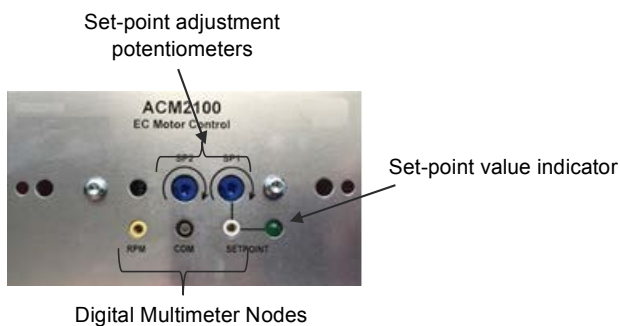


Figure 2: MS Controller Faceplate

5.1. DESCRIPTION OF OPERATIONS:

1. Before powering the unit, make sure that the potentiometer marked as SP1 is adjusted to its minimum set-point by rotating the potentiometer counter clockwise until you reach its stop.

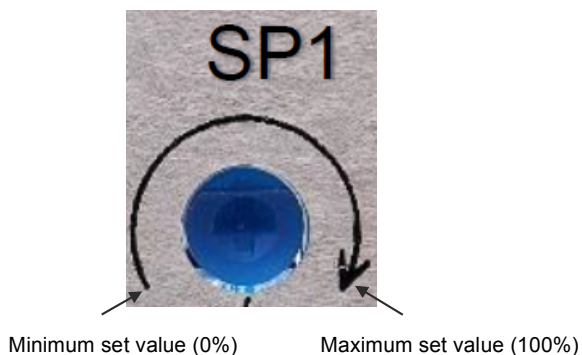


Figure 3: SP1 Potentiometer

2. Apply system power, MS controller require 24 VAC for proper operation (Figure 1) Then, proceed to slowly adjust SP1 to the desired set-point value per your application.

3. The Green LED provides visual confirmation of set-point. (The LED will flash 9 times then pause when SP1 is set to 90% of the full range; the LED will flash 5 times then pause when SP1 is set to 50% of the full range, etc...).
4. Additionally, you may also use the onboard digital multimeter probes jacks to confirm the corresponding voltage at the desired set-point and RPM.
 - Set-point and RPM are indicated in mV DC scale. Range 0 to 100% indicated as 0 to 1.000V (1000mV)
5. To set the second motor speed (SP2), follow steps 1 and 2 above using SP2 potentiometer – see Figure 2. Using an external switch, the output may be toggled between the SP1 and SP2 as indicated below (see Figure 1, for more details):
 - SP1: Common (P8) and HI-LO (P7) are open.
 - SP2: Common (P8) and HI-LO (P7) are closed.

Blank

Testing And Troubleshooting



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6. TESTING AND TROUBLESHOOTING:

It is recommended the MS controller system operation be tested periodically to verify functionality. It is critically important to test during the commissioning phase of the system life cycle. Many of the tests require no use of tools and can be administered using the built-in interface.

6.0. FAULT CONDITIONS:

A **fault condition** is when a system component is non-functional, this can be a result of a system condition caused by the present dynamics of the system or environment. Some of these variables are:

1. Controller parameters not adjusted properly for system conditions
2. Varying supply voltage

General Fault Description	Actions
MS controller does not enable/run	<ol style="list-style-type: none">1. Check wiring2. Verify power supply
Fan will not run	<ol style="list-style-type: none">1. Verify system wiring2. Check supply voltage3. Verify output voltage between terminals P5 and P6.4. Check disconnect <p><i>Refer to the fan IOM for more guidance</i></p>
Fan will not run at the desired set-point	<ol style="list-style-type: none">1. Verify system wiring2. Check supply voltage3. Verify proper set-point has been selected (SP1 / SP2) <p><i>Refer to the fan IOM for more guidance</i></p>

Commissioning



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7. SYSTEM COMMISSIONING PROCEDURES:



Do not skip any steps! Skipping steps may create a hazardous condition or damage equipment!

7.0. PRE-COMMISSIONING CHECKS:

1. Check that disconnect(s) are open/ de-energized
2. Verify all system components are installed properly and are secure
3. Verify wiring connections are correct per wiring diagram(s) and terminals are tight
4. Verify fan assemblies are clear of obstructions and personnel.

7.1. SYSTEM COMMISSIONING PROCEDURE:



Warning: Do not proceed unless the system is complete and ready to be commissioned. The following procedures require the MS controller and associated components to be energized.

1. Verify pre-commission checks have been completed.
2. Prior to energizing disconnect(s) verify equipment voltage supplies.
3. **Verify all personnel and equipment is/are clear of rotating equipment!**
4. Set up VFD (if applicable)
 - a. Energize VFD.
 - b. Verify VFD is in remote control.
5. Energize power supply for the MS Controller.
6. Check fan rotation on EC motor or VFD / 3 phase motor (refer to fan IOM).
 - a. Close disconnect to fan.
 - b. Open disconnect to fan.
 - c. Verify rotation as indicated on fan.
 - d. Correct rotation and retest if required (refer to fan IOM for procedure).
 - e. Close disconnect to fan.
7. If there are no issues, place system into operation and observe.
 - a. Adjust parameter settings as required for desired system operation.
8. Fill out commissioning form.

MS CONTROLLER COMMISSIONING FORM

Job Name: _____ **Company:** _____
Date: _____ **Technician:** _____

Installation Checks

	Yes / No
Components installed per installation instructions	
Wiring correct per wiring diagrams	
All debris removed from fan assembly	
Duct system clear of obstructions	

Electrical Data

MS controller power supply voltage Input: _____ VAC Output: _____ VDC

EC Motor Data

Supply voltage @ disconnect _____ VAC
 Fan rotation correct _____ (Yes / No)
 Amperage @ full load _____ Amp

Induction Motor Data

Supply voltage at VFD _____ L1-L2 _____ L1-L3 _____ L2-L3 _____ VAC
 VFD in Remote _____ (Yes / No)
 Motor Ratings: _____ Volts _____ FLA _____ HZ
 Fan rotation correct _____ (Yes / No)
 Amperage @ full load _____ Amp

Results

System operational?

Yes	No
-----	----

System is online and operational: _____



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