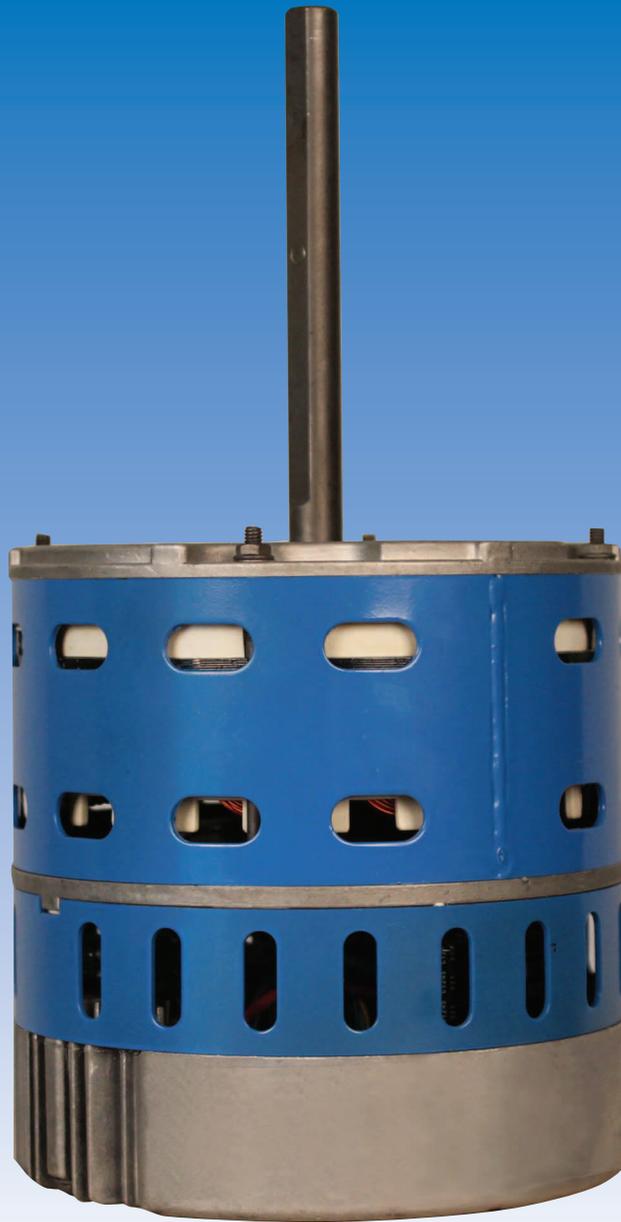# AZURE®

Digi-Motor® Installation Guide
MARS No. 10860/10861

Para obtener instrucciones en español, visite www.MARSDelivers.com
Pour les instructions en français, visitez www.MARSDelivers.com

MARS
marsdelivers.com

AZURE® **Digi-Motor®** Installation Guide

AZURE®

Digi-Motor®

For technical assistance with your Azure® Digi-Motor®, call the MARS technical support hotline:

800-678-9888

M-F 8 am – 5 pm EST.

Table of Contents

Please read the entire instruction manual before starting the installation.

mars®

Product Description

The Azure® Digi-Motor® from MARS is a high efficiency variable speed direct drive blower motor for a multitude of applications. Azure® is a replacement for both standard PSC and Genteq X-13 motors. Two motors cover ratings from 1/5 HP to 1 HP at 115V or 230V and CW or CCW.

Azure® features an auto sizing learn mode. In start-up learn mode, Azure® runs for approximately 2 minutes measuring the external static pressure of the system application. Azure® then assigns torque values to each of its speed taps self-programming itself to the correct horsepower for the application.

If none of the four speeds provides perfect airflow for the application or if duplicate speeds are desired on 2 or more taps, an optional hand held programmer (MARS No. 08502) can be used. The programmer connects to Azure® and displays the percentage of torque applied to the speed tap being energized. The percentage (motor speed) can then be increased or decreased and permanently set with the programmer. This tool overrides the motor torques established in the auto sizing mode.

Unlike other electronically commutated motors, an outboard surge protector is included within Azure's® wire harness. This is a replaceable device (MARS No. 08593).

- Outboard replaceable surge protector
- Adjustable speeds (with optional MARS No. 08502)
- 625 RPM constant fan speed tap
- Reversible rotation, dual voltage
- High efficiency 85%

- Multi-horsepower, direct drive
- Constant torque
- 4 Speeds
- Belly band mount
- No capacitor required

Safety

⚠ **WARNING!**

Use this motor only in applications for which it was designed.

- The Azure® Digi-Motor® is intended for use in direct drive centrifugal blower applications.
- The Azure® Digi-Motor® is designed for continuous, air-over duty and must be mounted in the air stream of an air-moving device to ensure proper cooling of the motor.
- Do not use this motor in locations containing explosive vapors.
- The ambient operating temperature range is -4˚F (-20˚C) to 131˚F (55˚C).

⚠ **WARNING!**

- Only trained and qualified HVAC professionals should install this motor.
- Before disconnecting or connecting the HVAC blower motor, ensure that power is shut off to the system. Failure to do so may result in system damage or personnel injury.
- Do not operate the motor without a load (blower wheel).
- Always ensure the voltage jumper on the motor is set to match the voltage of the system.

⚠ **WARNING - SHOCK HAZARD!**

To reduce the risk of electrical shock, do not separate motor and control unit. The control unit has no serviceable parts.

To reduce the risk of electrical shock or fire, do not expose the motor to rain or moisture.

Removing The Old Motor

⚠ WARNING!
To prevent electric shock, personal injury, or death, turn off the electric power at the disconnect or main service panel prior to making any electrical connections.
The installation of this motor must comply with all local codes and the NEC, article 430.

1) Disconnect main power to the HVAC system.

2) Note the motor voltage, horsepower, and rotation of the motor being replaced.

3) Disconnect the existing motor wire harness (from the control board), neutral, ground, and capacitor.

4) Remove the blower assembly and discard the capacitor.

5) Remove the old motor and mounting bracket.

Configuring The Azure® Digi-Motor®

⚠ **NOTICE**	*The Azure® Digi-Motor® must be securely mounted to minimize noise and vibration.* *A high quality bellyband with bolts is the desired means for mounting Azure®.*

Ensure the Azure® Digi-Motor® is an equivalent (in terms of HP rating) for the motor being replaced.

Azure® MARS No. 10860: 1/5 HP – 1/2 HP

Azure® MARS No. 10861: 1/2 HP – 1 HP

1) Install the Azure® Digi-Motor® into the blower housing using a high quality bellyband. **Be careful not to block the oval ventilation holes nearest the end bell (shown in the image below).**

   • MARS No. 08025 (10" bolt pattern)

   • MARS No. 08026 (11" bolt pattern)

   • MARS No. 08027 (13" bolt pattern)

   Orient the power harness downward (between the 4 o'clock and 8 o'clock positions). This will help prevent moisture from penetrating the control module on the motor. Refer to Image 1.

2) Secure the blower wheel to the motor shaft ensuring the wheel is centered within the housing.

Image 1: Motor Orientation

Configuring The Azure® Digi-Motor® cont.

3) Connect the surge protector into the wire harness. Refer to image 7.

Set the motor voltage to match the application using the RED voltage wire pigtail leads: Refer to image 2.

4) Set the motor rotation to match the application using the WHITE rotation wire pigtail leads: Refer to image 3.

CWLE: Connect the WHITE rotation leads together (closed circuit).

CCWLE: Leave the WHITE leads disconnected (open circuit).

5) Set the motor mode of operation (PSC or X-13) to match the application using the BLUE mode of operation pigtail leads: Refer to image 4.

PSC: Connect the BLUE mode of operation leads together (closed circuit).

X-13: Leave the BLUE mode of operation leads disconnected (open circuit).

X-13: Install the X-13 PC board into the speed tap wire harness by unplugging the connector and inserting the X-13 PC board. Refer to image 5 & 6.

X-13: Unplug and discard the WHITE and GREEN/YELLOW Azure® power wire harness. (The factory X-13 power harness will replace this harness)

6) Install the blower assembly back into the HVAC equipment.
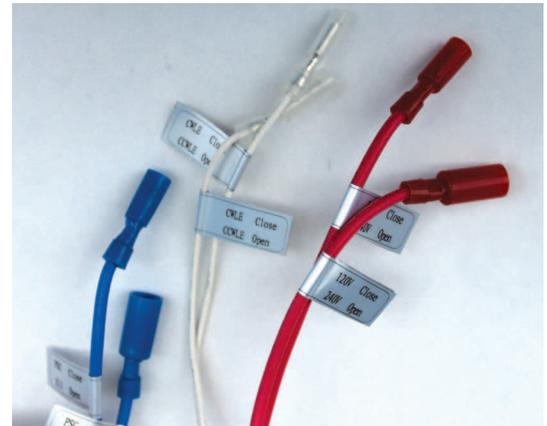
Configuration Leads
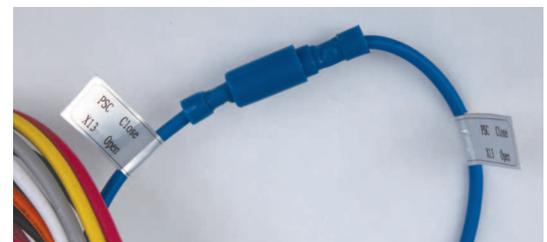
Image 2: Voltage
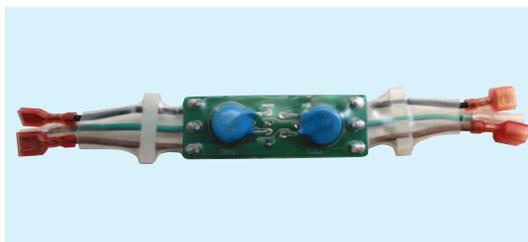
Image 3: Rotation

Image 7: Surge Protector

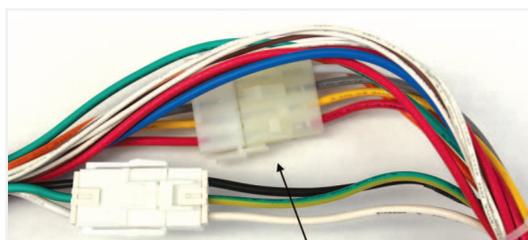**Image 4: Mode of Operation**
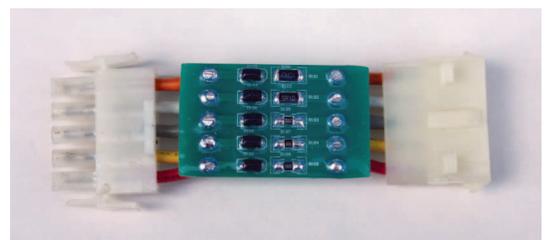
Image 6: X-13 PC Board Location

Image 5: X-13 PC Board

Connecting & Auto Sizing For PSC Applications

⚠ **NOTICE** *This motor must initially be put through a brief programming mode. During this procedure, the Azure® Digi-Motor® will run for approximately 2 minutes while it measures the external static pressure of the application. This process programs the motor to a horsepower value appropriate for the application and establishes proper torque values on each of the speed taps. This is necessary for both PSC and X-13 applications. The auto sizing process can performed as many times as desired. Each auto sizing event overrides the previous event.*

⚠ **WARNING!**

To prevent electric shock, personal injury, or death, turn off the electric power at the disconnect or main service panel prior to making any electrical connections.

1) Turn off the system thermostat. Make certain all supply registers, grilles, and zones are open and unobstructed. Make certain the air filter is clean. This is very important for accurate auto sizing and best performance of Azure®.

2) With the power removed from the HVAC system, make the following connections: Refer to wiring diagram A.

   - GREEN/YELLOW (Ground) lead to system ground

   - WHITE (N/L2) lead to Neutral or L2 (230V applications)

   - RED (Tap 5 High) lead to L1.
     Note: This is a temporary connection for auto sizing the motor.

   - BROWN & WHITE (24V & Common) harness to 24V transformer
     Note: This is a temporary connection for auto sizing the motor. Refer to image 7

3) Close the blower housing door. Carefully apply power to the HVAC system. The motor will run for approximately 2 minutes and then stop. Note: If power is left on, the motor will restart after 30 seconds and run at speed tap 5.

   IMPORTANT: THE PROCESS IS NOT COMPLETE UNTIL THE MOTOR COMES TO A COMPLETE STOP. DO NOT REMOVE POWER UNTIL THE MOTOR STOPS. IF THE MOTOR DOES NOT STOP, SEE TROUBLESHOOTING.

4) Remove power to the HVAC system.

5) Disconnect the BROWN & WHITE harness and RED speed tap 5.

6) Connect the 115V motor speed taps (select from High, Medium High, Medium, Medium Low, or Low) to the HVAC system control board; these connections match the connections of the PSC motor being replaced. **DO NOT CONNECT ANY OF THE SPEED TAPS (1-5) TO NEUTRAL.** See diagram on p.11. Carefully tie off any unused taps. Note: If low speed (625 RPM) constant fan is desired, proceed to 'Setting The 625 RPM Constant Fan Feature'.

7) Test complete system operation and confirm proper airflow.

		Ground	Neutral L2	
Tap 1 Low 625 RPM	Tap 2 Med Low	Tap 3 Med	Tap 4 Med High	Tap 5 High

Wiring Diagram A: Azure® Harness Connections for PSC Applications
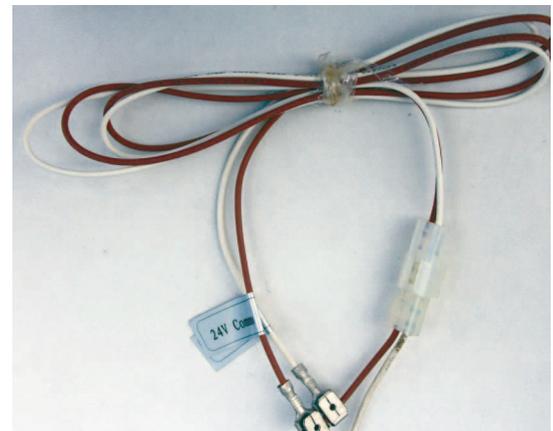

Image 7: Auto Size Harness

Connecting & Auto Sizing For X-13 Applications

⚠ **NOTICE** | *This motor must initially be put through a brief programming mode. During this procedure, the Azure® Digi-Motor® will run for approximately 2 minutes while it measures the external static pressure of the application. This process programs the motor to a horsepower value appropriate for the application and establishes proper torque values on each of the speed taps. This is necessary for both PSC and X-13 applications. The auto sizing process can performed as many times as desired. Each auto sizing event overrides the previous event.*

⚠ **WARNING!**

To prevent electric shock, personal injury, or death, turn off the electric power at the disconnect or main service panel prior to making any electrical connections.

1) Turn off the system thermostat. Make certain all supply registers, grilles, and zones are open and unobstructed. Make certain the air filter is clean. This is very important for accurate auto sizing and best performance of Azure®.

2) With the power removed from the HVAC system, make the following connections: Refer to wiring diagram B.

   • HVAC system power harness to the Azure® power harness (24V Common, Line, Ground, Neutral/L2)

   • BROWN & WHITE (24V & Common) harness to 24V transformer Note: This is a temporary connection for auto sizing the motor.
   Refer to image 7

3) Close the blower housing door. Carefully apply power to the HVAC system. The motor will run for approximately 2 minutes and then stop.

   IMPORTANT: THE PROCESS IS NOT COMPLETE UNTIL THE MOTOR COMES TO A COMPLETE STOP. DO NOT REMOVE POWER UNTIL THE MOTOR STOPS. IF THE MOTOR DOES NOT STOP, SEE TROUBLESHOOTING.

4) Remove power to the HVAC system.

5) Disconnect the BROWN & WHITE harness.

6) Connect the 24V speed taps to the thermostat where the original X-13 was connected. Select from High, Medium High, Medium, Medium Low, or Low. See diagram on p.11. Carefully tie off any unused tap.

7) Test complete system operation and confirm proper airflow.

24V Common	L1	Ground	Neutral L2	
Tap 1 Low 625 RPM	Tap 2 Med Low	Tap 3 Med	Tap 4 Med High	Tap 5 High

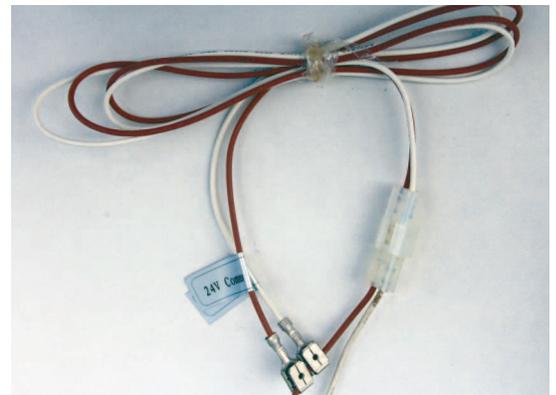**Wiring Diagram B: Azure® Harness Connections for X-13 Applications**

Image 7: Auto Size Harness

⚠ WARNING!
Electric Shock Hazard. Motor must be properly grounded.

Once installed, briefly test the motor operation in all system modes: Fan On, Heat, and Cool. Make certain the blower is operating in the correct direction.

It is normal for the motor to experience a short delay (even a rock back and forth) before beginning operation and ramping up to full Heat/Cool speed. In PSC mode, the ramp up to speed should be approximately 5 – 10 seconds. In X-13 mode, the ramp up to speed should be approximately 30 – 45 seconds depending the load.

Checking System Operation

Verify that correct airflow is present in all modes of operation. Temperature rise measurements in all modes must conform to the specifications provided by the original equipment manufacturer. If they do not, proceed to the ADJUSTING MOTOR SPEEDS section.

Adjusting Motor Speeds

The Azure® motor offers 4 speed taps for Heat/Cool modes and a 625 RPM low speed tap for constant fan use. If the motor being replaced by Azure® used high (Y) and medium (W) speeds, then high and medium speeds on Azure® should be a starting point for establishing correct airflow.

Tap 1 Orange: Low Speed (625 RPM)
Tap 2 White or Purple: Med Low Speed
Tap 3 Gray: Med Speed
Tap 4 Yellow: Med High Speed
Tap 5 Red: High Speed

In the event the perfect CFM for the application cannot be obtained, the optional hand held programmer (MARS No. 08502) can be used to adjust the blower speed of any of the 4 motor speed taps (625 RPM tap is fixed and cannot be adjusted). This tool is useful for:

- Establishing necessary blower speeds in multi-stage / multi speed systems where 4 speed taps are required

- Adjusting CFM in high altitude applications

- Adjusting CFM in high humidity applications

- Providing a digital readout of the percentage of maximum speed being delivered on the tap being energized

Operating The System In Constant Fan Mode - Excluding X-13 Applications

> ## ⚠ WARNING!
>
> When operating Azure® in X-13 mode, DO NOT connect the low speed 625 RPM speed tap 1 to a line voltage source as described below. MOTOR DAMAGE WILL OCCUR. X-13 speed taps are 24V, ONLY.

Continuous fan operation can be achieved in a variety of ways.

If the system HVAC control board provides a discrete fan output connection labeled FAN:

- Connect the orange speed tap 1 to this terminal. Constant fan operation will be controlled by the user from the thermostat.

If the HVAC system control board DOES NOT provide a discrete fan output (connection labeled FAN), then:

- Install the optional constant fan relay kit (MARS No. 08595). The kit consists of a relay and the necessary pre-cut & terminated wires. The relay is energized by the 24V signal from G on the thermostat and sends a line voltage signal to the orange speed tap 1. Constant fan operation will be controlled by the user from the thermostat. Refer to wiring diagram C.
  NOTE:
  1) Remove G wire between the thermostat and HVAC system.
  2) Some systems energize G and Y for high fan speed; in this instance jumper G to Y on the thermostat board.
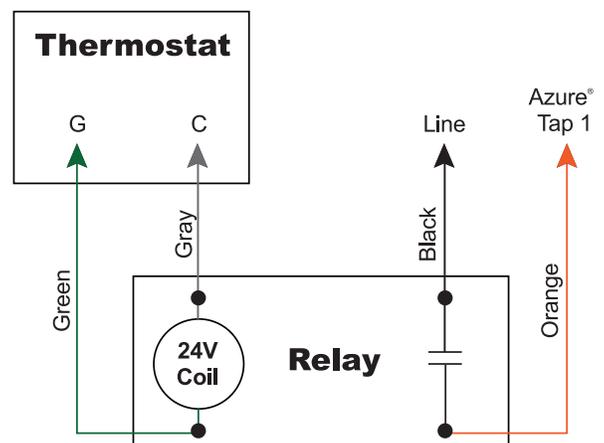
Wiring Diagram C: Constant Fan Kit

Operating The System In Constant Fan Mode – X-13 Applications

The speed taps in X-13 mode are rated for 24VAC and are driven by thermostat outputs. DO NOT CONNECT ANY SPEED TAPS TO LINE VOLTAGE. Azure® will run anytime the main power and at least 1 speed tap are energized. If more than 1 speed tap is energized, Azure® will run at the higher speed. Depending on the system, continuous fan operation can be achieved in a variety of ways:

- Connect the orange speed tap 1 to G on the thermostat.
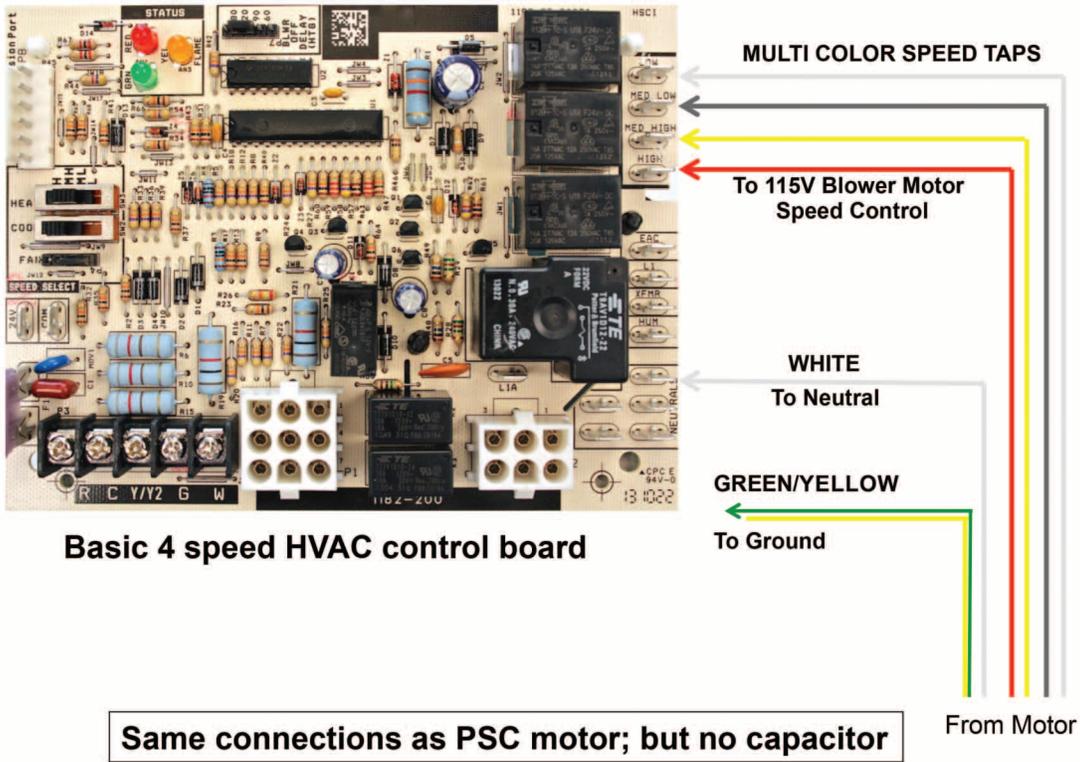
   Or

- Connect the orange speed tap 1 to any fixed 24VAC source. Azure® will provide 625 RPM constant fan operation as long as the system has power. Any calls for heat/cool will override the low speed constant fan operation.
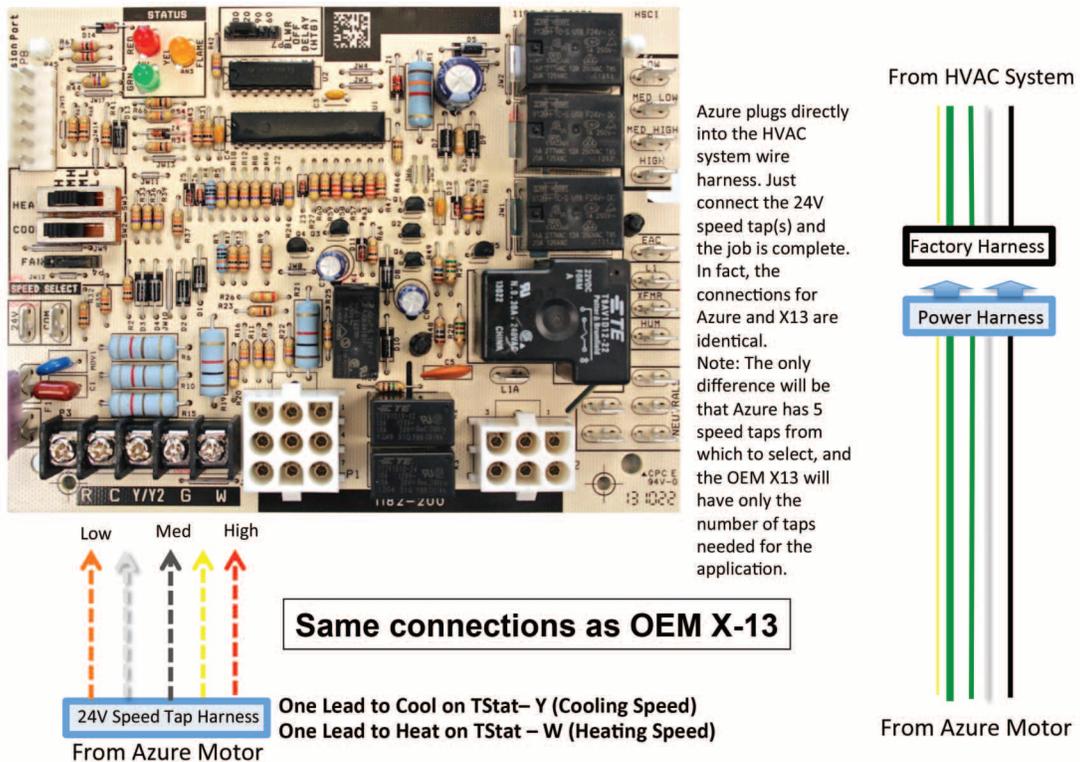
Troubleshooting

Symptom	Resolution
Motor does not run	Check for line voltage power across motor leads.
	Make certain motor is configured for the correct application voltage using the voltage jumpers.
	Check electrical continuity through the surge suppressor by removing it from the wire harness and testing Line and Neutral leads. Replace if bad, or remove and reconnect the harness.
	Make certain motor is connected to a blower wheel load.
	Make certain motor is correctly configured (PSC or X-13) for the application.
	If in X-13 mode, make certain motor has power and a 24V signal on the speed tap.
Motor speed taps do not provide correct airflow	Make certain the correct Azure® motor size is being applied. (10860 1/5 - 1/2 HP, 10861 1/2 - 1 HP) Make certain all supply registers and return grills are open and unobstructed.
	Make certain the air filter is clean.
	Make certain all zones are open.
	Re-perform the auto size function as described in the CONNECTING & AUTO SIZING section.
	Use the optional hand held programmer (MARS No. 08502) to adjust speeds.
Motor does not stop during auto sizing	Load may be to great for the motor; try setting speeds with hand held programmer or try 1 HP Azure® (10861).

Typical Connections For PSC Applications

Basic 4 speed HVAC control board

MULTI COLOR SPEED TAPS

To 115V Blower Motor Speed Control

WHITE
To Neutral

GREEN/YELLOW
To Ground

From Motor

Same connections as PSC motor; but no capacitor

Typical Connections For X-13 Applications

Azure plugs directly into the HVAC system wire harness. Just connect the 24V speed tap(s) and the job is complete. In fact, the connections for Azure and X13 are identical.
Note: The only difference will be that Azure has 5 speed taps from which to select, and the OEM X13 will have only the number of taps needed for the application.

From HVAC System

Factory Harness

Power Harness

From Azure Motor

Low   Med   High

Same connections as OEM X-13

24V Speed Tap Harness
From Azure Motor

One Lead to Cool on TStat– Y (Cooling Speed)
One Lead to Heat on TStat – W (Heating Speed)

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