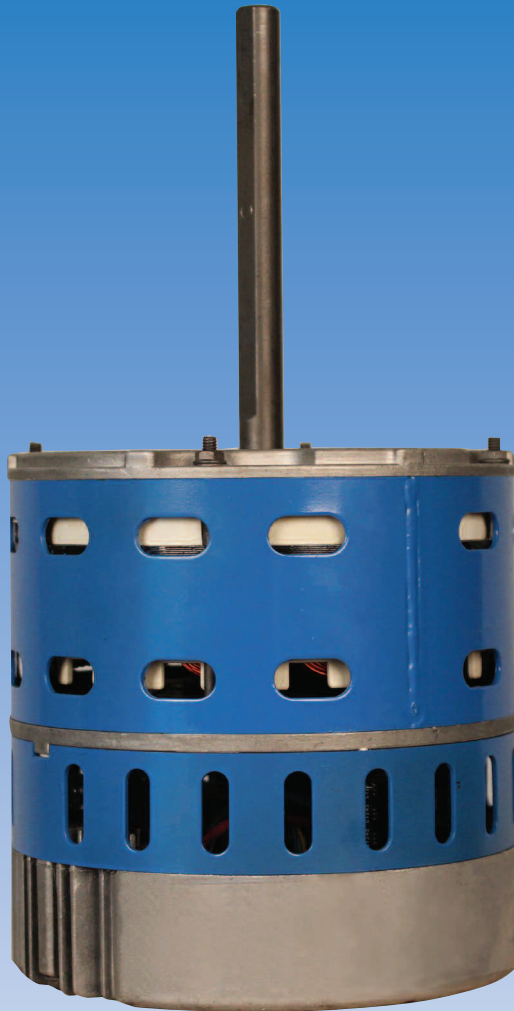# AZURE™

Digi-Motor® Installation Guide

Installation Video...located at www.marsdelivers-contractors.com

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.

Installation Video...located at
www.marsdelivers-contractors.com

Table of Contents

Please read the entire instruction manual before starting the installation.

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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 120V or 240V and CW or CCW.

Azure™ features an auto sizing learn mode. In start-up learn mode, Azure™ runs for approximately 90 seconds measuring the external static pressure of the system application. Azure™ then assigns torque values to each of its five speed taps essentially self-programming itself to the correct horsepower for the application.

If none of the five speeds provides perfect airflow, an optional PWM variable speed controller (MARS No. 08501) can be added to the motor. This controller provides 2 speed potentiometers (pots), one for heat and one for cool, that allow the motor to be set at any speed from 350 RPM to 1400 RPM (depending on the application) for perfect comfort.

Unlike other electronically commutated motors, an outboard surge protector is included within Azure's™ wire harness. This is a replaceable device (MARS No. 08591).

- Outboard replaceable surge protector
- Variable speed PWM (with use of MARS No. 08501)
- 600 RPM constant fan mode
- Reversible rotation
- High efficiency 85%

- Multi-horsepower, Direct Drive
- Dual voltage
- 5 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.

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

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.

4) Remove the blower assembly.

5) Remove the old motor and mounting bracket.

Mounting 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.*
>
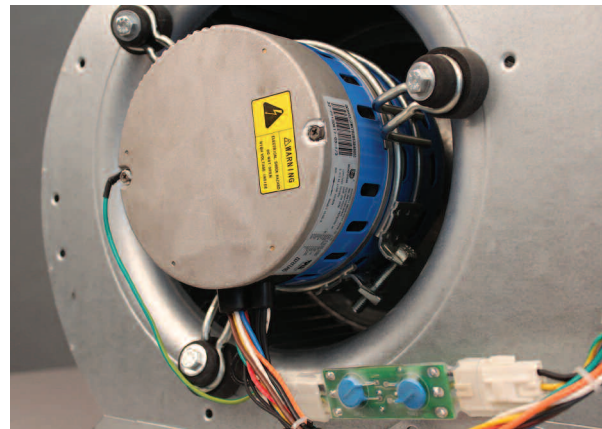> *Azure™ MARS No. 10800: 1/5 HP – 1/2 HP*
>
> *Azure™ MARS No. 10801: 1/2 HP – 1 HP*

1) Install the Azure™ Digi-Motor® into the blower housing using a high quality bellyband. MARS No. 08025 (10" bolt pattern), MARS No. 08026 (11" bolt pattern) or MARS No. 08027 (13" bolt pattern) is recommended. 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.

3) Select the correct motor voltage using the voltage jumper located within the power wire harness. Install the jumper for 120V; eliminate the jumper for 240V. Refer to Image 2.

4) Select the correct rotation using the rotation jumper located within the power wire harness. Install the jumper for CW (Lead End) rotation; eliminate the jumper for CCW (Lead End) rotation. Refer to Image 3.

5) Install the blower assembly back into the HVAC equipment.

Image 1: Motor Orientation

Image 2: Voltage Jumper

Image 3: Rotation Jumper

Connecting The Power Wires

⚠️ **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) X-13 motor applications may not require the use of the Azure™ supplied 4-wire power harness. For X-13 applications, confirm that factory power wiring corresponds to the Azure™ power wiring before plugging factory harness directly into the female connector within the motor wire harness. Refer to Wiring Diagram A. If the factory harness corresponds with Azure's™ connections, plug it into the Azure™ harness, skip the remainder of this section and proceed to the AUTO SIZING THE MOTOR section. For PSC motor applications or non-standard X-13 applications use the Azure™ supplied 4-wire power harness; ensure it is securely plugged into the female connector within the Azure™ motor wire harness. Refer to Image 4. The use of a capacitor is not required with Azure™.

2) Connect the black lead (L1) to a continuous **HOT** power source after the door switch.

3) Connect the white lead (Neutral/L2) to the main power **NEUTRAL or HOT (for 230V apps)**

4) Connect the green/yellow lead (Ground) to an equipment **GROUND.**

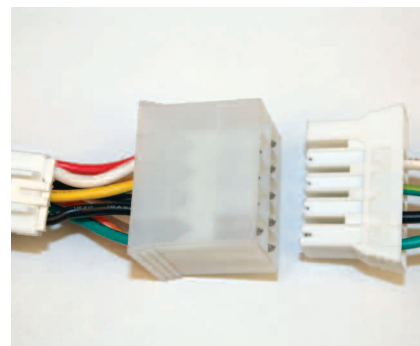5) Connect the green lead (Com) to the low voltage **COMMON.**

Image 4: Power Harness

Auto Sizing The Motor

⚠️ **NOTICE** *This motor must initially be put through a brief programming mode. During this procedure, the Azure™ Digi-Motor® will run for approximately 90 seconds 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 five speed taps. This is necessary for both PSC and X-13 motors.*

Common	L1	Ground	Neutral L2	
Tap 1 Low	Tap 2 Med Low	Tap 3 Med	Tap 4 Med High	Tap 5 High

Wiring Diagram A: Azure™ Harness Connections

1) Ensure all supply registers and return grills are open and unobstructed and that all zones are open. This is very important for accurate horsepower sizing and best performance of Azure™. Also, ensure air filter is clean. Turn Thermostat OFF.

2) With power removed from the HVAC system, temporarily connect the blue special features programming harness (SF) to the blue wire within the Azure™ motor wire harness labeled (SF). Temporarily connect the other end of the special features programming harness (SF) to a fixed +24V source. Refer to Image 5.

3) Important: Close the blower-housing door. Carefully apply power to the HVAC system. The motor will run for approximately 90 seconds and then stop to indicate the auto sizing process is complete. **IMPORTANT: THE PROCESS IS NOT COMPLETE UNTIL THE MOTOR COMES TO A COMPLETE STOP. DO NOT REMOVE POWER UNTIL THE MOTOR COMPLETELY STOPS.**

3) Remove power to the HVAC system.

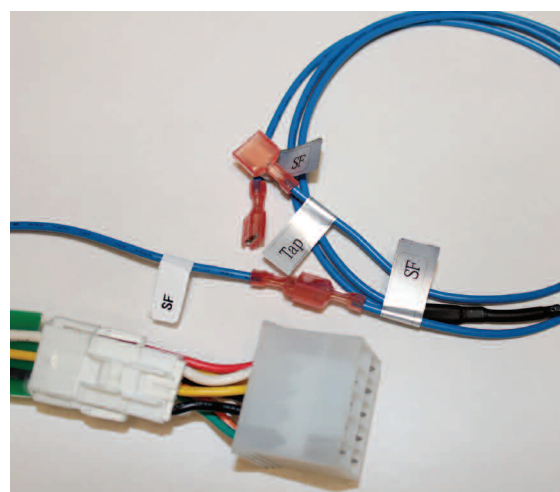4) Remove the special features programming harness.

Image 5: SF Harness

Selecting The Operating Mode

1) **The Azure™ motor is factory programmed for PSC motor replacement.** If Azure™ is being used to replace an X-13 motor, proceed to step 2 below. For PSC motor applications, skip the remainder of this section and proceed to CONNECTING THE 24V SPEED TAPS section.

2) With power removed from the HVAC system, ensure the 5-wire speed tap harness is securely plugged into the female connector on the Azure™ motor wire harness. Refer to Image 6.

3) Temporarily connect the blue special features programming harness (SF) to the blue wire within the Azure™ motor harness labeled (SF). Temporarily connect the other ends of the special features programming harness (Tap) to the yellow speed tap (Tap 4 Med High) and the (SF) connector to a fixed +24V source. Refer to image 7.

4) Apply power to the HVAC system. The motor will run for approximately 10 seconds and stop to indicate the change to X-13 mode is complete. **IMPORTANT: THE PROCESS IS NOT COMPLETE UNTIL THE MOTOR COMES TO A COMPLETE STOP. DO NOT REMOVE POWER UNTIL THE MOTOR COMPLETELY STOPS.**

5) Remove power to the HVAC system.
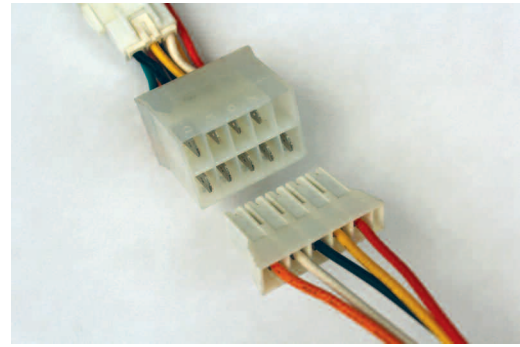
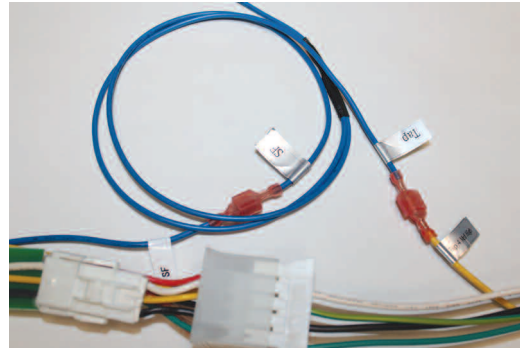6) Remove the special features programming harness.

Image 6: Speed Tap Harness

Image 7: Programming X-13 Mode

Connecting The 24V Speed Taps

⚠ **NOTICE** *This motor requires two run signals to operate in PSC mode:*

1) The motor requires a power signal to determine when the motor will run. This signal is derived from the HVAC system control board where all speeds of the old PSC motor were connected. All connections previously used by the PSC motor speeds (except Neutral) will now be wired together via the brown control signal harness. This allows Azure™ to receive a 115V communication signal from all HVAC system demands. This signal is not required for X-13 applications.

2) The motor requires a +24V speed tap signal from the thermostat to determine the speed at which to run (in heat, cool, high/low heat, and high/low cool). DO NOT CONNECT SPEED TAPS TO ANY OF THE OLD PSC MOTOR SPEED CONNECTIONS. MOTOR DAMAGE WILL OCCUR.

1) With the power removed from the HVAC system, ensure the 5-wire speed tap harness is securely plugged into the female connector within the Azure™ motor wire harness.

2) Select one of five speed taps (Tap 1 Low, Tap 2 Med Low, Tap 3 Med, Tap 4 Med High, Tap 5 High) for system cool speed; connect the selected lead to the +24V tap designated for cooling on the thermostat terminal board. Clip the quick connect terminal on the speed tap as necessary.

3) Select a second speed tap for system heat speed; connect that lead to the +24V tap designated for heating on the thermostat terminal board. Clip the quick connect terminal on the speed tap as necessary.

4) For multi-speed systems, select any of the remaining speed taps. If the same speed tap is required for more than one call, use the optional PWM Variable Speed Controller. Do not connect the same speed tap to more than one thermostat connection.

5) For PSC motor applications, connect the single end of the brown control signal harness (H) to the brown lead within the Azure™ wire harness labeled (H). Connect the other ends of the harness to all motor speed connections previously used by the PSC motor. These connections could be on a main circuit board, a separate fan control circuit board, or individual fan relays/switches. These connections are for communication; they tell Azure™ when to run and when to stop. Tie off and insulate any unused (H) leads. **For connection options, see addendum on page 11.**

⚠ **NOTICE** X-13 applications do not require the use of the brown control signal harness (H).

Testing Motor Operation

> ⚠️ **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, which will take approximately 45 seconds depending on 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 (24V & PWM Variable Speed)

The Azure™ motor has five 24V low voltage speed taps that offer five different motor speeds based on the load. Select the necessary taps to provide the correct airflow for all modes of operation:

Tap 1 Orange:	Low Speed
Tap 2 White:	Med Low Speed
Tap 3 Gray:	Med Speed
Tap 4 Yellow:	Med High Speed
Tap 5 Red:	High Speed (also PWM Input)

In the event the perfect CFM cannot be found using the above speed taps, the optional PWM variable speed controller (MARS No. 08501) can be used. This controller accepts a 24V call for heat and cool from the thermostat and generates a PWM output signal to the motor. Two speed pots (one for heat and one for cool) can be set to deliver any motor speed between 350 and 1400 RPM's (depending on the application).

Installing The PWM Variable Speed Controller (Optional MARS No. 08501)

> ⚠️ **NOTICE** *The optional PWM variable speed controller replaces the use of the 24V low voltage speed taps on Azure™. The controller receives a 24V signal from the thermostat for either a call for heat or cool and converts it to a digital PWM (Pulse Width Modulation) signal that drives the motor through tap 5. The motor speed is set via two speed pots (one for heat and one for cool).*

> ⚠️ **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.
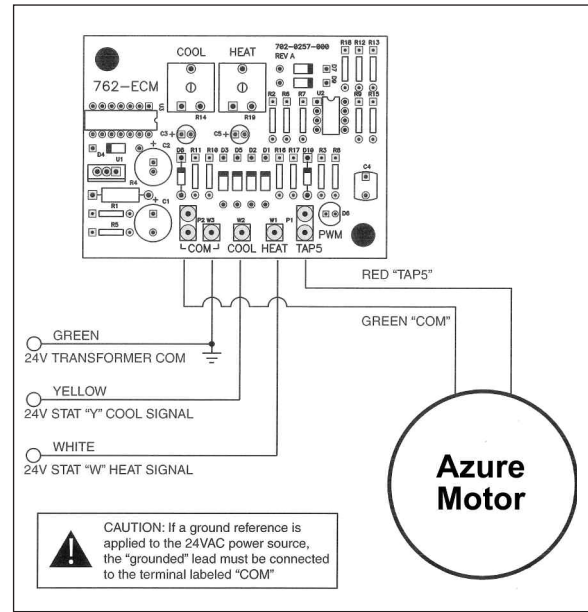
1) With the power removed from the HVAC system, make the following connections. Refer to Wiring Diagram C on page 8:

- Red motor lead (Tap 5) to PWM control board marked Tap 5.
- Yellow lead from PWM board to +24V tap designated for cooling on the thermostat terminal board.
- White lead from PWM board to +24V tap designated for heating on the thermostat terminal board.
- Green lead (COM) from motor to COM on PWM control board.
- Green lead (COM) from PWM control board to a COMMON source.

2) Using the supplied screws, carefully secure the PWM control board to a flat surface. If the board is mounted to the blower housing, make certain the mounting screws do not interfere with the blower wheel.

3) Restore power to the HVAC system.

4) Using a small screwdriver to carefully adjust the speed pots (potentiometers), set the blower speed for both heat and cool modes to deliver the necessary system CFM. Once set, leave the speed pots set in place.

Operating The System In Constant Fan Mode

The Azure™ Digi-Motor® is electronically controlled and very efficient at all RPMs. It is designed to deliver continuous airflow at a gentle 600 RPM when the thermostat is set in the ON position. This is ideal for systems with indoor air quality equipment. When a call for heat or cool occurs, Azure™ will gently ramp up to the appropriate run speed. At the conclusion of the call, Azure™ will then gently ramp back down to its low constant fan speed.

Wiring Diagram C

Troubleshooting

Symptom	Resolution
Motor does not run	Check for line voltage power across black (Line) and white (Neutral) 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.
	Make certain motor is connected to a blower wheel load.
	Make certain motor is correctly configured (PSC or X-13) for the application. Factory default setting is PSC mode.
	If in PSC mode, make certain brown control power harness is connected to ALL fan power relays (all cool and heat on the system control board) and that they are supplying a line voltage signal during the call.
	Make certain a 24V thermostat signal (for HEAT or COOL) is present and applied to a speed tap on the motor.
	Make certain the blue SF harness has been removed after auto sizing is complete.
Motor runs but only in low RPM constant fan mode	Make certain motor is correctly configured (PSC or X-13) for the application. Factory default setting is PSC mode.
	If in PSC mode, make certain brown control power harness is connected to ALL fan power relays (all cool and heat on the system control board) and that they are supplying a line voltage signal during the call.
	Make certain a 24V thermostat signal (for HEAT or COOL) is present and applied to a speed tap on the motor.
Motor speed taps do not provide correct airflow	Make certain the correct Azure™ motor size is being applied.
	Make certain all supply registers and return grills are open and unobstructed.
	Perform the auto sizing function as described in AUTO SIZING THE MOTOR section.
	Install the optional Variable Speed PWM Controller (MARS No. 08501).

Azure™ Programming Options

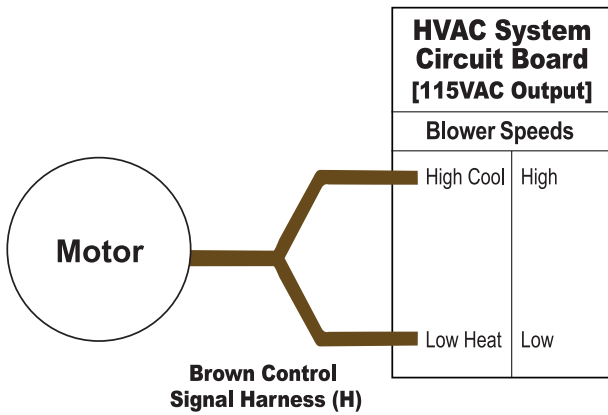| ⚠ WARNING! |
|---|
| To prevent electric shock, personal injury, or death, turn off the electric power at the disconnect or main service panel prior to making any electrical connections. |

Azure™ can be reconfigured in the field using the blue special features wire harness (SF) and the motor wire connections listed below. This procedure also requires the motor power harness to be installed.

1) With power removed from the HVAC system, temporarily connect the blue special features programming harness (SF) to the blue wire within the Azure™ motor wire harness labeled (SF). Temporarily connect the other end of the special features programming harness (SF) to the leads identified in the table below for the desired function.

2) Carefully apply power to the HVAC system. The motor will run for the period of time described below and stop.

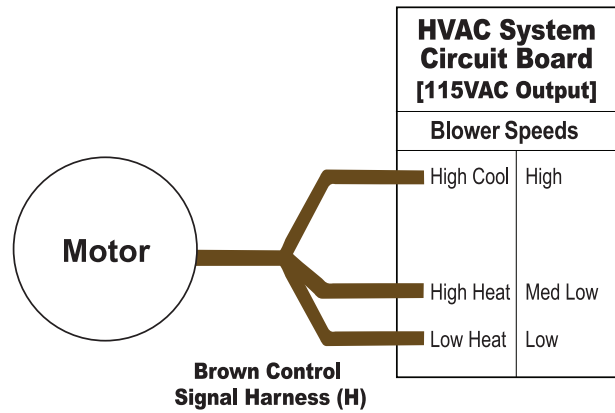3) Remove power to the HVAC system and remove the special features harness and any other temporary connections.

Function	Motor Wire Connections
Auto Size Mode:	(SF) + 24VAC: Motor will run for approximately 90 seconds and then stop to indicate the sizing process is complete. IMPORTANT: THE PROCESS IS NOT COMPLETE UNTIL THE MOTOR COMES TO A COMPLETE STOP. DO NOT REMOVE POWER UNTIL THE MOTOR COMPLETELY STOPS.
X-13 Mode:	(SF) + (Tap 4) + 24VAC : Motor will run for approximately 10 seconds and then stop to indicate the switching process is complete. IMPORTANT: THE PROCESS IS NOT COMPLETE UNTIL THE MOTOR COMES TO A COMPLETE STOP. DO NOT REMOVE POWER UNTIL THE MOTOR COMPLETELY STOPS.
PSC Mode:	(SF) + (Tap 5) + 24VAC: Motor will run for approximately 10 seconds and then stop to indicate the switching process is complete. IMPORTANT: THE PROCESS IS NOT COMPLETE UNTIL THE MOTOR COMES TO A COMPLETE STOP. DO NOT REMOVE POWER UNTIL THE MOTOR COMPLETELY STOPS.
Factory Reset:	(SF) + (Tap 3) + 24VAC: Motor will run for approximately 10 seconds and then stop to indicate the reset process is complete. IMPORTANT: THE PROCESS IS NOT COMPLETE UNTIL THE MOTOR COMES TO A COMPLETE STOP. DO NOT REMOVE POWER UNTIL THE MOTOR COMPLETELY STOPS.

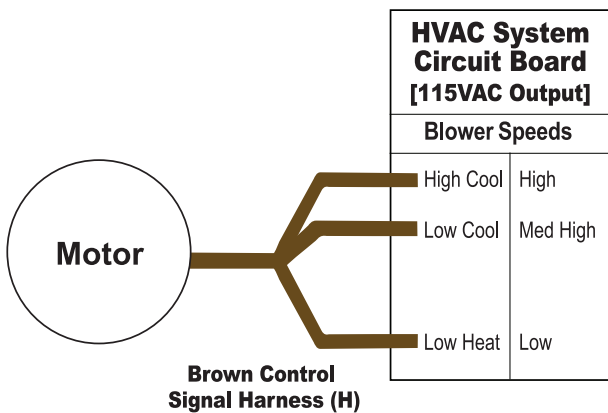# NOTES

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Wiring Addendum

Single Stage Heat
Single Stage Cool

Motor

**Brown Control
Signal Harness (H)**

HVAC System Circuit Board [115VAC Output]	
Blower Speeds	
High Cool	High
Low Heat	Low

Two Stage Heat
Single Stage Cool

Motor

**Brown Control
Signal Harness (H)**

HVAC System Circuit Board [115VAC Output]	
Blower Speeds	
High Cool	High
High Heat	Med Low
Low Heat	Low

Single Stage Heat
Two Stage Cool

Motor

**Brown Control
Signal Harness (H)**

HVAC System Circuit Board [115VAC Output]	
Blower Speeds	
High Cool	High
Low Cool	Med High
Low Heat	Low

Two Stage Heat
Two Stage Cool

Motor

**Brown Control
Signal Harness (H)**

HVAC System Circuit Board [115VAC Output]	
Blower Speeds	
High Cool	High
Low Cool	Med High
High Heat	Med Low
Low Heat	Low

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Digi-Motor®

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